GSGS'17

2ND GAMIFICATION & SERIOUS GAME SYMPOSIUM

HEALTH | TRAINING | ART & CULTURAL INHERITANCE | POLITICS, ECOLOGY & ECONOMY | SOCIAL | BUSINESS EXPERTISE | EDUCATION

30 June & 1 July 2017 | Neuchâtel | Théâtre du Passage | www.gsgs.ch

STÉPHANE GOBRON

haute école arc neuchâtel berne jura

NIFFF NEUCHÂTEL INTERNATIONAL FANTASTIC FILM FESTIVAL
THE 17TH SWISS EVENT FOR FANTASTIC FILM, ASIAN CINEMA & DIGITAL CREATION
30 JUNE - 8 JULY 2017

hep/ haute école pédagogique vaud

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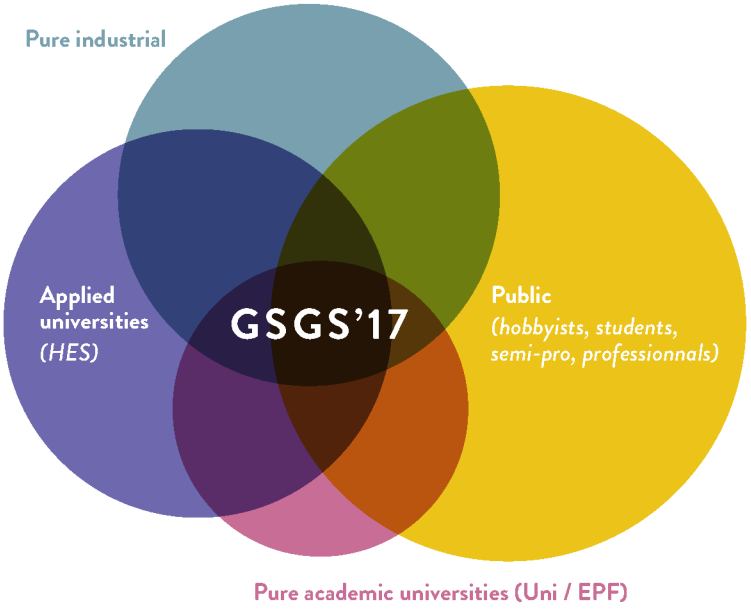
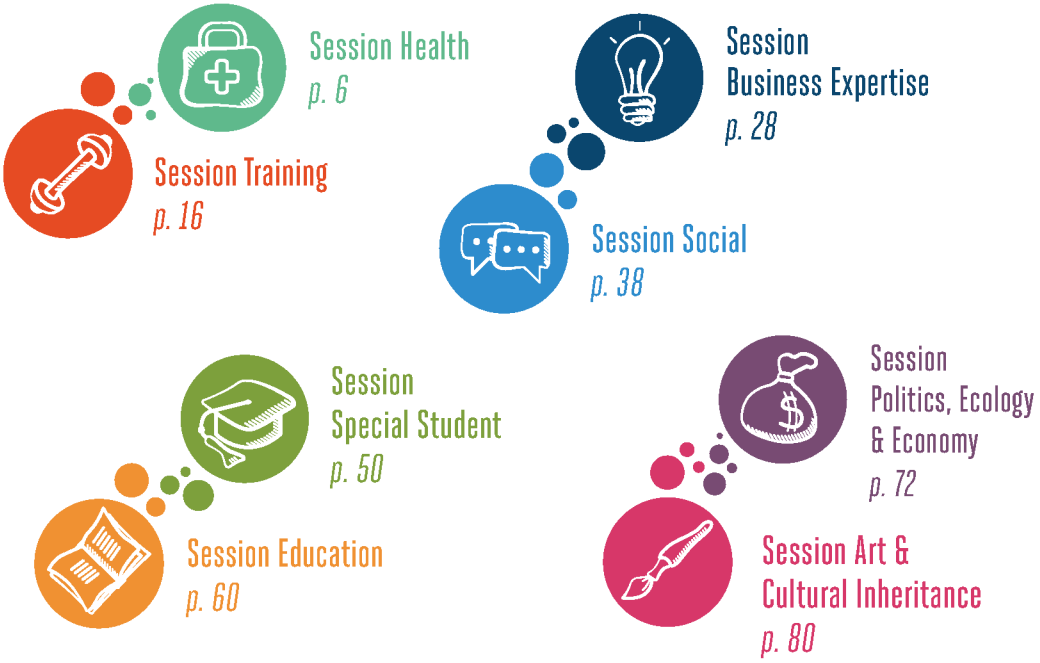
The GSGS'17 conference is at the interface between industrial needs and original answers by highlighting the playful perspective to tackle technical, training, ecological, management and communication challenges. Bringing together the strengths of our country, this event provides a solid bridge between academia and industry through the intervention of more than 50 national and international actors. In parallel with the 60 presentations and demos, the public will be invited to participate actively through places of exchange and round tables.



Four categories of people interacting to rise innovation.

GSGS'17: 8 SESSIONS COVERING A LARGE PALETTE OF DOMAINS



FRIDAY

JUNE 30

DAY 1

BUSINESS EXPERTISE — CHAIR: SHABAN SHAAME | EVERDREAMSOFT | GENEVA

14h15–14h28 **9** Deadline
Valérie Pierrehumbert | HEAD, HES-SO | Geneva pp. 29–30

14h30–14h43 **10** Gamification to defeat the Crisis of Engagement
Joris Beerda | the Octalysis Group | Massagno pp. 31–32

14h45–14h58 **11** How to build up a game studio around an educational game prototype
Philomena Schwab | Stray Fawn Studio | Zürich pp. 33–34

15h00–15h13 **12** Case studies: from client's needs analysis to serious-game solutions
Olivier Reutenauer | Digital Kingdom | Vevey pp. 35–36

15h15–15h40 **roundtable** Hybrid – Virtual & Physical – Games
All business & social sessions speakers and chairs p. 37

15h40–16h05 Break & demo focus #2

SOCIAL — CHAIR: JEAN-PIERRE TABIN | EESP | LAUSANNE

16h10–16h23 **13** StoriaBox – from Gamification to Serious Game, is it the right way?
Francesco Termine | HEG-Arc, HES-SO | Neuchâtel pp. 39–40

16h25–16h38 **14** A mobile serious game fostering healthy eating habits
Stefano Carrino | HE-Arc, HES-SO | Neuchâtel pp. 41–42

16h40–16h53 **15** Datak: Months of investigation in a Serious Game to raise awareness of Big Data implications
Julien Schekter | RTS | Lausanne pp. 43–44

16h55–17h08 **16** Educational Scenarios – How to produce Motivation to learn with a Serious Game?
Florence Quinche | HEP-VD | Lausanne pp. 45–46

17h10–17h35 **roundtable** Serious Games effects on Social Change
All business & social sessions speakers and chairs p. 47

17h35–18h00 End of day #1: summary & important informations

18h00–21h00 Social event: GSGS'17 official toast & cocktail @ the official VIP site

SATURDAY JULY 1

DAY 2

8h15–8h35 Café-croissant, Proceedings & Program

8h40–9h20 SPECIAL GUEST **RUBÉN RIESTRA**

RAGE: Advanced technology and know-how for Serious Games studios
BiP media | Hyères | France pp. 48–49

SPECIAL STUDENT — CHAIR: STEFANO CARRINO | HE-ARC, HES-SO | NEUCHÂTEL

9h30–9h43 17 Penultimo
Jessica Friedling | HEAD, HES-SO | Geneva pp. 51–52

9h45–9h58 18 Massive, a Game of Four Forces based on particle Physics, approved by the Physicists
Patrick Arthur Donaldson | HEAD, HES-SO | Geneva pp. 53–54

10h00–10h13 19 Object Conception for Kids – an Upgrade of three Serious Games
Stéphane Gobron | HE-Arc, HES-SO | Neuchâtel pp. 55–56

10h15–10h28 20 Rehabilitation by mirror therapy through virtual reality in symbiosis with a robotic device
Gaétan Séchaud | EPFL | Lausanne pp. 57–58

10h30–10h55 roundtable Gamification & SGs Role & impact on Swiss Universities
All student & education sessions speakers and chairs p. 59

10h55–11h10 Break & demo focus #3

EDUCATION — CHAIR: | HEP-VD | LAUSANNE

11h15–11h28 21 Adventures-mat, a new concept of serious game using Augmented Reality
Antoine Widmer | HE-VS, HES-SO | Sierre pp. 61–62

11h30–11h43 22 Getting The Public involved in Quantum error correction
James Wootton | Basel University | Basel pp. 63–64

11h45–11h58 23 Can we be motivated to learn Algebra with a Serious Game?
Denise Sutter Widmer | UniGE | Geneva pp. 65–66

12h00–12h13 24 Teachers' Motivations to integrate Video Games in the classroom
Ludovic Favre | HEP-VD | Lausanne pp. 67–68

12h15–12h40 roundtable How can SGS contribute to renew Educational Approaches?
All student & education sessions speakers and chairs p. 69

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REINFORCING THE DIFFERENCE BETWEEN SIMULATION, GAMIFICATION, AND SERIOUS GAME

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CONTEXTUALIZATION

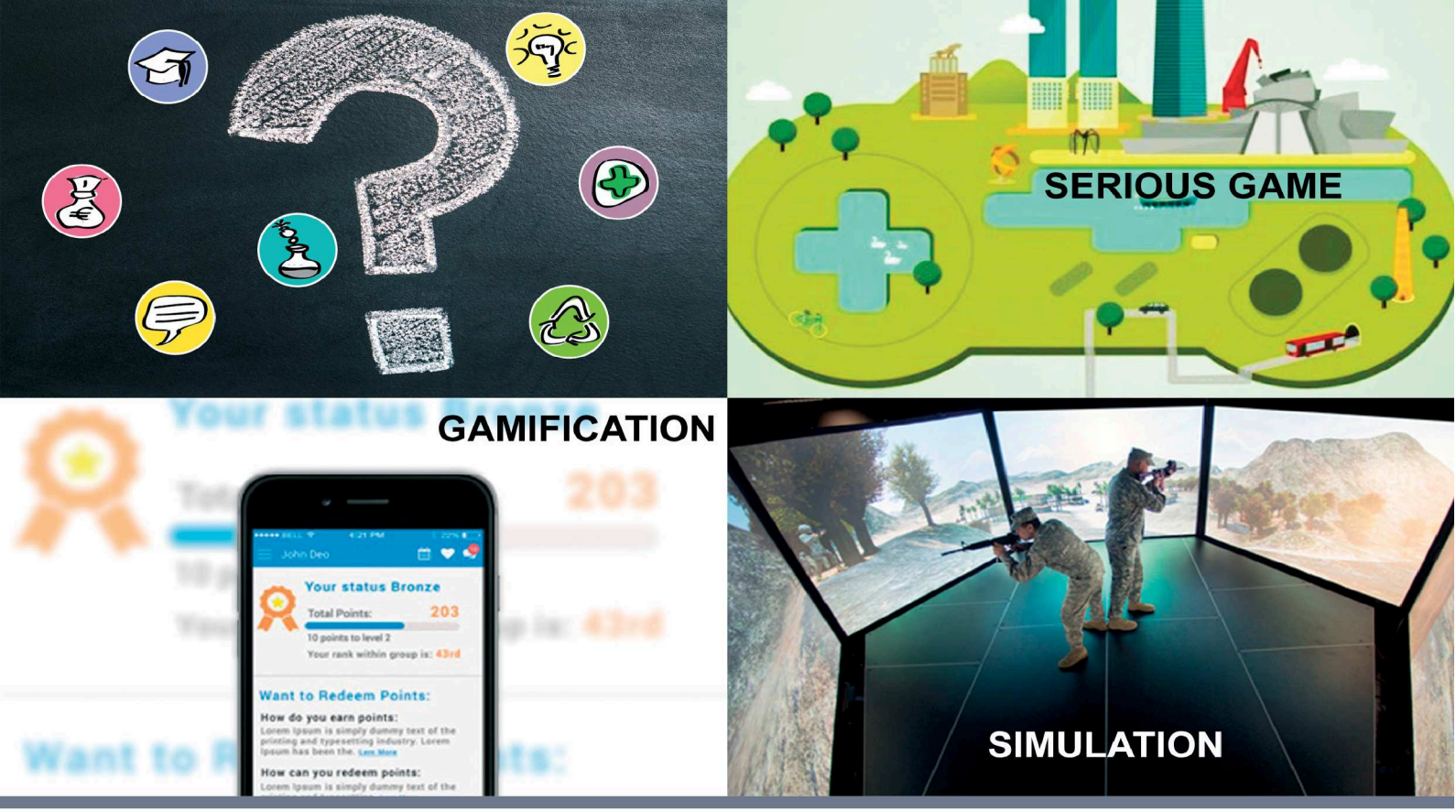
Catching up the first introduction paper of last year conference, we take the opportunity to reinforce the difference between three frequently mixed up concepts: "simulation", "gamification" and "serious games". The reason for this confusion could be that they often share the same domain of application or medium, and even, in some cases, overlap themselves. However they are distinct concepts, and it is therefore important to make distinctions between these different practices. We can note that "eLearning", being a term that is relatively well defined and understood, is not further detailed here, as it was in last year paper.

THEME & OBJECTIVES

This short paper proposes definitions of the three concepts. It also highlights their limitations and where they could overlap. Examples representing their main characteristics are also illustrated in the figure.

Simulation is a representation of some behaviour or process based on real life phenomena. It finds application in fields like physics, biology or even economics and society. It aims to reproduce these phenomena with their consequences using corresponding scales and measurements based on well-defined units, e.g. distance, weight or time. Real-time (that can be 60Hz or a day per frame) is frequently the main factor allowing the simulation rhythm **[1]**. The medium is, in most of the case, computers with possible dedicated input or output device (lower-right part of the figure). The domain of application can be learning, evaluation, discovering or prediction.

Gamification is a recent term, and its origin makes debate; some say 2002, other 2008. It consists in adding game components to a non-game activity, e.g. score or achievements (lower-left part of the figure) in order to make it



more enticing and entertaining for its participants [2]. Providing measurable and comparative feedback on an activity will promote users' motivation and engagement [3] without altering the activities nor the way they are performed. This definition shows a large domain of application, e.g. learning, data collection, health and many more. Even if this terms is mostly used in a context that involves software, it is not a requirement and can be applied to a more basic medium such as paper.

A **Serious Game** (SG) is a game (upper-right part of the figure) that have a serious primary purpose, instead of being only an entertainment product [4]. This aspect aims to train, search for or promote three possible cognitive levels: knowledge, skills or behaviours. It allows many different domains of application like learning, health and advertising. The term is usually used implying a software as a medium, but the concept allows various applications. SGs can be very similar to classic video games (which can strongly alter how we perceive the "serious" concept) or, on the contrary, have the appearance of a simulation software. Even if entertainment is not the primary purpose, an SG has to provide enjoyment like any other games and has to contain some game key components: rules, challenge, and interaction.

COMMON FEATURES AND DIFFERENCES

Here is a non-exhaustive list of properties that can help to define boundaries for each concept:

Gamification is the concept that requires the most user feedbacks as it is based on providing them using gaming elements. Gamification might also be seen as the less restrictive one, as the medium can easily be non-digital, allowing it to be applied to most of the existing tasks that would benefit from a greater user engagement. The use of game components is present into both Gamification and SG. The difference lies in how they are used: a gamification is a task to which they are added; an SG is a game conceived with a given purpose and may use them like any other game. An SG can be realistic or not, and if it is, the distinction with simulation can be hard. A simulation is based on reproducing real phenomena while an SG targets "serious" aspect such as learning and provide rules, challenge, and interaction. Finally, we see that these concepts can overlap and some products could be more than one of them.

A PRACTICAL EXAMPLE

It is not always easy to understand the difference, especially when searching the best development strategy. Here is a practical and simple example that might help concerning posture's impacts on health at a desk:

- A **simulation solution** would allow the user to select between different desk configurations and see a projection based on probability of its future disorder;
- A **gamified solution** would be a record (automatic or manual) of user activity with a web platform showing him his computed score and achievements depending on how often he does short break or other criteria;
- A **serious game application** would be a game where the user's progression is designed to make him learn how to behave. The interaction would allow him to make mistakes, but the rules would be designed so that a better behaviour would grant him a better success on the offered challenge.

REFERENCES

[1] J. Banks, J. Carson, B. Nelson, D. Nicol (2001). *Discrete-Event System Simulation.* Prentice Hall. p. 3. ISBN 0-13-088702-1.

[2] Marklund, B. B. (2015), *Unpacking digital Game-based learning—The complexities of developing and using educational games,* Doctoral Dissertation, Department of Informatics, University of Skövde, Dissertation Series, n°8.

[3] Deterding, S., Dixon, D., Khaled, R. and Nacke, L. (2011), *From game design elements to gamefulness: defining "gamification"*, Proceedings of the 15th International Academic MindTrek Conference: Envisioning Future Media Environment, Tampere, Finland, pp. 9–15.

[4] Djaouti, Damien; Alvarez, Julian; Jessel, Jean-Pierre. *Classifying Serious Games: the G/P/S model* (PDF). Retrieved 26 June 2015.


SPEACH
&
SHORT
PAPERS

SESSION HEALTH 9H15-10H40

Gamification has mostly contributed in the field of health by using fun and pleasure to raise awareness or improve learning "healthy" behaviours. Moreover, game technologies explore new communication ways between human and machine: making visible the evolution of performances, communicating with the machine through its emotions or gestures are examples that will be presented in this session. These will open our appetite and highlight the potential of the gaming development and technologies for health professionals and everyone's health.

CHAIR: VERA BUSTOMANTE | CHUV | LAUSANNE

hepia
Haute école du paysage, d'ingénierie et d'architecture de Genève

1 TOUCHLESS MEDICAL IMAGES INTERACTION IN SURGERY

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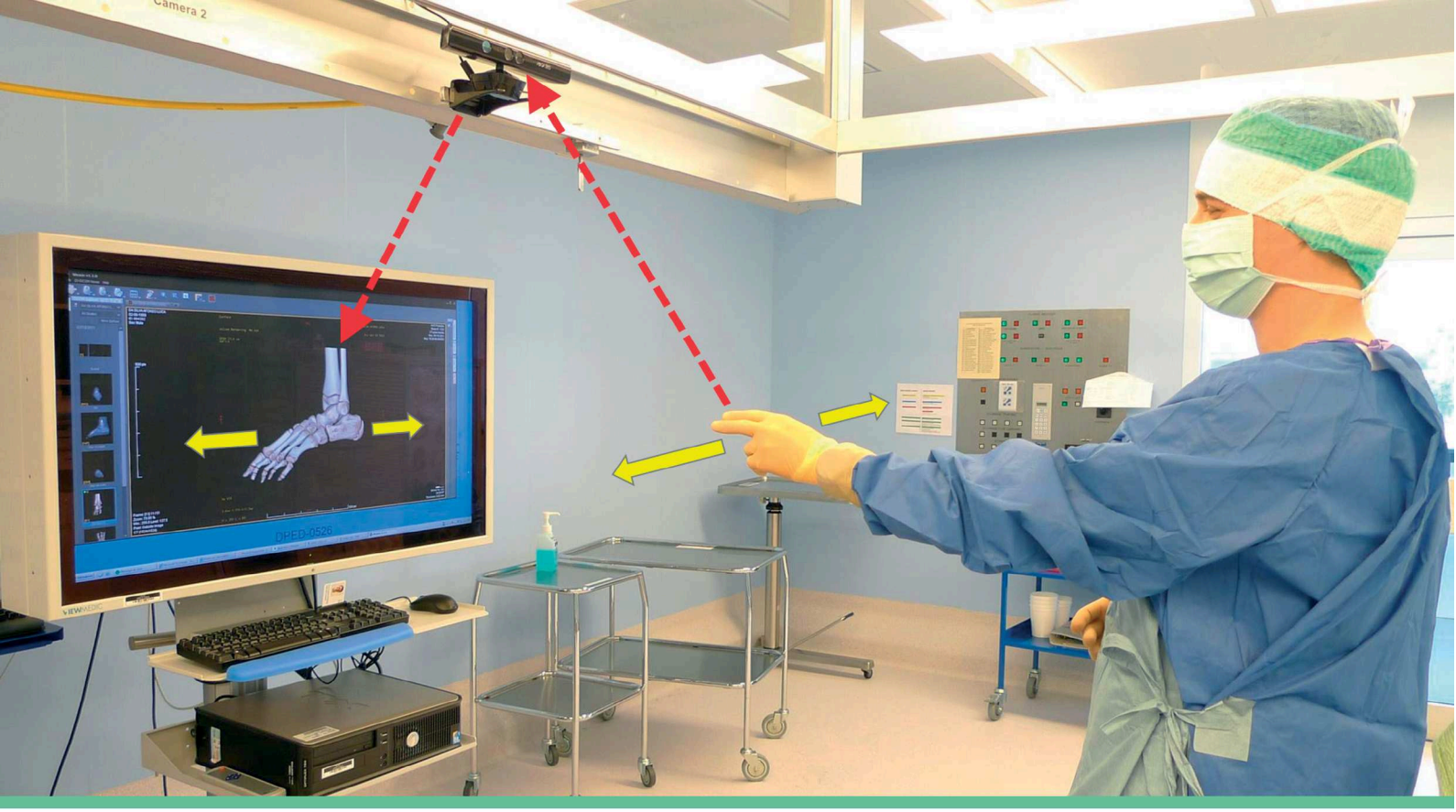
Surgeons are very interested in the new human-machine interface solutions recently marketed. They are particularly attracted by the potential applications using augmented reality systems and depth sensors [1]. However, these interfaces, initially designed for games, are not directly usable in the operating rooms. The problem may be on the hardware side. For example, it is difficult to imagine a surgeon wearing Microsoft HoloLens during an entire surgical operation, because this device hides part of the view and because it is too uncomfortable to wear for several hours. The software side can also create difficulties because these devices are usually provided with their own Software Development Kit (SDK), but these SDKs are rarely multiplatform and open source. Finally, there may be incompatibilities with the aseptic rules. Surgeons and engineers therefore need to work together to design solutions.

In this paper, we present the ongoing work carried out by Hepia engineers and HUG surgeons to solve an issue related to the manipulation of radiological images. Currently, each time the surgeon needs to change the displayed images of his patient during a surgery, he must touch a computer keyboard or a mouse. Then, before proceeding the surgical operation, the surgeon must perform a sterilization procedure (wash the hands and pull new gloves on) increasing the surgery time and contamination risks for the patient. An alternative solution consists in dictating the manipulations to an assistant, but it is not practical either. In [2], HUG surgeons showed, with a first prototype developed by Hepia engineers, that using a touchless user interface based on a depth sensor is a good solution. The whole team has therefore continued developing this prototype named KiOP (contraction for Kinect Operating room).

It is difficult to imagine a surgeon wearing Microsoft HoloLens during an entire surgical operation.

For the development of this touchless interface, the constraints imposed by its integration in surgery are the following. Due to the ambient noise and for sterility reasons, the viewer should be controlled by gestures without markers. Because surgery can take hours, the gestures must be as effortless as possible. To reduce the surgeon learning time, the user interface should be particularly intuitive. Finally, to ensure the system usability and real interest, gesture recognition must be excellent. Indeed, errors in detecting gestures in a video game are annoying but acceptable, whereas in the operating room, the surgeons have no time to deal with bad gesture recognition.



Regarding the depth sensor, we chose to develop our gesture-based interaction system with the Microsoft Kinect sensor 2.0, as its wide field of view allows to track the surgeon inside the sterility area from an outside point of view. Moreover, the Kinect 2, based on time of flight technology (ToF), shows better performance in the high-brightness operating room environment and higher resolution depth data than camera based on structured light technology (e.g. Kinect 1.0) [3].

The most challenging part of this project is about the surgeon hand tracking robustness. When we detect a problematic situation, we increase the robustness of our software either with image processing algorithms or by adding feedback information to the user.

In conclusion, the new human-machine interface coming from games can have very useful applications in the surgery field. In this paper, we presented a work regarding tool development to assist surgeons in their work with a Kinect 2 sensor. In future work, we would like to use such human-machine device in surgeon training application. In [4], K. Kahol and M. Smith showed that game devices can contribute to develop surgeon dexterity in a playful way. In [5], D. Chevallier presented the current need to develop serious games dedicated to surgeon, particularly to learn and practice technical gestures.

REFERENCES

[1] Wagner M., North T., Strgar T., Duay V., Bourquin S., Pignat M., Sierro A., Mudry P.-A. et Dubois-Ferrière V., *Lunettes à réalité augmentée commandées par les gestes et la parole pour applications médicales*, EPHJ, Juin 2015.

[2] Wipfli R., Dubois-Ferrière V., Budry S., Hoffmeyer P., Lovis C., *Gesture-Controlled Image Management for Operating Room: A Randomized Crossover Study to Compare Interaction Using Gestures, Mouse, and Third Person Relaying*, PLOS ONE, 2016, vol. 11, no 4.

[3] Li L., *Time-of-flight Camera – An Introduction*, Texas Instruments, Technical White paper, SLOA190, January 2014.

[4] Kahol K., Smith M., *Surgeons on Wii: Applying Nintendo Wii to improve surgical skill*, the 16th Annual Medicine Meets Virtual Reality Conference, California, 2008.

[5] Chevallier D., *Serious games en médecine et santé: Gamification et simulation chirugicale*, SeGaMed 2014.

2 ARISTOTLE WAS RIGHT: AN APP FOR LEARNING WHILE MOVING

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During the fourth century BCE, as he was teaching in the Lyceum of Athens, Aristotle used to walk around accompanied by his pupils. This practice had such a central role in his pedagogical approach that the Greek word περιπατειω, which means "to walk around", gave name to the peripatetic school.

Today, as our society faces serious "sedentary lifestyle" issues, we think that walking and moving should become again a central element of learning. We will thus use the smartphone technology to transform the physical space of the University of Lausanne in a big learning space. In the context of Mr. Davide Malatesta's course "Adapted Physical Activity and Obesity", we will have the opportunity to develop an application offering several pedagogical trails on the campus, for students to learn, think and move. Our objective is to create, on a smartphone application, an adaptive, pedagogical structure that may be freely used by all professors and assistants in the university.

Student life is characterized by long sitting periods. In the last years, research has shown that sitting has several detrimental effects on metabolism [1]. It is maybe the right time to re-invite movement in learning, moreover because walking and physical activity have positive effects on learning and memory [2], creativity [3] and protects the brain from ageing [4]. A study has also shown that walking in a natural environment is more profitable that in an urban environment [5]. It would thus be sad not to use the marvellous environment surrounding the university with its forests, river and lake.

We aim at creating an adaptive pedagogical structure that any university collaborator could use by creating post-punctuated trails on the campus. At each post the participants would be invited to perform exercises, acquire knowledge and answer questions. The whole community would thus be able to use an innovative and playful tool for learning. In the context of the "Adapted physical activities and obesity" class, given by Mr. Malatesta from the Institute of Sport Sciences at Lausanne University, we are developing three trails of experiential learning. We are going to set up a first course to give the students information about socio geographic determinants of obesity. They will have to visit the Bourdonnette district in Lausanne which is, according to an article describing the link between urban environment and obesity, a risk area of obesity prevalence. The second course offers the students to try the different training method of obese patient running through Lausanne university campus. Lastly, we are developing a trail structured as a "role game" where students will have to place themselves in the shoe of a lipid to understand the metabolic processes and then the physiology of obesity.

Here, the whole trail is a spatial representation of the metabolic pathways.

The three trails are designed so that the knowledge can be acquired through experience. They are of course structured around reading or listening, but in a way that puts incorporation, imagination or experimentation forward. For example, the last trail about the obesity physiology is structured as follows: developing knowledge is the main goal, specifically to understand the different metabolic pathways (how nutrients are transformed, stocked and used). Each post during the trail is composed of a short text and a quiz. But this traditional written knowledge is supported by experience. Here, the whole trail is a spatial representation of the metabolic pathways. Buildings are organs, periods of walk are the organic transportations and the user is a nutrient. By experiencing a spatialized narration of a complex physiological process, the user can process information differently than while reading a text. Offering new physically active learning modes is the core principle of our project!

REFERENCES

[1] Hamilton, M. T., Healy, G. N., Dunstan, D. W., Zderic, T. W., & Owen, N. (2008). *Too little exercise and too much sitting: Inactivity physiology and the need for new recommendations on sedentary behavior.* Current Cardiovascular Risk Reports, 2(4), 292–298. http://goo.gl/aEyyi4

[2] Erickson, K. I., Voss, M. W., Prakash, R. S., Basak, C., Szabo, A., Chaddock, L., ... Kramer, A. F. (2011). *Exercise training increases size of hippocampus and improves memory.* Proceedings of the National Academy of Sciences, 108(7), 3017–3022: www.pnas.org/content/108/7/3017

[3] Oppezzo, M., & Schwartz, D. L. (2014). *Give your ideas some legs: The positive effect of walking on creative thinking.* Journal of Experimental Psychology: Learning, Memory, and Cognition, 40(4), 1142–1152. http://goo.gl/myZW3Y

[4] Cotman, C. W., Berchtold, N. C., & Christie, L.-A. (2007). *Exercise builds brain health: key roles of growth factor cascades and inflammation.* Trends in Neurosciences, 30(9), 464–472. http://goo.gl/WVRv6Y

[5] Berman, M. G., Jonides, J., & Kaplan, S. (2008). *The Cognitive Benefits of Interacting With Nature.* Psychological Science, 19(12), 1207–1212. http://goo.gl/37pDCs

3 MINDMOTION GO: A PORTABLE VIRTUAL REALITY SYSTEM FOR POST-STROKE REHABILITATION

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15 million people suffer stroke worldwide each year. Of these, 5 million die and another 5 million remain permanently disabled [1]. Standard treatment includes a hospitalization right after the accident during the acute phase; then the survivor is sent back home following physiotherapeutic exercises in rehabilitation centre and home usage.

Innovative technologies based on virtual reality and natural interaction were found significantly more effective than conventional therapy in improving upper limb function [2]. A certain number of rehab centres have introduced some commercial system such as the Nintendo Wii but those systems are not adapted to patients' needs. Those entertainment systems controlled by the user's motion generated motivation from the patient. Gaming is a really crucial factor to motivate patients to keep using the system and increase the dose of rehabilitation [3].

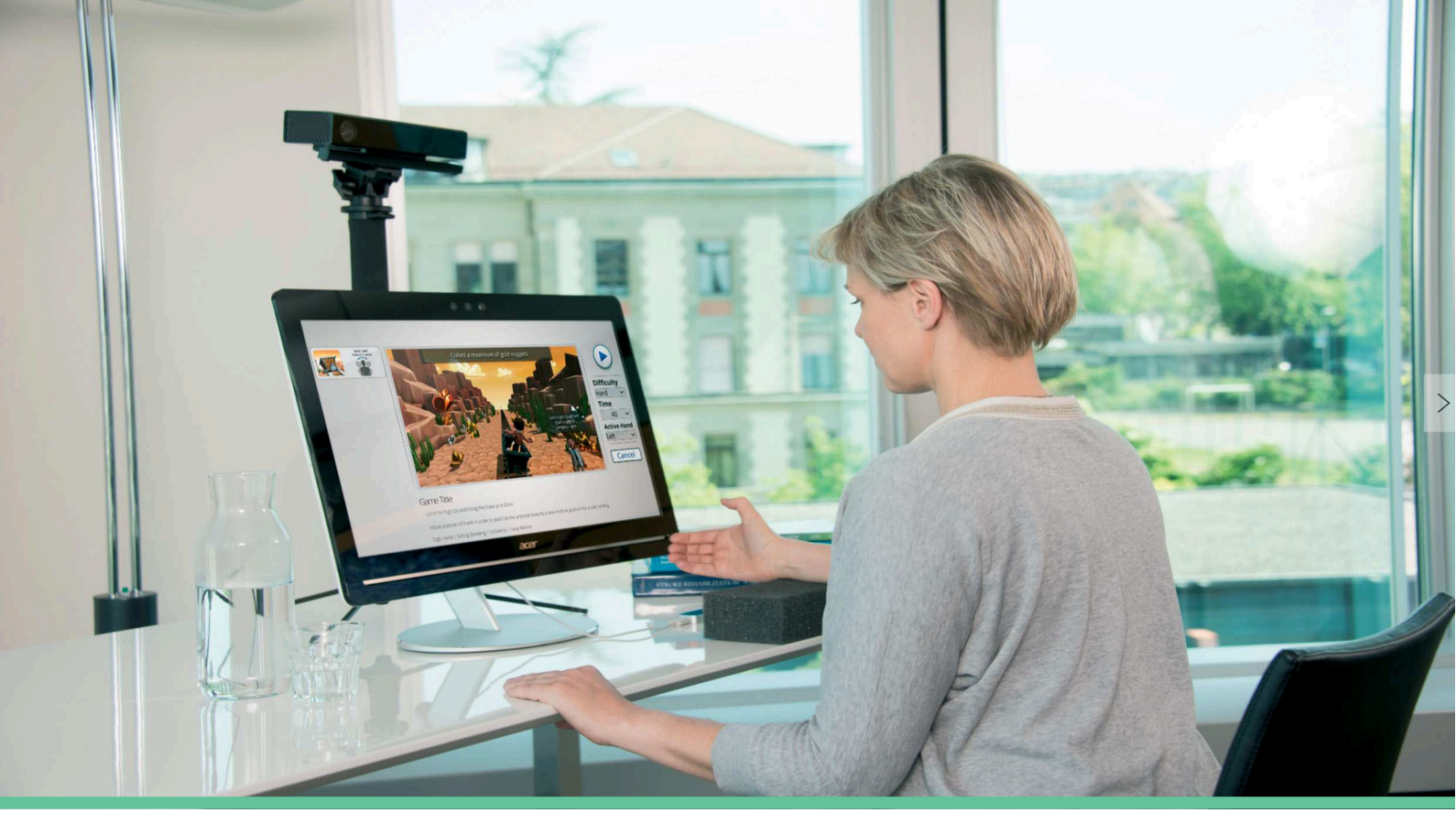
After a stroke, patients usually have motor deficiency that reduces the strength and motion range of their limbs. Physiotherapeutic rehabilitation focuses on exercises that train single movements and functions of different body parts: shoulder flexion/extension and abduction/adduction, wrist flexion/extension and radial/ulnar deviation, reaching, hand opening/closing and pinch, trunk axial and lateral rotation, lateral and frontal body weight transfer on the lower limbs.

Gaming is a really crucial factor to motivate patients to keep using the system and increase the dose of rehabilitation.

MindMaze has developed a breakthrough platform to build intuitive human machine interfaces combining virtual reality (VR), computer graphics, brain imaging & neuroscience. The company's medical grade technology enables exciting new applications in gaming, brain machine control and healthcare. In the framework of care continuum, the patients would use MindMotion Go at home following treatment with MindMotion PRO, a hospital based platform.

MindMotion GO is a portable, user-friendly device. It is a platform intended to improve neurological functions allowing rehabilitation of distal and proximal upper limb, trunk and lower limbs through functional tasks during the subacute and chronic phase after a stroke. MindMotion GO is built by experts in cognitive neuroscience, neurotechnology and serious game design to make activities interactive, motivating and at the same time therapeutically effective to improve neurological functions. The device goal is not to replace the therapist but to improve the rehabilitation exercises quality and quantity.

The system is composed of a standalone medical software working with the following components: All-in-one computer, Unikey time USB dongle, Microsoft Kinect 2.0 (full body tracking camera), PC mount clip (Kinect support to mount Kinect on top of the computer for better positioning and tracking), Leap motion (hand tracking camera).



The software integrates a large variety of games, 20 in the current version feature 10 different environments, targeting trunk, upper limbs, lower limbs and hand movements. Each of those movements has been specially designed by physiotherapists to match the rehabilitation exercises mentioned earlier.

Each game is focusing on a particular movement which can be calibrated to the patient motion range by measuring his own current ability. The difficulty and length are adjustable to the patient condition and therapeutic effort.

After each game session, the system displays a score reflecting the ability to achieve the presented tasks using the game specific movements. Scoring is an important part of the motivation factor as it presents his performance results and invite him to beat and progress in the following sessions. Performance tracking records the duration and score of each session to show comprehensive daily progress to both the patient and therapist.

Efforts have been made to provide an easy-to-use and intuitive tactile interface to quickly play the rehabilitation game as well as access complementary information such as tutorials, performance tracking and calibration. Translation have also been included in English, French and German to cover the first market zone.

MindMotion Go has been soft launched with early adopter's therapeutic centres and tested by 156 patients supervised by 23 different therapists in Switzerland, Germany and the United Kingdom. This first study results are very encouraging as the system has proven to be easy to use for both the therapist and patient and manages to raise the length of the therapeutic sessions.

REFERENCES

[1] World Health Organization, *The world health report 2002*, book, 2002, p. 188

[2] Laver K., George S., Thomas S., Deutsh J.E., Crotty M., *Cochrane Review: Virtual Reality for Stroke Rehabilitation*, EUR J Phy Rehabl Med, 2015

[3] Flores E., Tobon G., Cavallaro E., Cavallaro FI., Perry JC., Keller T., *Improving patient motivation in game development for motor deficit rehabilitation*, Proceedings of the 2008 International Conference on Advances in Computer Entertainment Technology, 2008

UNIVERSITÉ DE GENÈVE
SWISS CENTER FOR AFFECTIVE SCIENCES

4 DESIGNING AND USING BIOFEEDBACK GAMES FOR EMOTION REGULATION: THE CASE OF NEVERMIND

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Nevermind is a 3D biofeedback game that challenges players to manage their physiology when facing stress. This paper highlights some of Nevermind's design characteristics as a means of promoting game design tools that help personally involve players. These highlights are drawn from the Client #251 level wherein players inhabit the subconscious of a middle-aged woman. At the onset, players learn that the client's father passed away when she was very young – he died in a car accident. The client reports sudden feelings of guilt, anger and anxiety from her belief that people judgingly stare at her. In the level, the player inhabits the client's nightmarish subconscious where the idyllic suburban home from her youth is a dilapidated house of horrors. There are signs of financial insecurity and marital unrest. At the level's end, the player discovers that the story about Client #251's father dying in a car accident was a lie pushed by her mother. In fact, as a little girl, she witnessed her father's suicide and felt responsible. Below, we will discuss how the game uses thematic congruence and environmental storytelling to engage players by making this level clues and themes central to the gamespace.

The more players explore, the more they are rewarded with details that help tell a story.

THEMATIC CONGRUENCE

Thematic congruence means that there is an overlap between the game themes and the player's visual experience. This indicates that Nevermind's assets resonate with the messages its designers aimed at conveying. Therefore, themes such as domestic unrest and social anxiety are given visual analogs. For example: the idea that Client #251's family unit was corroded is depicted by a literally broken home. Also, she speaks of an intense guilt felt when she is looked at; the family portraits show blank faces and in the nightmare version of the home, these faces are aggressively blotched out. Such images recur, and in some cases, blank faces follow the player, staring in judgment.

ENVIRONMENTAL STORYTELLING

Because Nevermind has consistent thematic congruence, the exploration of the gamespace is meaningful for the player. The more players explore, the more they are rewarded with details that help tell a story. Moreover, because much of the exploration is voluntary, the player's discoveries feel special. Conveying domestic unrest, for example curious players will notice "Past Due" in bold red printed on envelopes in the level. Similarly, the board game titles featured in the level living room subtly change when players explore the home nightmare version ("Family Games, Inc." becomes "Fractured Family, Inc."). Nevermind features many more of these subtle environmental clues for players to discover on their own initiative. Crucially, these instances of environmental story-telling not only compel players to explore, but with each discovery, these discoveries help players feel increasingly like they are cultivating their own personalized understanding of Client #251.

BIOFEEDBACK AND POTENTIAL FOR PSYCHOEDUCATION

Nevermind's biofeedback mechanic also helps personalize the game. Biofeedback refers to a system where the player's physiology provides the game with input. In Nevermind, the game uses the player's heart rate variability to calculate their stress levels. Within the gamespace, the more the player feels stress, the more hostile the world becomes. The manifestation of this hostility is different across in-game areas. This allows unique experiences; different sections in Nevermind are likely to trigger different stress degrees on players, leading to unique experiences.

At its core, this feedback loop is designed to experientially teach players how to manage stressful situations in their everyday lives. Significantly, this biofeedback mechanics is consistent with the game's design goals. It gives players a visual analogy of their internal state and points out when players need to downregulate their negative affect. This design choice, coupled with the aforementioned ways Nevermind gets players personally invested in the experience, lends promise to Nevermind as a context for potentially training emotion regulation skills. Nevermind may give players a deeper awareness of their internal physiological states during everyday stressful experiences. This so-called interoceptive awareness **[1]** is a valuable tool to healthily manage one's emotions **[2, 3]**. We therefore invite others to use Nevermind's design approach and help test its psycho-educative potential.

REFERENCES

[1] Mehling, W., Price, C., Daubenmier, J., Acree, M., Bartmess, E., and Stewart, A., *The multidimensional assessment of interoceptive awareness (MAIA).* PlosOne, 7(11), pp. 1–22. 2012.

[2] Füstös, J., Gramann, K., Beate, H., and Pollatos, O., *On the embodiment of emotion regulation: Interoceptive awareness facilitates reappraisal.* Social Cognitive and Affective Neuroscience, 8(8), pp. 911–917. 2013.

[3] Pollatos, O., Matthias, E. and Keller, J., *When interoception helps to overcome negative feelings caused by social exclusion.* Frontiers in Psychology, 6(786), pp. 1–8. 2015.

ROUNDTABLE

IMPACT OF SERIOUS GAMES' TECHNOLOGIES ON GAMER'S HEALTH

Most of the projects we see today are aimed at sensitizing the player to take care of himself or to stay healthy. New technologies bring new opportunities, but they also bring new health risks. The increase of some capacities happens often done at the expense of other capacities. For instance, gesture precision is multiplied but in a more limited field; virtual immersion helmets cut us from our real environment and increases the risk to fall and get hurt. The new pathologies we see are, for example, musculoskeletal disorders due to rigid positions and repetitive gestures, addictions such as NoMoPhobia (no-mobile-phobia) regarding addiction to its smartphone and other disorders known or still unidentified. How do creators and developers integrate these collateral risks? Another possible question for the roundtable is if serious games are efficiently influencing behaviour and emotions in order to care for people and what about the impact of non-serious but violent games on gamers.

Chair: Vera Bustomante
CHUV | Lausanne

SESSION TRAINING 11H00-12H25

Gamification development and adoption in diverse training contexts is gaining increased attention. Serious games, in particular, trigger participation and enhance personal and collaborative training experience. Often combined with virtual reality, serious games can be applied to various training contexts such as formal educational training, formal fitness exercises and informal seamless training aimed at improving living conditions. Indeed, serious games dedicated to raising personalized awareness regarding imbalanced eating habits or wrong physical postures and suggesting improvements, help users acquire better habits on the long run.

CHAIR: SANDY INGRAM | HEIA-FR, HES-SO | FRIBOURG

5 FIRST STEP IN MSD PREVENTION WITH SG – FOCUS ON ENVIRONMENT TRANSITIONS

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Musculoskeletal Disorders (MSDs) are one of the most common work-related injuries in Western Europe, costing tens of billions to society every year **[1]**. They consist of lesions to muscles, tendons, ligaments or nerves, commonly due to repetitive work in an inappropriate position and include various pathologies affecting different body parts, depending on the job and working conditions. The financial loss due to such disorders comes from productivity decline from the affected workers and their sick leaves. Specialists have been working on the issue, improving workstation layout and organising prevention sessions among employees. After years of observation, these solution seem not to be very productive; one of the problems is that the teaching method does not provide enough time and motivation for the user to deeply and truly change his habits.

To address this issue, a consortium has been formed by Swiss and French academic and industrial actors focusing on solutions to MSDs in the watchmaking and automotive industries, the main idea being to prevent employee MSDs and show management how it impacts the workers' health.

In this context, we imagined the following approach: combining Serious Games (SG), Virtual Reality (VR) and real-time motion capture. The idea is to put the user in a VR game. When he reaches a potentially harmful position, the user is notified and has to correct himself to finish the level. Two elements are provided to help the user: a virtual representation of himself, where the problems will be displayed, and a virtual coach that will help him change and guide him through the levels. We hope this approach will help the user understand the dangers and learn good postural habits.

As we work with this idea, we face the hardest part to change in people: behaviours.

As we work with this idea, we face the hardest part to change in people: behaviours. We want them to be in the best-suited environment that has to be motivating and stressless (that we will call "calm") to help them learn those new habits. Once the user has acquired the wanted knowledge in the "calm" environment, we want to be sure that he will be able to transpose those habits on his actual workplace. Thus, we decided to make the "calm" environment evolve progressively into the user working environment. This evolution takes place as the SG levels are cleared.

The virtual environment (VE) evolution is the central idea around this project, so before all, we had to validate the feasibility of evolving VEs. In this context, three environmental types were imagined: the "calm" VE (the starting one), the "work" VE, that has to be as similar as possible to the real workplace, and the "intermediate" VE, that has to be somewhere in the middle.

The calm VE was chosen according to the Attention Restoration Theory (ART) **[2, 3, 4]**, that says that exposition to nature allows quick stress recovery and relaxation. The "calm" VE must represent a natural setup, such as a garden or a beach. The "intermediate" VE was chosen to be indoors and relaxing (for example a living room) and the "work" VE has to portray as much as possible the work reality. For testing purposes, we chose one VE of each: a garden, a living room and a generic workshop. To evolve from one VE to the next, we applied transitions to its elements. For example, making an object fade in or morphing an object into another.

The user tests (simple assembly task) were conducted on 80 people who were only asked to perform the assembly task. No mention was made of the transitions or the environment. They lasted 15 to 20 minutes in VE. All the users managed to stay through the whole process with no major problems such as motion sickness or headaches. They were then asked in a survey whether they had noticed transitions during the test. The results are very interesting as only four transitions were noticed at least 25% of the time. Going even further, 37% of users did not even notice the environment change from a garden to a workshop. More details for this work can be found in [5].

Those results are promising as they confirm that environmental transitions can be used in VR: without significant discomfort, the transitions were mostly unnoticed and did not disturb users in their tasks.

REFERENCES

[1] Bevan S., *Economic impact of musculoskeletal disorders (MSDs) on work in Europe,* Best Pract. Res. Clin. Rheumatol. vol. 29, no. 3, pp. 356–373, 2015.

[2] Kaplan S., *The restorative benefits of nature: toward an integrative framework,* J. Environ. Psychol., vol. 16, pp. 169–182, 1995.

[3] Ohly O. H., White M. P., Wheeler B.W., Bethel A. and Ukoumunne V. N. & R. G. C., *Attention Restoration Theory: A systematic review of the attention restoration potential of exposure to natural environments,* J. Toxicol. Environ. Heal. Part B, 2016.

[4] Stone R., Small C., Knight J., Quian C., and Shingari V., *Virtual Natural Environments for Restoration and Rehabilitation in Healthcare,* Virtual, Augment. Real. Serious Games Healthc. 1, vol. 68, pp. 547–566, 2014.

[5] Sisto M., Wenk W., Ouerhani N., Gobron S., *A study of transitional virtual environments,* book chapter of Augmented and Virtual Reality, Volume XXX of the series Lecture Notes in Computer Science, pp. xx-xx, (in press), 2017.

6 COLLABORATIVE GAMEBOOKS FOR EDUCATION

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In 2015, the Swiss Distance University of Applied Sciences (FFHS, Fernfachhochschule Schweiz) started several strategic projects with the goal of bringing innovation into teaching. "Collaborative Gamebooks" is a project conceived by Prof. Willi Bernhard which allows the integration of "serious games" into teaching in a completely new way.

A collaborative game book is an interactive game where all game environment elements are created through text components (similar to a book) in the players head - with the best imagination system we know today: our mind! The reader takes the player role who interacts and impacts the storyline. From time to time, the player has to solve certain tasks in collaboration with other players so as to move forward. The actions in the game can be chosen by the learner itself. Thus, knowledge is experienced in a playful way. Direct, situational interactions require personal decisions. The digital game responds immediately and allows the player to experience a personalized learning path. Gamebooks enable learning in a playful environment with the challenge of teamwork and competition.

The teachers can easily create gamebooks and integrate their own teaching and learning content with the big advantage of not needing IT staff, computer programmers or a game-developers budget [1]. Thanks to the open-source software "Squiffy" teachers can create a little gamebook in just a few minutes. "Squiffy" transforms the interactive storycontent into HTML-format, so that the gamebook can be played in any HTML-browser on any device [2]. The game is automatically saved via the browser local storage or, if needed, via simple HTML-data-handshake to an internet server. Pictures, audio and video can also be included if wished and the game can even be played offline for individual tasks.

The teachers can easily create gamebooks and integrate their own teaching and learning content.

A didactic model has been developed to support gamebook creation by teachers. It uses a revised Bloom's taxonomy of educational objectives, which includes a knowledge dimension and a cognitive process dimension to teach the learner via a set of story building blocks (story bricks). These story building blocks are predefined structures, connected in sequences to build the gamebooks whole interactive story. Six predefined story-blocks are available as templates for the creation of collaborative gamebooks: the loop, the alternative, the loop-alternative mix, the forced collaboration, the voluntary collaboration and the composition.

Collaborative gamebooks have been developed and successfully applied to Bachelor and Master courses at FFHS. For example, the one-semester course "Kolloquium for the Masterthesis" uses a collaborative gamebook which provides all the necessary knowledge for the whole course.

Gamebooks can also be created in the classroom to fulfill a project work where students must deal with the problems and their possible perspectives [3]. At the FFHS, it was already used in a mathematics course where students worked in groups to solve a problem by building a gamebook.

In a gamebook learners must collaborate with others. The collaborations are asynchronous and let the players introduce their own time and location possibilities within a certain framework. In a collaborative task, the learner is usually led into an online space where he must use his knowledge with or against others in order to progress in the game. As in other games, the learner has to deal with resources like money, time or points and can, at any time, see the others' score to check his own position.

As a conclusion, serious games are very demanded in the education sector and with collaborative gamebooks, lecturers can react without the help of external game designers and software developers. In terms of content, lecturers can prepare their own subjects in a self-governing, playful, didactical and technical manner. The reverse is also possible if the students deal with the learning material by creating a gamebook: the game story and its content are only limited by their own ideas and not by technical circumstances.

Two gamebooks examples:

- a mini-gamebook with two-storey building blocks and a simple collaboration at the end: http://goo.gl/VKiZoU
- an adventure-oriented mini-gamebook (without collaboration, with two-storey building blocks): http://goo.gl/kpExTX

REFERENCES

[1] Bernhard, W. (2016). *Das ganze Spiel im Kopf. Bildung Schweiz.* 12/2016, pp. 30–31.

[2] Bernhard W., Boyle E. (2013). *HTML-5-Games for Learning. In Research Presentation: Design and Develop Your own Educational Game.* Online Educa Berlin 2013, 4–6. Dec. 2013.

[3] Bittel, N. & Bettoni, M. (2012). *Learning CSCW through Fairytales: a Practical Model. In A. Cercone & D. Persico (eds.),* Proceedings of InSuEdu 2012, 1st International Symposium on Innovation and Sustainability in Education, Thessaloniki, Greece, 1 October 2012. Berlin: Springer.

7 "PLUNDER PLANET" – A PSYCHOPHYSIOLOGICALLY ADAPTIVE FITNESS GAME ENVIRONMENT FOR CHILDREN AND YOUNG ADOLESCENTS

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Traditional gym and fitness exercise regimens are currently being enhanced with innovative technology and interactive gamification systems. So called "Exergame gyms" offer body-centered games, which are controlled by relating the level of the user's physical activity to interactive coordinative and cognitive game demands.

Based on findings of our R&D work and results from the international game research debate, we found that this approach can further be enhanced by implementing game-balancing mechanisms, and specifically designed full-body-motion controllers, to yield a personalized, optimal play/training session. Thus, our interdisciplinary R&D team, which consists of experts from the fields of sport science and game design, developed and evaluated "Plunder Planet".

"Plunder Planet" is a psychophysiologically adaptive fitness game environment prototype for children and young adolescents with and without previous gaming and/or sport experiences. It provides a holistic fitness workout for the player and can be used as addition or alternative for traditional fitness training. The "Plunder Planet"-setupconsists of three main elements: two controller-setup variations, a psychophysiological adaptive virtual exergame scenario and a Trainer GUI.

Currently, two forms of input devices are used for the physical control of "Plunder Planet". The specifically developed Full-Body-Motion-Controller (FBMC) offers haptic feedback, and demands coordinative and spatial orientation skills. To contrast our controller development, and to validate different impacts on the player's gameplay experience, we also used the gesture-based Kinect2® sensor, which allows for a high freedom of movement.

Furthermore, three adaptive game mechanics are implemented and tested, according to the approaches of "dual flow" [1] and "game flow" [2] in the current state of development. One adaptive variable targets the physiological dimension of the exergame session: A Polar H7 sensor measures the user's heart rate (HR) during the game, while a Trainer-GUI offers the possibility to gradually adjust the frequency of obstacles in real time in order to reach a predefined individual training load. By calculating the individual maximum HR (HRmax=220–age) the optimal training level for each user/sports type can be derived (health zone, fat burning zone, aerobic and anaerobic zone). Two other variables target the psychological dimension of the game: The in-game performance is assessed by the number of collisions, successfully overcome obstacles and opponents defended. As a result, the track varies between easier or harder layouts (straight and even, or curvy and hilly). Also, overcoming obstacles can become easier or harder (by varying the arrangements of the obstacles).

Thus, the game difficulty and complexity are adjusted to the current physical and emotional states and needs of the player during the training session.This guidance to the individual perfect training mode results in a maximum motivating and a maximum effective training/gameplay experience.

Within numerous user testing and a feasibility study **[3]** we could show that our innovative approach provides benefits compared to existing solutions and related research findings. We could show that an psychophysiological adaptive and individually challenging game scenario has a positive impact on the motivation of the player and the effectiveness of the training.

Additionally we could verify that controller setups with different request profiles are needed in order to provide a holistic dual flow experience for various player/sports types (e.g. children with previous sports experience preferred the higher freedom of movement with the Kinect® sensor while rather non-athletic children tended to prefer the full-body-motion controller and the feeling of being cognitively and coordinatively challenged). Concerning the effectiveness of our training we found that the average HR lay between 125-145 beats per minute (bpm) for the full-body-motion controller and 130-160 bpm for the Kinect® setup after a play session of 40 minutes. Thus, children worked-out within the "fat burning zone" (60-70% of HRmax) and the "aerobic zone" (70-80% of HRmax), while for both setups none of them realized the effective duration of the training session.

We could show, that our approach works and will continue the experimental development of "Plunder Planet" focusing on the enhancement and automatization of the dynamic game balancing mechanisms on the levels of body movements, controller variations and in-game mechanics.

REFERENCES

[1] Sinclair, J., Hingston, P. and Masek, M. (2007). *Considerations for the design of exergames. In Proceedings of the 5th international conference on Computer graphics and interactive techniques in Australia and Southeast Asia* (GRAPHITE '07), pp. 289–295.

[2] Sweetser, P. & Wyeth, P. (2005). *GameFlow: a model for evaluating player enjoyment in games.* Computers in Entertainment 3, 3, pp. 3–4.

[3] Martin-Niedecken, A. L., & Götz, U. (2016). *Design and Evaluation of a Dynamically Adaptive Fitness Game Environment for Children and Young Adolescents. In Proceedings of the 2016 Annual Symposium on Computer-Human Interaction in Play Companion Extended Abstracts,* pp. 205–212. ACM.

ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

8 ENSURING SELF-HAPTIC CONSISTENCY FOR IMMERSIVE AMPLIFIED EMBODIMENT

Sidney Bovet, Ronan Boulic
EPFL, Lausanne,
Ronan Boulic

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CONTEXT

With the rise of consumer-grade Virtual Reality (VR) technologies, high quality VR equipment is becoming widely available. This opens up to a lot of possibilities, one of which appears to be in health-related applications and in particular for rehabilitation. The latter is of interest to us, especially the motor recovery process. It is a long, tedious and often demotivating process, currently treated through exercises and movements of an affected limb. This unrewarding process often leads the patients to live with their handicap rather than treating it. Understandably, as argued by Flores et al. **[1]**, the more a patient participates to a rehabilitation task the greater the motor recovery will be. Keeping patients motivated during such tasks is thus essential.

Serious games can definitely help in this regard by making the recovery process more rewarding and involving. A notable example is the solution developed by Lambda Health System involving a pair of robotic arms used for lower limb rehabilitation. It can be included in a Serious Game in VR, as proposed by Gobron et al. **[2]**. We explore two tracks as to how we can involve users even more and have them keep using their paretic limb: a VR game that not only transposes but also amplifies their movements in a virtual environment where they are required to reach for targets at various locations on both their body and in the air. We assume that patients using such an application will stay motivated by seeing that they can achieve more.

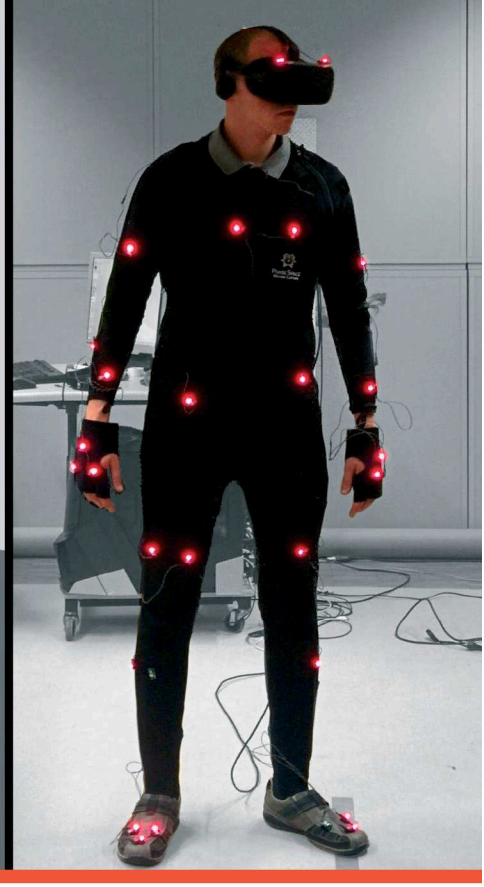
SELF-HAPTIC CONTACTS

In many VR applications, the provided sense of Presence can be improved by introducing accurate contact reproduction - that is, producing convincing haptic feedback. Improving the sense of Presence is key because it makes users more involved in the game or task, which aligns with our motivation goal. It is quite hard to implement proper general haptic feedback: reproducing the tactile feeling of any object requires a complex motorised exoskeleton. On the other hand, assuming that the user's body is partially or fully tracked, it is easy to know where various body parts are. This piece of information can therefore be used to ensure that at least these physical objects are well represented in space and induce proper haptic feedback.

This unrewarding process often leads the patients to live with their handicap rather than treating it.

Our work focuses on such an improvement to VR applications. Its implementation is eased by a new formalism proposed by Molla et al. **[3]**, which defines positions not in world coordinates, but rather with respect to nearby body surfaces. A hand held in front of the face is hence expressed in terms of a relative displacement vector from said head portion, instead of using absolute coordinates. A self-contact thus translates into a zero vector and can be accurately represented.

We are currently running an experiment to understand how well the brain accepts when such self-con-



tact are altered with an offset: when the user touches his thigh, a given offset is added between the avatar's thigh and hand. The goal of this experiment is twofold: issuing guidelines about the importance of self-haptic consistency and acquiring a better understanding of what our tolerance is regarding such self-contacts.

MOVEMENT DISTORTION

Additionally, we focus on the elaboration of a movement distortion algorithm aimed at amplifying a user's movement. We propose a modification of the coordinate system proposed by Molla et al. [3] to apply a distortion to the movements of a tracked performer, while preserving self-haptic consistency. In other words, we introduce a way to create an application in which, when patients touch their skin the virtual avatar does so as well, but when they lift their hand away from the surface of the skin, the avatar may show an amplified gap between hand and skin if a positive distortion is applied.

We include in the aforementioned experiment a condition in which we assess acceptance to movement distortion. It is key here because we do not want patients to detect the distortion, or at least not too heavily. Indeed, if their eyes constantly remind them that what they see is not what they achieve, we might lose the motivating effect we are looking for.

CONCLUSION

This work explores amplified embodied interactions and aims at issuing guidelines as to how developers can produce efficient embodiment through self-haptic consistency for all sorts of VR applications. We intend to pursue research in this area to improve treatment efficiency and rehabilitation patients life quality, as well as for VR experiences in general.

REFERENCES

[1] Flores E., Tobon G., Cavallaro E., Cavallaro F. I., Perry J. C. and Keller T., *Improving patient motivation in game development for motor deficit rehabilitation*, Proc. of the 2008 Int. Conference on Advances in Computer Entertainment Technology, ACM, 2008, pp. 381–384.

[2] Gobron S., Zannini N., Wenk N., Schmitt C., Charrotton Y., Fauquex A., Lauria M., Degache F., and Frischknecht R., *Serious games for rehabilitation using head-mounted display and haptic devices*, Int. Conference on Augmented and Virtual Reality, Springer, 2015, pp. 199–219.

[3] Molla E., Galvan Debarba H. and Boulic R., *Egocentric mapping of body surface constraints*, to appear in IEEE Trans. Viz. Comput. Graphics, 2017.

ROUNDTABLE

GAMIFICATION IN EMPLOYEE TRAINING: A NICE-TO-HAVE OR MUCH MORE?

Based on the experience of some large corporations, gamification fosters employees' engagement in training exercises. Gamification is still considered sometimes as an overrated trend, a practice that is extrinsic and superfluous to training. What are the reasons behind this position? Is there enough evidence in literature on the positive impact of gamification on employee training? Do you have any experience with the gamification application to business contexts? Should gamification be considered as a nice-to-have or an essential integral training practice?

Chair: Sandy Ingram
HEIA-Fr, HES-SO | Fribourg

SPECIAL GUEST

UNIVERSITY OF SKÖVDE

FROM EDUCATIONAL REVOLUTION TO NICHE MARKET; THE BARRIERS BETWEEN GAMES AND FORMAL EDUCATION

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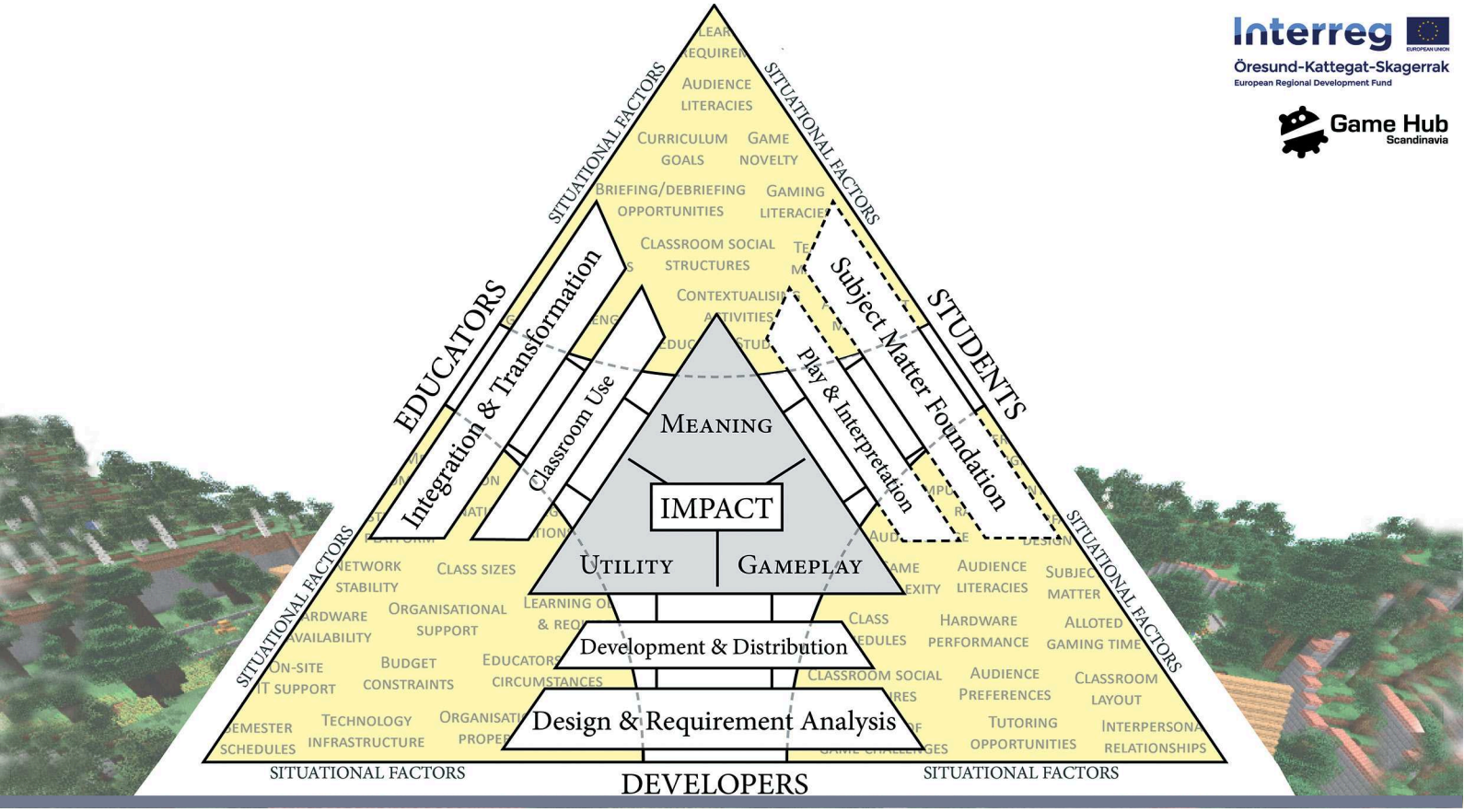
While digital Game-Based Learning (GBL) has been around since the '70s, they have had a remarkable journey in the past couple of decades. From being a multi-billion dollar industry in the mid-90s to evaporating almost completely in the early '00s, GBL has, alongside many other genres of 'serious games', grown to once again become an enthusiastically debated and energetic area for both developers and researchers to thrive in. However, even though the discourse and interest surrounding GBL is continuously growing, the type of wide-spread implementation that has long been predicted and anticipated is yet to happen.

In this presentation, I will discuss why this is the case by highlighting some key ways in which game-based learning research and praxis has continuously failed to accommodate for the complexities, or even banal practicalities, of the real world. Many of the assumptions that constitute the foundation of GBL, when pressed against real-world conditions, don't hold much weight: students, or the 'digital native' generations, are not as adept or interested in games as many scholars and pundits often claim; schools and other organizations have severe barriers to entry that make it difficult to achieve an economy of scale with GBL products; digital technologies might be far from egalitarian when it comes to enabling people to engage with educational content; and the relationship between gameplay and learning outcomes might be even more complicated than previously believed. I will present my findings regarding why real-world implementation and use of GBL is often at odds with the theories surrounding games and education, and will I conclude with some ways in which I think that we - as researchers, developers, and practitioners - need re-evaluate our understanding and expectations of what GBL can and should be.

The current issue with GBL begins in how they have historically been studied. Previous research on the topic of games and their role in education (whether they're called edutainment, game-based learning, serious games, or educational games) has heavily emphasized the 'game artefact' and the player-game relationship when discussing the viability and efficacy of digital games as tools for learning **[1]**. When viewed from this perspective, games can often be seen to have high educational potential, and studies tend to show a positive correlation between gaming activities and learning **[2, 3]**. When seen as an isolated artefact, games do contain many qualities that are traditionally associated with good learning processes as they: contain progressively more difficult challenges that put accumulated knowledge to the test; invite the player to actively participate in complex problem solving; encourage repeated attempts; and, they present all these things in an engaging and immersive way. While conclusions drawn from this isolated artefact perspective may say something about games' ability to produce learning outcomes in simple player-game relationships, they do not say much about their broader viability and usefulness as teaching tools in formal educational settings. When games are put in different use contexts, especially a context as socially and practically complex as a classroom, the relationship between a game's educational content and its players become dramatically different. Working processes of



teachers, technological infrastructures, social relationships, and many other components that are ever present in a classroom strongly affect the ways in which a game can perform and how students interact with it. All these complications are so far not particularly well understood, as the artefact-centered perspective does not take the context surrounding GBL into account.

This situation is, luckily, slowly changing. In the broader field of game research (that is to say, research that does not focus on the educational potential of games), games are increasingly being studied and described on their qualities as situated, context-dependent activities, and games and their mechanics are treated as one part of a larger system of game playing, e.g. **[4, 5]**. A similar shift has started to emerge in educational games research, where the structures and components that surround the game artefact are starting to get more attention (cf. **[6, 7]**), and focus more on understanding how organizational cultures and teachers' literacies needs to be supported if GBL integration is to become more feasible for teachers and schools. Even though interest is increasing, and the current understanding of games' viability as teaching tools is becoming more nuanced, the knowledge surrounding the processes that are involved in implementing and using games in formal educational settings is still limited. Calls for more examinations of how GBL affect teachers' and students' processes of working and learning have been made frequently throughout the past decade. However, examples of empirical work done to understand the practicalities involved in using educational games, such as the tasks teachers need to perform when integrating games into formal educational contexts, remain comparatively rare. In my own research, I have attempted to ameliorate this knowledge gap, and have chosen to study all the factors surrounding educational games to better understand how epistemologies, development practices, teachers' working processes, schools' organization, students' approaches to games, and situational factors, and other various elements that exist around the educational games themselves affect their ability to perform and function as tools for engaging and playful learning.

REFERENCES

[1] Young et al., 2012
[2] Backlund & Hendrix, 2013;
[3] Connolly et al., 2012
[4] Eklund, 2012
[5] Stenros, 2015
[6] Greener and Wakefield, 2015
[7] Bourgonjon and Hanghøj, 2011

SESSION BUSINESS EXPERTISE 14H15-15H40

The economic and social evolutions of the last decades have brought new societal challenges that the societies have to face. Ecological footprint of human activities, social and economic exclusion of minorities, the disinterest of young people in political actions are some examples of those challenges. School programs, political initiatives, associative works are potential actions in order to address these challenges. And what if we try to sensitize individuals and groups of people while playing. We believe that gamification and serious games represent a relevant vector to leverage in order to increase citizens' awareness towards the societal challenges we are facing.

CHAIR: SHABAN SHAAME | EVERDREAMSOFT | GENEVA

9 DEADLINE

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At the early stage of this project, the team was composed of Valérie Pierrehumbert and Margaux Charvolin. The main idea was to make a hybrid project mixing paper and new technologies. The projects developed by the "éditions volumiques" were a fantastic source of inspiration and the game "World of Yo-Ho" **[1]** was a fine example of what could be accomplished when mixing technologies and paper.

That freedom of doing everything we were imagining allowed us to explore and prototype numerous ideas. It was at that moment of our work that we elaborated, modified and remodeled our project. We had the chance to have enough time to experiment, fail and redo our work, which played an important role in the project creation. We should note that at that specific moment, we missed something crucial: a story to tell. Finally, when stress and exhaustion started to hit us, the idea came to our minds: why not tell all this making and searching process that we were living? Of course, we didn't aim at complaining about our profession! It was the exact contrary. We simply wanted to tell what it was like to live the design process from the inside, with a humoristic ironic touch.

We simply wanted to tell what it was like to live the design process from the inside, with a humoristic ironic touch.

As soon as we found this thematic, our project started to take off and the title was easy to find as, after our many experimentations, we were beginning to run out of time! That's why we decided to call our game "Deadline". To this point, Margaux and Valérie started to think about designing a funny and efficient gameplay where the notion of stress was the core idea we wanted people to feel. Thus, we integrated a deadline at the project end with a tablet application that we put at the project center: it was the project calendar. At that moment, the application indicated when each player had to play, it integrated unexpected events (such as public holiday) and provided a reminder calendar of the remaining time.

We wanted the game to be funny and not only stressful. After several searches, we discovered many funny stories picturing the relationship between graphic designers and their clients. At that moment we understood that we had to take advantage of them by adding other actors in the game. That's how the marketing manager, the IT engineer and the printer were introduced.

Part of our work consisted in gathering anecdotes and testimonies on graphic designers and their co-workers. We turned those short stories into punchlines embodied as text messages that a player could get at any time. We implemented this more narrative part of the project in the card game. Margaux and Valérie finally shipped a first version of the game in June 2016. We presented it to an examination board composed of Florence Marguerat, Pierre Corbinais and Yannick Rochat. Their feedback was truly helpful to pursue our project as they said the application was useful, but not totally justified. It had to be more complete to have a real role in the game. They liked the card game humoristic touch, but they also advised us to add more, so players wouldn't discover all too quickly and get bored.

In September 2016, the team took a new shape. Marion Couesnon joined the team to work with Valérie Pierrehumbert to enhance the application and develop the game at the same time. We started

collecting more anecdotes on the profession by speaking with many designers we knew who were working in different fields and we shortened the texts to make them catchier. Projects as "my mason was an illustrator" **[2]** or "next customer" **[3]** were also good inspiration sources for our work. We also redefined the card game graphic design to make it clearer and more adapted to the game dynamic, and had to think about the project scenography. After designing a square table around which people could sit, we imagined a rounded interface that would be more intuitive and around which everybody could read. Aside from the challenge of designing a rounded interface, we redesigned the gameplay in order to find a balance between the application and the card game. A reasonable amount of time was required to manage creating a legible interface that would use the rounded format to its advantage. Thanks to pictograms, an adequate version could be reach embodying all tasks a player had to check to fulfill his mission.

To improve the gameplay, we designed several mission types a player could do, from web to video and print design. Randomly, each player got a mission at the beginning of the game. But most of the missions didn't have the same number of tasks. This is the luck factor of the game. However, we wanted the end of the game to be unpredictable which is why we planned to integrate unexpected events with time variation of each task depending on the player's closeness to the end in comparison with other players.

This game remains in progress as Valérie is currently improving gameplay aspects while developing a "family-friendly" version for a potential production.

REFERENCES

[1] Les éditions volumique (red.). *World of Yo-Ho*, Volumique. Looked up May, 15, 2017

[2] Anonymous. *Mon maçon était illustrateur*, tumblr. Looked up May, 15, 2017: www.monmacon.tumblr.com

[3] Dorne, G., *Client suivant*, Graphisme & interactivité. Looked up May, 15, 2017: www.graphism.fr/client-suivant-les-phrases-quil-ne-faudra-dire-aux-graphistes

THE OCTALYSIS GROUP

10 GAMIFICATION TO DEFEAT THE CRISIS OF ENGAGEMENT

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Worldwide, only 13% of employees are "committed" to their work while 24% is categorized as "actively disengaged". So there are actually more people actively sabotaging their work than there are trying to be productive. In the last decade these numbers have not changed despite major technological advances on the work floor. **[1]**

Work place gamification projects have been introduced in the last 10 years to tackle this Crisis of Engagement. Unfortunately, the long term impact of the large majority has been low due to bad design that focuses on adding extrinsic, add-on, design like Points, Badges, Leaderboards and Competition. Already in 2012, analyst Gartner predicted that 80% of all new Gamification projects would fail because of this design failure. **[2]**

It is time to step away from function-focused designs with a heavy emphasis on extrinsic rewards and game mechanics. We need to create human focused solutions that craft long term user motivation instead of only aiming at getting an easy short-term engagement spike. Design for intrinsic motivation and empowerment of people's autonomy on the work-floor.

The Octalysis Gamification Framework provides the foundation for this very needed innovative workplace design. We have created a successful approach that, when fully integrated in the company workflow, generates an increased workplace commitment.

The inventor of Octalysis, Yu-kai Chou, studied the reasons why successful games were so successful. He found that these games (like "World of Warcraft") were designed with the right balance between extrinsic and intrinsic motivational design. **[3]**

In fact, Chou went on to detail what elements guaranteed the success of these games and came up with Octalysis 8 Core Drives for motivation. It means that for any motivation to exist, at least one of these Core Drives needs to be present. If none of these drives are present, there is no motivation and no behavior will take place.

The eight Octalysis Core Drives are:

1) **Epic Meaning & Calling:**
   Epic Meaning & Calling is the First Core Drive of the Gamification Framework Octalysis. It is the drive where people are motivated because they believe they are engaged in something that is bigger than themselves.

2) **Development & Accomplishment**
   The Core Drive where people are driven by a sense of growth towards a goal and accomplishing it. Most known for XP, badge, progress bars and other game mechanics.

3) **Empowerment of Creativity & Feedback**
   This is the Core Drive that really emphasizes on creating autonomous choices, creativity and "Play".

4) **Ownership & Possession**
   This Core Drive is based on the "owner" principle: because you own something, you want to improve it, protect it and get more of it.

5) **Social Influence & Relatedness**

This Core Drive relates to activities inspired by what other people think, do or say. It is the engine behind themes like mentorship, competition, envy, group quests, social treasures and companionship.

6) **Scarcity & Impatience**

The drive that motivates us simply because we are either unable to obtain something immediately or because it is very difficult to obtain it, for example discounts, countdown timers or our wish for luxury goods

7) **Unpredictability & Curiosity**

The main force behind our infatuation with experiments that are uncertain and involve chance like gambling.

8) **Loss & Avoidance**

This Core Drive's motivation is the fear of losing something or suffering undesirable events. Many people go to work every day simply because of the fear of losing it if they wouldn't.

In Octalysis, great care is taken to further adjust the designs for the different player (= user) types, which are defined on a demographic, psychographic and motivational background basis.

In addition, Octalysis designs are dynamic throughout the user journey in the created experience. The first time you encounter a product your motivations and expectations are very different from the 100th time you engage with it, so designs need to change from the initial Discovery Phase, through the Onboarding and Scaffolding Phases, all the way to the End Game of the experience.

In Octalysis (workplace) Gamification projects, the short and long term Return on Investment numbers are extraordinary with key indicators in double and triple digits over time.

REFERENCES

[1] *The Worldwide Employee Engagement Crisis*, Annamarie Mann and Jim Harter, In Gallup Business Journal, January 2016: www.goo.gl/p0J3J2

[2] Brian Burke, *Gamification Trends and Strategies to Help Prepare for the Future* in http://goo.gl/tcWtAs, 2012

[3] Yu-kai Chou, *Actionable Gamification: Beyond Points, Badges, and Leaderboards*, 2015

11 HOW TO BUILD UP A GAME STUDIO AROUND AN EDUCATIONAL GAME PROTOTYPE

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The initial idea behind "Niche - a genetics survival game" was to create a video game in which players need to adapt to the game world. There are countless video games where players can freely shape and change the world around them at their will. Trees are cut down to build houses for little avatars, terrain is shifted, monsters are slaughtered for loot. The goal of "Niche - a genetics survival game" was to turn this around. In Niche the player needs to change its own shape in order to adapt to the ever changing ways of nature. This premise was predestinated to be combined with a scientific topic: evolution. At this point it is important to note that Niche was not designed to be an educational game, but as an entertainment game based on the scientific principles of population genetics. Niche is used to teach genetics and evolution principles by various biology teachers but has not been brought to schools in a broader attempt yet.

The very first prototype of Niche was developed as a semester project in the Procedural Game Design Course at the Zürich University of the Arts. After playtesting with several people it became clear that the prototype was pleasant and had the potential to be turned into a full game. In the following months Niche development continued, this time in the shape of a Bachelor thesis. Not only the game's mechanics evolved during these months, but also its scientific aspirations. Niche was shaped into a game about population genetics, turning scientific principles into its core gameplay. This decision was not made in order to create a serious game; the game was planned to be and still is an entertainment game, but the topic of population genetics gave the game a context and offered very interesting gameplay choices for the player.

The most important decision in this whole process was to show the game to people in an early state.

The Bachelor ended and Niche had taken on the form of a funny little game that people played at the graduation exhibition for around an hour before running out of things to achieve. This is the point where most school projects end because real world knocks on your door and tells you to find a job and earn your living. After working a bit more on the game, it was uploaded to Facebook, free to try out and ready to hear what the world had to say about it. A small group of people, mostly animal enthusiasts and biology lovers, started to gather around the little game. They started discussing, suggested improvement and new features.

After releasing a mobile game during the Bachelor (which didn't cover its development expenses), this was a terrifying moment: there seemed to be people interested in the concept but I was unsure whether I could turn this into a game they would love, due to a potential lack of skill and time if I decided to start a full time job then. I decided to take on the challenge and try to turn Niche into the starting point of my career as an indie game developer. After completing a part-time internship as a game marketer in a Swiss game studio, I decided to head back to school and start a master of arts in game design focusing on game marketing. Niche development went on as a hobby project and a team started to form around the game.

A cultural promotion (i.e. Pro Helvetia) sped up our development pace since the team could then

devote one day per week to Niche development. At the end of the master the game had evolved a lot and our team decided to crowdfund it through a Kickstarter. Our market research showed that there were very few games about genetics released since the Creature **[1]** series and Spore **[2]** about a decade ago. Niche raised $75'000 and our team was then able to work on it full time for a few months. Shortly after the Kickstarter, Niche was released on Steam **[3]** Early Access. So far over 30'000 copies have been sold on Steam generating about $350'000. Soon afterwards, our lead programmer Micha Stettler and I founded a studio together. Niche's full release is still ahead at this point.

The most important decision in this whole process was to show the game to people in an early state. Game developers often want their work to be perfect before letting anyone see it. If this had been the case for Niche, it would never have been finished and wouldn't have led me to my own indie game studio. Passionate people about tiny games are who kept on pushing me forward and let me find motivation. So, show us what you are working on!

Besides, working on Niche also made me realise that there are no borders between entertainment, serious and educational games. People like to categorise things but that really shouldn't stop us from creating whatever we want.

REFERENCES

[1] Creatures, Cyberlife Technology/Creature Labs
[2] Spore, Maxis/EA Games
[3] Steam, Valve

12 CASE STUDIES: FROM CLIENT'S NEEDS ANALYSIS TO SERIOUS-GAME SOLUTIONS

Basile Perrenoud, Stéphane Restani, Olivier Reutenauer, Benjamin Vurlod
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GENERAL CONTEXT

When creating a serious-game for a customer, most of the work consists in answering specific client needs using video games mechanics. These client needs can, at first sight, be difficult to conciliate with game mechanics. The challenge is then to build a functional, coherent entity, integrating an answer to these needs in a serious game. These needs are the raw material on which numerous conception decisions will depend. In the paper, we quickly discuss the used methodology and present two succinct case studies illustrating this raw material use.

CONTEXT AND SOLUTIONS, CASE STUDY 1

In "Parcours Pro" **[1]**, the client aimed at showing Swiss students finishing their compulsory education the large panel of schools and professions available to them in Vaud canton. The experience needed to be calibrated for a specific event, the "salon des métiers et de la formation" (professions and education fair) in Lausanne. This included being able to absorb a high number of users, while still targeting teenagers. The amount of information to be displayed was huge: numbers of professions and schools, messages against prejudices, specific professions valorisation, using only tablets as hardware. The main difficulty in this case was to get all this information transmitted in a short amount of time.

The solutions lay in a mixture of gameplay, narrative, ergonomics, graphics and technology.

The developed solution is based on the "gamebook" idea: a story including multiple branches letting the user live the same day several times and see the impact of his/her choices. This model allows a good control over the play time without impacting on the user's experience. Furthermore, it ensures great modularity and replayability, which in turn let a large quantity of information to be treated. The design and mechanics are specifically chosen to keep the game simple and easy to access for everyone. Humor is added in the narration, helping to target the teenage public.

CONTEXT AND SOLUTIONS, CASE STUDY 2

"Les voies lactées" **[2]** is a localized edutainment application for the 7-to-12-year-olds on the theme of milk, developed in the context of a museum's exhibition. The raw material for development consisted of a theme and messages linked to the exhibition's content, an all-public demographic that privileged the 7-12-year-olds, a game time of 3-4 minutes and the use of an existing physical support, a 42" touch table.

The first decision made was to propose a longer game time, judging from the theme and elements to treat, but at the same time work on a collaborative multiplayer aspect: to handle an identical number of players. The chosen solution is a puzzle game with raw dairy materials to process and hand over to different consumer types. The graphical "miniature world" aspect enables to communicate to a

large public. It also allows exaggeration of certain shapes or objects, to increase details and ease their readability and comprehension for the younger audience. The difficulty is adapted to all ages thanks to gradual error feedback. This model works very well with the younger users, used to trial-and-error without the fear of failure.

METHODOLOGY

There is no single approach to answering client's needs. The solutions lay in a mixture of gameplay, narrative, ergonomics, graphics and technology. The identification and classification of the important raw material, the message or desired experience must be integral to the initial reflection. The universe of game mechanics is vast. It is possible to pick from this pool and identify the impact of mechanics on a given client constraint; and by combining simple elements, one can answer a large range of needs. Finally, the concept validation is equally primordial. The clever and repeated exercise of playtests with the target demography is key to guaranteeing the correct functioning of the final product, both technically and experientially **[3]**. They also ensure the messages to be well received.

CONCLUSION

In both cases, playtests, observations in situ and feedbacks were very good and proved that the chosen solutions worked and that the goals were attained. Being able to pick from such a large pool of experience, culture and video games expertise, and adding the required bit of creativity is the way to reach coherent solutions matching the raw material provided by the client.

REFERENCES

[1] Digital Kingdom SàRL, *Parcours'pro,* customer: État de Vaud, DFJC, Département de la formation, de la jeunesse et de la culture, http://goo.gl/ZsguhV: Salon des métiers et de la formation (SDMF), Lausanne 2014–2016.

[2] Digital Kingdom SàRL, *Les voies lactées,* customer: Alimentarium, musée de l'alimentation et fondation Nestlé à Vevey, http://goo.gl/mhVd68, for the temporary exhibition: *DÉTOX. Croyances autour de la nutrition,* 2014–2015.

[3] Shell J., *L'art du game design,* Chapitre 25, book, Pearson, 2010.

ROUNDTABLE

HYBRID
– VIRTUAL & PHYSICAL –
GAMES

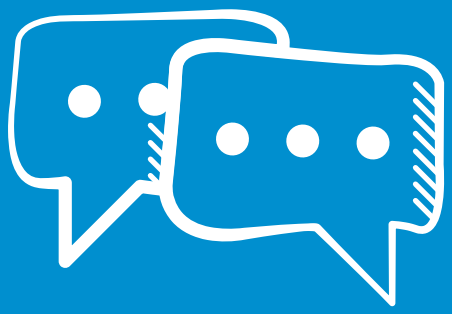
Most existing games rely on purely virtual environments to increase players' immersion and, thus, enrich their user experience. More and more initiatives tend to explore the hybrid physical-virtual game worlds and environments with the objective of reaching a different user experience through combined virtual and physical player interactions. What is the added value of such games? What are the next innovations that will disrupt interactions in games? Those questions will be addressed by a panel of experts in game design.

Chair: Shaban Shaame
EverdreamSoft | Geneva

SESSION SOCIAL 16H10-17H35

Can SGs change people's behaviour, and not only for a limited time? This is the challenge faced by many projects. In this session, four different projects will be presented, developing ideas about how to do it successfully. Topics presented by researchers will include tourists' destination choices, education, eating habits and big data with very original solutions. The discussion will revolve around the social potential as well as the possible risks of SGs.

CHAIR: JEAN-PIERRE TABIN | EESP | LAUSANNE



13 STORIABOX: FROM GAMIFICATION TO SERIOUS GAME, IS IT THE RIGHT WAY?

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Since 2014, strong Swiss franc has negatively impacted on the Swiss tourism sector. Daniel Lampart, first secretary of the Swiss Federation of Trade Unions confirmed it in an interview: "We are certainly witnessing an improvement in 2016, but pressure remains strong on Swiss economy key sectors like industry, finance or tourism [...]" **[1]**. In this context, we conducted the project "Mobile Tour Information System" (MTIS). Its idea was to propose scenarised visits produced with new technologies.

We thus created a mobile app that enables the user to discover a site through a story where each chapter corresponds to a sightseeing attraction (GPS or bluetooth detection). Different contexts such as texts, sound, videos, 3D objects, animations, quizzes and AR techniques (digital content overlay to the actual scenery) are supported by the mobile app. We conceived CreaStoria, a methodology that structures the story creation stages, from storyboard to its digitisation. So the app uses storytelling, and in particular digital storytelling, considered one of the application gamification mechanics (Muletier et al. 2014). This paper highlights the evolution of the app related with its gamification mechanics.

Storiabox contains nine visits. The tour contents were adapted according to the target audience and operating conditions. For instance, in the Roselet of Les Breuleux, Samara the little horse (digital character) shows you around the old horses' residence, a walk complemented by many games and quizzes. In another visit, two spa clients, Jules and Julie (actors) guide you through the centre of Yverdon-Les-Bains to show the hidden treasures from Roman times as well as its ancient Castrum that reappears on site in augmented reality. After three years of operating the app, we noted that the itineraries containing lots of gamification elements are more successful. We thus asked ourselves if we should transform StoriaBox into a serious game to improve its attractiveness.

After three years of operating the app, we noted that the itineraries containing lots of gamification elements are more successful.

In order to answer this question we led an exploratory study during the summer 2016 and expressed the following hypothesis: "Increasing gamification mechanics integration enables to raise user commitment and pleasure." To test it we selected the StoriaBox watchmaking town planning of La Chaux-de-Fonds. The study had two phases: in the first phase, we quantitatively and qualitatively measured the user experiment through this route with a poor gamification content. In the second phase we established a gameplay and added gamification mechanics such as games, a classification system according to game-obtained results, a result-sharing leaderboard and a trophy-obtaining system awarding some challenges realised during the tour. In this phase we also quantitatively and qualitatively measured the experiment.

We proceeded to 16 half-directive interviews on a batch of 3 men and 5 women in the first phase and in the second on 6 men and 2 women. Although the exploratory study results did not confirm our hypothesis, as the app perceived quality, the intention to reuse and the user satisfaction is statistically identical before and after the gamification mechanics addition, they are interesting because they are contradictory, unexpected and they open new research perspectives (Nassisi et al. 2017).

The size of the sample of this preliminary study does not enable us to draw a conclusion. Nevertheless it shows that adding some gamification mechanic does not increase the user commitment and pleasure. We could maybe explain it by the fact that they do not correspond to the user expectations in this context. In order to check this, we are going to base our future reflections on Bartle's taxonomy (1999), which defines four types of players: socializers, achievers, killers and explorers. According to Muletier (2014), we can bind the last ones to their corresponding gamification models. Binding a priori a user profile to a player type should be useful in guiding future research.

In conclusion, it would then be possible to propose gamification tools matching the user "player profile" and thus raise his commitment (with an initial survey or a mini-game). The perspectives and impact are promising if we manage to create this "player profile" determining process in a tourist context.

REFERENCES

[1] Jaberg S., 2017, *Deux ans après le choc du franc, une économie suisse encore convalescente,* swissinfo.ch, http://goo.gl/Q0k0xY

Bartle, R., 1999. *Hearts, Clubs, Diamonds, Spades: Players Who Suit Muds.* Journal of MUD Research, 1.

Muletier, C., Bertholet, G. & Lang, T., 2014. *La gamification ou l'art d'utiliser les mécaniques du jeu dans votre business,* Paris: Eyrolles.

Nassisi, A., Baudet, C. & Termine, F., 2017. *De la complexité de la notion de gamification à la complexité de sa mise en œuvre: une étude exploratoire dans un contexte d'application mobile touristique.* In Paris: AIM, pp. 1–18.

14 A MOBILE SERIOUS GAME FOSTERING HEALTHY EATING HABITS

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INTRODUCTION

In recent years, overweight and obesity have become epidemic and have been identified among the leading causes of death for non-communicable diseases. However, several studies demonstrated that knowledge about food and nutrients tends to imply healthier food habits [1]. Thus, in the context of the PEGASO European project [2], we aim at creating a serious game (SG) that improves the user knowledge on food nutrients in a pleasant and enjoyable way.

This paper focuses on the design approach used to develop a mobile solution for a target population of teenagers within an age range of 13-16.

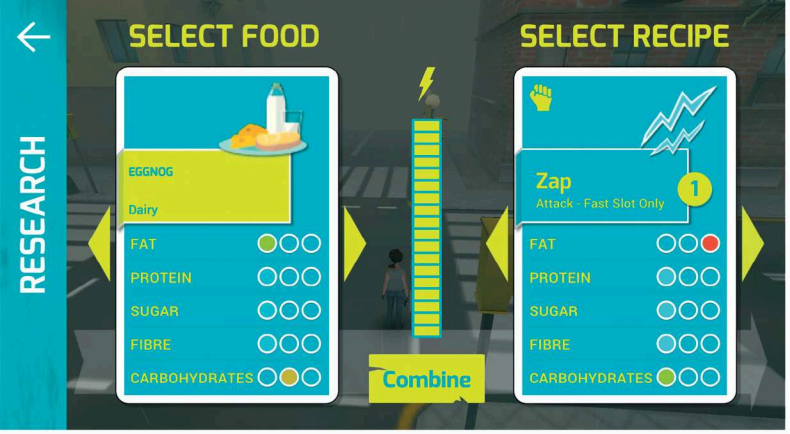
PARTICIPATIVE DESIGN

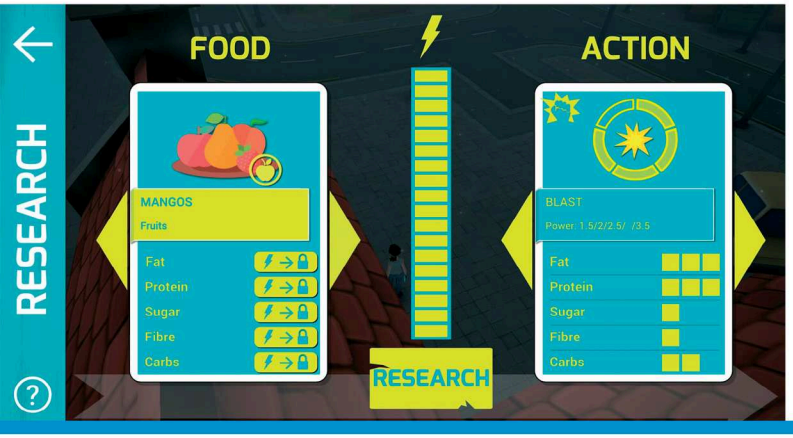
Involving the final users in the development of an application is the basic principle of participative design. We think that this approach is particularly interesting in the development of SGs, as the one presented in this paper, and that our experience can be useful to researchers in the SG domain who intend to involve users in the creative design process.

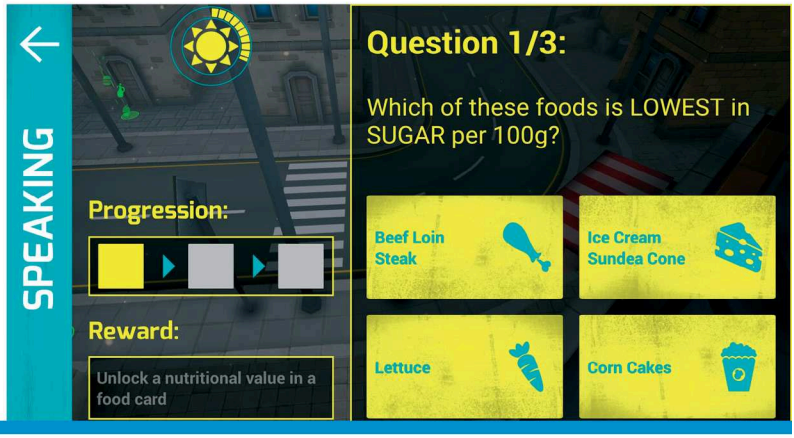
The game described in this paper has the special characteristic of being conceived as a mini-game inside a broader game experience. The "parent" game [3] focused on healthy behaviours aspects related to physical activity and sedentariness neglecting aspects related to nutrition and healthy eating habits. We designed this game to address this specific issue via the expert support in the PEGASO consortium (in physiology and nutrition) and the results found in the scientific literature [1]. For instance, Turconi et al. [4] produced a multiple-choice survey and it concluded that a person that can answer it accurately tends to eat healthier. The mini-game iterative design approach started from such survey and intended to provide the user with the knowledge to answer it correctly.

FIRST DESIGN ITERATION

As first step, we developed a standalone version of the mini-game. In it, the user had to select the most adapted aliments to craft a balanced meal with the right combination of macronutrients (carbs, proteins, fat, fibers and water). Then, a skill-based mini-game asked the user to catch the right nutrients in a time-limited session. The goal of this first prototype was to detect and address usability and content issues as soon as possible. As a result of the evaluation phase, we assessed that the game was pleasant to play but the knowledge transmitted to the user was, to a certain degree, limited. Therefore, we decided to combine a quiz game to the original skill-based crafting mechanics. Quizzes are, indeed, a valuable way to provide nutritional knowledge to the user and, additionally, can be easily integrated in the main game narrative. In our solution, correct answers to the questions increase also the in-game player character knowledge, creating a favourable correlation between real world and the virtual one. While the player acquires new knowledge in the real world, her character is doing the same in the virtual one (for instance, new in-game knowledge brings the character the possibility of acquiring new abilities).







THE INTERMEDIARY STEPS: PRE-PILOT STUDIES

After the integration with the main game, two short duration studies (1 and 3 weeks respectively) were conducted. The first pre-pilot study goal was to assess the usability of the novel concept that includes the mini-game into the main game and the second measured the user experience in the whole PEGASO platform.

THE FINAL STEP: THE PILOT STUDY.

As we are writing this paper, about 400 teenagers are using the game in an international pilot study in Catalonia (ES), England (UK), Scotland (UK) and Lombardy (IT). The study has been designed as a multi-centre quasi-experimental controlled pilot study with control groups. The aim of this experiment is to quantitatively and qualitatively measure if, at the study end, players have acquired knowledge about eating healthy habits and evaluate possible impacts on the users' behaviours.

This research project has been supported by the European Commission under the collaborative project PEGASO ("Personalised Guidance Services for Optimising Lifestyle in Teenagers") funded by the European Commission under the Seventh Framework Program, FP7-ICT-2013-10.

We want to thank the Serious Game Institute of the Coventry University Technology Park and Imaginary SpA for supporting the development of the first prototype.

REFERENCES

[1] Wardle, J., Parmenter K., and Waller J., *Nutrition knowledge and food intake.* Appetite 34.3 (2000): pp. 269–275.

[2] Carrino, S., Caon, M., Khaled, O. A., Andreoni, G., & Mugellini, E. (2014, June). *Pegaso: Towards a life companion. In International Conference on Digital Human Modeling and Applications in Health, Safety, Ergonomics and Risk Management*, pp. 325–331. Springer International Publishing.

[3] Carrino, S., Caon M., Mugellini E., Ascolese A. *PEGASO – A Serious Game To Promote Healthy Lifestyles For Teenagers.* Gamification & Serious Games Symposium 2016, pp. 26–27

[4] Turconi, G., Celsa, M., Rezzani, C., Biino, G., Sartirana, M. A., & Roggi, C. (2003). *Reliability of a dietary questionnaire on food habits, eating behaviour and nutritional knowledge of adolescents. European journal of clinical nutrition*, 57(6), pp. 753–763.

RTS Radio Télévision Suisse

15 "DATAK": MONTHS OF INVESTIGATION IN A SERIOUS GAME TO RAISE AWARENESS OF BIG DATA IMPLICATIONS

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On en Parle, La 1ère – RTS, Lausanne

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How and for what purpose is our personal data used? From loyalty cards and medical records to geolocation, CCTV cameras and biometric passports, the list is long and varied. Under the auspices of "On En Parle" (a "news to use" Swiss radio program), a major investigation was launched in 2015 with active participation from the public **[1]**. This work culminated with the creation of a serious game: DATAK. DATAK will open people's eyes on how personal data is used and their associated risks. The interactive game, available in English, French, German and Italian, presents the results of many months of investigation in a pleasant way and raises awareness about the implications of big data. Big data and the collection of personal details are hot topics right now, with discussions revolving around the potential as well as the dangers. We therefore hope that this game has come at exactly the right time.

HOW DOES DATAK WORK?

Players assume the role of a new employee who has been hired to work for the town's mayor and manage social media. He faces various dilemmas in his day-to-day life: there are important decisions, and interspersed with videos from YouTubers, to be made very quickly in the employee's private life, for the community and the city. The serious game was developed by DNA studios in Bulle with the support of the Youth and media platform of the FSIO **[2]**. It is aimed at anyone aged 15 or over and brings to life the main themes of the investigation (social media, government surveillance, commerce and health). Some of the specific questions the mayor might ask his new recruit include whether to approve a project to install CCTV cameras all over the town and whether to pass on citizens' details to companies or political parties. Every time players complete a project, they have the option of accessing the SRG investigations results and a bunch of useful tips. Datak is free and aims at being an educational tool in four languages, but even more importantly a fun game with useful tips, to inform without lecturing. Alongside of our panel of experts –i.e. the game design studio and with the precious contribution of Youtubers – we hope that this Serious Game will help you get to grips with your personal data **[3]**.

THE TOPICS COVERED BY THE GAME

- INTERNET IN DAILY LIFE: Online tracking, hacking, email addresses, user accounts, terms and conditions, using data against people, data sharing with third-party sites.
- SOCIAL MEDIA AND INTERNET USERS' ACTIONS: privacy settings, smartphones, geolocation, photo/video metadata, connected objects, video games, search results relevance, cultural bubbles.
- GOVERNMENT SURVEILLANCE CCTV: data collected by authorities, biometric passport, Intelligence Service Act, phone tapping, police state hacking, Data Protection Act revision and surveillance authorities in Switzerland and Europe.
- TRADE: Loyalty cards, credit cards, credit score, customer profiling, segmentation, data brokers, targeted/differentiated advertising, contactless payment.
- HEALTH: Health data, electronic patient files, quantified self, brokers and insurers, DNA storage (biobanks).

OUR EXPERTS

In order to assess the relevance of the actions and choices in DATAK, a panel of experts supervised the way in which points are awarded in the game, based on the advantages and risks of sharing personal data.

Liliane Galley, youth protection expert, scientific advisor to youth and media platform of the Federal Social Insurance Office

- Isabelle Dubois, former cantonal data protection commissioner for Geneva, former cantonal judge, lecturer at the University of Geneva and member of ThinkData, AD HOC RESOLUTION
- Christian Flueckiger, data protection and information commissioner for Jura and Neuchâtel cantons, doctor of law and qualified lawyer
- Jean-Henry Morin, associate professor at the University of Geneva's Institute of Services Science, president of ThinkService and expert committee member at ViGISWISS (Swiss Data Center Association)
- Solange Ghernaouti, professor at the University of Lausanne, international expert in cybersecurity and cyber defence, director of the Swiss Cybersecurity Advisory and Research Group
- François Charlet, legal expert specialising in technology law and future lawyer; blogger, trainer and speaker
- Sylvain Métille, doctor of law, barrister, university lecturer and blogger, expert in issues related to data protection, technologies and cybercriminal law
- Paul-Olivier Dehaye, mathematician, founder of PersonalData.IO
- Bertil Cottier, professor of communication law at the University of Lausanne and University of Lugano, former deputy director of the Swiss Institute of Comparative Law, member of the steering group for the revision of the FADP

Also took part in the investigation:

- Jean-Philippe Walter, deputy data protection and information commissioner

REFERENCES

[1] *Enquête ouverte: donnez-moi mes données!:* www.rts.ch/la-1ere/programmes/on-en-parle/6813759.html
[2] *Jeunes et médias: portail d'information consacré à la promotion des compétences médiatiques:* www.jeunesetmedias.ch/fr/accueil.html
[3] *DATAK, Un jeu sur les données personnelles:* www.datak.ch

16 EDUCATIONAL SCENARIOS – HOW TO PRODUCE MOTIVATION TO LEARN WITH A SERIOUS GAME?

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Which are the key elements contributing to generate motivation? According to education specialist R. Viau **[1, 2]** there are several factors influencing students to learn. Can also be applied to SG and serious gaming?

One of them is the sense of control: to decide and choose how to do a task, but also, which one to achieve. Thus, several activities must be proposed to the player. In this way, the task can be adapted to specific needs.

The difficulty level is also an important point to keep the learner's attention. Vygotsgy described the proximal zone as the one having the best ratio between challenge and interest. If an activity is too difficult and the student can't achieve it, even with help, he can be quickly demotivated. If it is too easy, it will also demotivate the learner. The best ratio is a constant difficulty and the possibility of being helped, if necessary (as in collaborative games): the player being confident to be able to solve the problems, realizes the required tasks, even if it takes time and efforts. Without this confidence, he will be tempted to give up the game.

Another important element is the task value perception. The student has to consider the task as an important thing, but also understand the relations between the different proposed activities. The introduction of activities in a coherent project or their combination into a meaningful narration is a good way to do this.

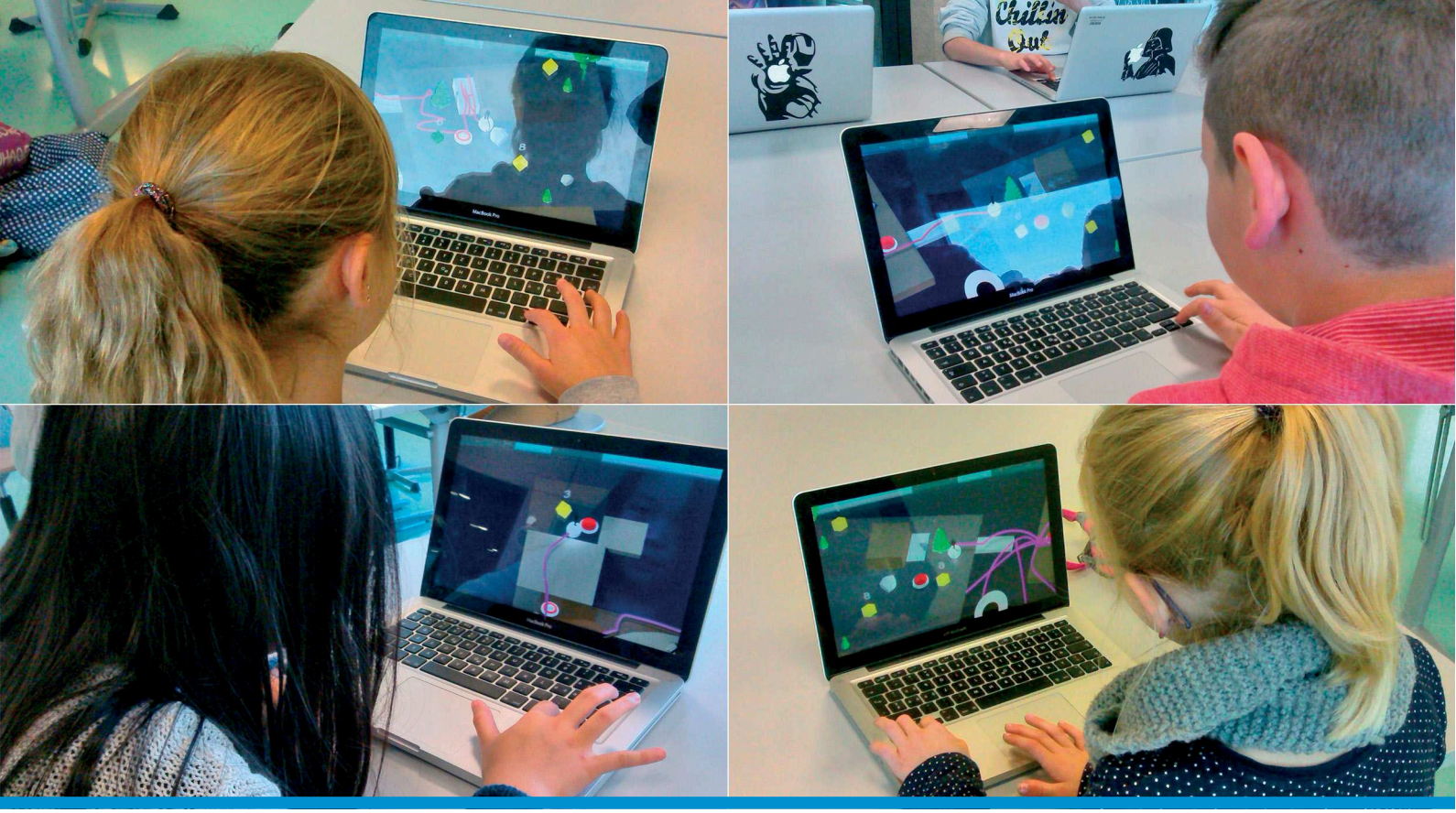
The task must have a real value for the student himself: the activity must be interesting as such and have a personal meaning: pleasure to play, interest for challenges, desire to learn something.

If an activity is too difficult and the student can't achieve it, even with help, he can be quickly demotivated. If it is too easy, it will also demotivate the learner.

The third element impacting the motivation to learn is the authenticity of the task. The proposed tasks must correspond to something that the student can relate to the real world or to his life. Applying this principle to video games doesn't mean that all SG should be completely realistic. For example, in a language learning game, you can learn vocabulary, idiomatic, pronunciation, dialogues, in a perfectly fictional game. And sometimes, the fiction narrative aspects can be a strong element to motivate a player go on (if realistic situations are not as interesting as a good fictional scenario). Even if the game takes place in another world or even another planet as Elegy for a dead world (a game based on science-fiction trip to another planet, designed to learn writing short stories) the acquired abilities are real.

The cognitive implication is another important learning element. But students will be motivated to learn, if they feel self-confident (think that they can achieve the task) and consider it as a real one (not just a fake exercise) and give it a value.

Ideally the game should not just be the application of rules or simple repetitive exercises, it should give the opportunity to reactivate knowledge in different contexts, and link them to new elements **[3]**.



R. Viau also suggests that connecting different learning areas, in an interdisciplinary approach, is more motivating. SG are especially interesting in this aspect as they can demand several skills: for example, we tested a SG in history class with 16-year-old students which was about American history (Flight to freedom).

In the game the player is a young slave in a 19th-century plantation. His task is to flee the plantation. The game scenario proposes to discover real facts and historical figures in a fictional adventure. The students had to play in English, read the texts, analyse the different documents, to understand the plot and find a way to escape. To do so, they used their knowledge of English, but also of American history and strategy skills.

The teacher also proposed another scenario: the students had to compare what they had learned in the SG to other historical sources (photographs, testimonies). So they had to produce a comment, as if they were experts. So, a learning task is more meaningful, as C. Freinet defended, if the student produces something on his own. The learning process must give him the opportunity to create, but also to present this production to an audience, which is also a way to reactivate acquired knowledge.

How could teaching with a SG include this? The game can be used as the source to produce something. For instance, S. Delalay **[4]** used the exploration game "Journey" (where the player discovers a world made out of enigmatic ruins) in an English learning class. The students explored this world and then produced a short novel about the trip. This helped them build a story. In the end, the students had to give their own and personal meaning of the game. In "Elegy for a dead world", the players can share their short stories online, and read others' productions.

REFERENCES

[1] Viau, Rolland (1994), *La motivation en contexte scolaire,* Bruxelles, De Boeck Université

[2] Viau, Rolland, (1999). *La motivation dans l'apprentissage du français.* St-Laurent (Québec): Éd. du Renouveau Pédagogique.

[3] Quinche, Florence (2015), *Le jeu vidéo, lieu d'apprentissage et de collaboration, l'exemple de Minecraft,* in Jeunes et médias, n° 7, pp. 61-71

[4] Delalay, Sophie (2015), *Écrire des récits de voyage à partir d'un jeu vidéo? Un exemple de scénario pédagogique dans l'enseignement des langues,* In Jeunes et médias, n°7, pp. 73–83

ROUNDTABLE

SERIOUS GAMES EFFECTS ON SOCIAL CHANGE

Do serious games have any impact on social change? If it is the case, it is a challenge for game designers (Klimmt, 2009), because social change is no only a very broad, but a much complex phenomenon. According to French sociologist Pierre Bourdieu, social change does not only need objectification, which means that counter-realities have to be produced, but also subjectification, which means that individual perception of social word must be transformed. We aim at discussing the effects of SGs on social change which these two lenses. What kind of design must respect SG in order to grab the user's attention and interest? How can a SG influence holidays or any other personal choices? Which SG conception is the most accurate in order to change people's habits regarding what they eat, drink, smoke, do on the internet, etc.? And can a SG targeting social change be developed without addressing its moral standards?

Chair: Jean-Pierre Tabin
EESP | Lausanne

SPECIAL GUEST

RAGE: ADVANCED TECHNOLOGY AND KNOW-HOW FOR SERIOUS GAMES STUDIOS

Rubén Riestra, Wim Westera
BiP media

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Gaming studios and developers have now access to advanced gaming technology resources and state-of-the-art knowledge to develop innovative Applied Games easier, faster and more cost-effectively, thanks to the RAGE project. RAGE is an EU Horizon 2020 project combining the experience of 19 partners from 10 countries including game studios, universities and organisations from different sectors using Applied Games to improve the skills and employability of the European workforce. RAGE was created to contribute to the progress of Applied Games and to foster the competitiveness of the small while dynamic landscape of European games studios. Tangible outputs of the project include:

- An interoperable set of advanced software components ("assets") tuned to applied gaming,
- Evidence of the added value of Applied gaming, extracted from pilot tests using RAGE components and games in real-world contexts,
- Easy access to a wide range of technologies, software modules and knowledge resources,
- An online social space to facilitate collaboration among studios and other interested parties.

RAGE ADVANCED SOFTWARE COMPONENTS

RAGE has already made available a first version of 32 reusable game software components. These are functional building blocks that help developers to create better applied games using efficient and cost-effective approaches. They cover a wide range of functionalities including:

- Learning analytics
- Assessment
- Social gamification
- Emotion recognition
- Emotion appraisal
- Natural language
- Game balancing
- Embodiment

RAGE game software components are ready for being tried out and can be accessed through the RAGE website **[1]**.

COMPELLING ARGUMENTS FOR PROMOTING APPLIED GAMING

The gaming technology assets produced within the project are being be tested and evaluated by gaming companies integrated in RAGE. These games are validated in real world pilots in different application scenarios representing different markets and target groups. Six pilot cases show how innovative Applied Games solutions can provide effective solution to challenges related to employability of young graduates or specific needs of re-skilling seasoned professionals. These pilot experiments are taking place across Europe, involving real settings and participants in Portugal, UK, Italy, France and the Netherlands. They cover areas such as professional communication skills training in vocational education; digital skills in art schools; Entrepreneurial skills for future graduates; soft skills in sports for employability; crime advanced interviewing skills or job search skills. An example of our pilots:

"Play a game, get a job". Randstad, one of the world's largest Human Resources services company, with operations in 39 countries, is well-aware of the problems people face when looking for a job. These processes require a positive attitude and careful planning. People feel much more confident approaching this job-hunting phase if they have done some thinking and preparation. Randstad has joined forces with RAGE experts to use Applied Games to help to master the process of searching for a job. The proposed game will help people to confirm their job wishes, know the characteristics of the jobs and better know the reality of the market.

ECOSYSTEM: MEETING POINT FOR BOOSTING COMPETITIVENESS

All RAGE results as well as third party technologies will be made available through an open repository and community platform -the Ecosystem as a marketplace-, which aims to connect game developers, applied researchers, market players and Gaming users for achieving enhanced synergies, e.g. through cross-border and/or cross-sector collaboration in market development, addressing bigger projects or cross-selling purposes.

NEXT STEPS: WIN-WIN COLLABORATIONS

RAGE seeks collaboration with game developers, technology creators and software developers who want to join forces and strengthen the field of applied gaming.

- As a game developer, you may want to easily enhance your own games by including RAGE components. Your comments and feedback on the practicability of the components will then allow us to improve the quality of our software and to address your needs.
- As a software developer or technology creator, you may want to contribute and turn your own technology into a game software component. Your software could then be profitably reused by other parties in a multitude of game engines and platforms.

The RAGE team is willing to share our results with you. Go ahead, get in contact with us!

REFERENCES

[1] RAGE website: www.rageproject.eu
From Educational Revolution to Niche Market; the barriers between games and formal education

SESSION STUDENT 9H30-10H55

It is an undeniable fact that the creation of Serious Games or gamified applications requires multidisciplinary knowledge. Arts (design, 3D modelling ...), technology (computer science, electronics,...) psychology and sociology are a little list of the minimum competences required to develop valid and effective solutions. In the scattered Swiss scenario, companies and associations could lack one of these skills. Therefore, universities can (must!) play a key role in this field, on the one hand providing their know-how and on the other hand working as glue connecting the different actors together.

CHAIR: STEFANO CARRINO | HE-ARC, HES-SO | NEUCHÂTEL

17 | PENULTIMO

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Penultimo is an hybrid cocktail apparatus, inspired by the world of alchemy. A machine between digital and analog systems that questions our relationship to new technological devices. As players descend into the depths of a smartphone game, their actions within the app prepare a unique elixir from the innards of the physical machine.

The name "Penultimo" comes from the famous philosopher Gilles Deleuze's **[1]** "Abécédaire". He uses the term "pénultième" to refer to the second last glass search, the one of drunkenness, the glass preceding the one that will make you sink. That glass brings you to the ultimate step of inebriation where you are still inspired. The project is directly inspired by the Boris Vian's "Pianocktail" **[2]**. The "Penultimo" user has to play well to get the right cocktail. He has to be very precise and quick to collect only the right ingredients. The more he plays, the cleverer he becomes and the drunker he gets. Thus, everything is in the search for balance between training and drunkenness.

For centuries, humans have sought out divine elixirs such as ambrosia or the youth fountain through the search of the philosopher's stone. Alchemists have created various chemical experiments in order to achieve this ultimate goal — a quest for the quintessential material that so many have sought before. But what if this research were the ultimate goal, that quintessential essence that so many have been seeking? As we search, we open ourselves to a discovery spirit from and within which we can discover new states of awareness. Travelling various paths, we learn new things. We discover. We explore. The path is winding, the road is as yet unfamiliar to us — nevertheless we travel along it to achieve some sort of result.

In search of the perfect mixture and the balance of different elements, the player travels in a digital coloured maze between organic and abstract worlds.

Penultimo plays with this experience of research. Following a virtual path, the player explores an interactive environment, collecting liquid substances, whose results can be tasted as a physical experience — the quest quintessence. In search of the perfect mixture and the balance of different elements, the player travels in a digital coloured maze between organic and abstract worlds.

The gameplay mechanics requested many tests from us, especially about the player's experience and the relation between what happens in real time in the machine or in the smartphone game. Once we found a gameplay that could balance between smartphone and machine, we began designing the object according to our references.

The object design is inspired by the shape of historical alembics, instruments which allow to extract the essence of a liquid, and the chemistry glassware, tools of research and experimentation.

The glassware shape gives the user keys to understand the gameplay. The three round spheres match the liquid that can be operated in real time - fruit alcohol with spices – and the lights indicate which liquid flows. The two central glasses show the result of the user's elixir and allow him to observe the liquid pouring into the last glass.

The apparatus is connected to a smartphone or a digital tablet. Inside this virtual space, the player is represented by a liquid droplet that sucks neighbouring liquids as they approach. By rotating the device the player controls this droplet through the gyroscope. As the player siphons off the virtual liquids, a mechanical servo valve is activated, mixing physical liquids into the final, drinkable vial. As players reach the final level, a cul-de-sac fills up with the various coloured liquids they have collected throughout the game. Each physical liquid is related to the colour of the liquid discovered in the game.

The two possible results are two main cocktails inspired by historical recipes. If players have not collected any red liquid, they have created ambrosia, a sweet and illuminating drink that refers to many Olympian Gods myths. If, on the other hand, players have mixed in too many red liquids, they have concocted hippocras, which comes from the old rural traditions. The player's dexterity will determine the success and taste of the blend. There are 5 different ingredients: white and red wine and fruit alcohol with 3 different spices: anise, clove and orange blossom. Different tests were performed to define the spices and their amount.

"Penultimo" is a fragile equilibrium between virtual and physical environments where the players experiment a round trip between machine and smartphone.

REFERENCES

[1] Boutang, A., Pamart, M. and Parnet, C., *B comme Boisson, L'Abécédaire,* Gilles Deleuze, Paris, Arte, 1988 to 1989.

[2] Vian, B., *L'Écume des jours.* Paris: Éditions Gallimard, 1947.

18 MASSIVE, A GAME OF FOUR FORCES BASED ON PARTICLE PHYSICS, APPROVED BY THE PHYSICISTS

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What is the universe about? What is it made of? How does it work?... Questions such as these have puzzled mankind since the beginnings of human thought. Indeed, one of the earliest attempts of an explanation dates back to the ancient Greek pre-Socratic philosopher Democritus who put forward the atomic theory of the universe. He was quite in advance of his time, although it has been discovered since that the unbreakable atom structure he spoke of can in fact be broken down even further. Since then, the top thinkers of our civilisation have kept pushing the barriers forward, finding answers and happening on more questions the further they go. This is the beauty and complexity of particle physics.

Today, particle physics is reserved to the elite. It is one of the hardest sciences to understand. Sadly, little is done to make it more achievable and the masses are lagging behind the current understanding of the topic. Moreover, most people get lost in the alien-like scribbles and the abstract maths. And every textbook risks losing the reader after the first few pages. So what can be done to counter this problem and bridge the gap? How can we get people to enjoy particle physics, understand it and not fear the big words anymore?

This is what drove me to create Massive, a game of four forces. Massive is the first particle science-based card game. It gives the players knowledge of the most fundamental aspects of our universe: the particles therein, and how they interact with one another. By playing the game, one can finally experiment with what happens at the subatomic scale and understand terms such as quarks, leptons, fermions and bosons.

By playing the game, one can finally experiment with what happens at the subatomic scale and understand terms such as quarks, leptons, fermions and bosons.

Each player's game aim is to build the atom with the biggest mass. To do so, he must assemble standard model particles whilst attacking and defending against other players using the four fundamental forces: the strong force, the weak force, the electromagnetic force and gravity. Along the way you must watch out for your atom's stability and charge and use them to your advantage. But beware of the cosmic phenomena that come and disturb the gameplay such as cosmic rays, black holes, wormholes and more.

To help with the learning curve, the game's logic is based on visual elements such as shapes and colours [1]. One can understand the composition of protons and neutrons simply by looking at the card visual representation. And one can see which card will impact another based on its colour. In doing so, the abstract language of particle physics is avoided and the interactions are clear. However, we have not completely removed the scientific notation. In the card corners, one can still discover the correct scientific notation and memorise it unconsciously. Certain confusing names have also been rethought to provide a nicer experience.

To make it interesting to beginners as well as to physicists, the game is divided into two versions. an "easy" version allows the players to concentrate on the game without worrying about certain details. Whilst a "hard" mode forces the players to beware of additional criteria and is more prone to radioactive decay.

With the popularisation of online teaching, Massive will also take advantage of the player's smartphone. In addition to the written rulebook, a video rulebook will animate each rule of the game and accompany them with examples. All of these will be present on the official website accessible to all. This will completely change the way rules are checked in-game.

Massive originated from the collaboration between the Ideasquare at CERN (the European Center for Nuclear Research) and HEAD (the Geneva University of Art and Design) in 2014. Thanks to this ongoing collaboration, the game rules stay true to particle physics and the most successful model to date: the standard model. Currently still in development, Massive has been presented and tested in several conferences and exhibitions such as Lift in Geneva or the Salone del Mobile in Milan.

With the amazing feedback received so far, Massive is hoping to start a Kickstarter for funding and to make the dream a reality. The first pack of Massive concentrates on ordinary matter. However, this represents only four percent of the universe matter. As a further development, I would like to explore more topics with exotic expansion packs like the antimatter pack, the dark matter pack or the supersymmetry pack.

REFERENCES

[1] Wiener G. J., Schmeling S. M. & Hopf M., *Can grade-6 students understand quarks? Probing acceptance of the subatomic structure of matter with 12-year-olds.* Article, European Journal of Science and Mathematics Education Vol. 3, 2015.

"I like it! You've managed to boil down the complexity of particle physics to a comprehensible set of rules!"
– Alex Brown, Multimedia librarian at CERN

"Finally I'll be able to explain to my family what my job is about!"
– Leonardo Gerritse, Physicist at CERN

"I've never come across a game like this one, and I've played a lot of games."
– Hugo Day, Physicist at CERN

SPECIAL STUDENT SESSION

19 OBJECT CONCEPTION FOR KIDS – AN UPGRADE OF THREE SERIOUS GAMES

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RESEARCH CONTEXT

This research project began in 2015 **[1]** with a collaboration between HEP-VD – Art and technology, research and teaching department, Media and technology – and HE-Arc, HES-SO – Image processing & Computer graphics group. From a first platform including five prototypes we developed three new serious games (SGs) in 2017 focused on object-creation activity: from computer-based virtual conceptualization to real world object generation using for instance 3D printer.

This SGs platform has an original approach as it addresses several types of end users –i.e. children from 8 to 13 as well as teachers – and is a very promising tool also for pedagogy staff since it enables to collect data on the creative process. Through the different game levels, children learn to implement skills in an interactive context, i.e. mathematical and basic skills in science and technology, digital skill, learning to learn, social abilities **[2]**. During phase alpha, the SGs were tested on two children groups children (8-9 and 12-13 years old) and we collected the notes from 70 professors in continued training within the PIRACEF program.

The idea that SGs can train executive functions is not new and several games were created for this task.

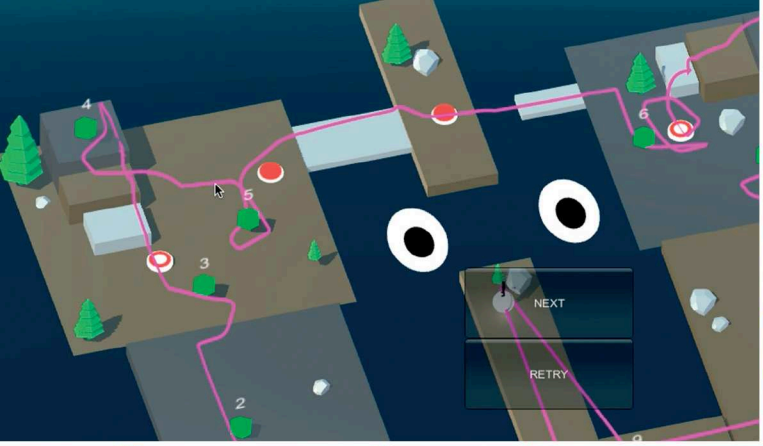
SCIENTIFIC CONTEXT

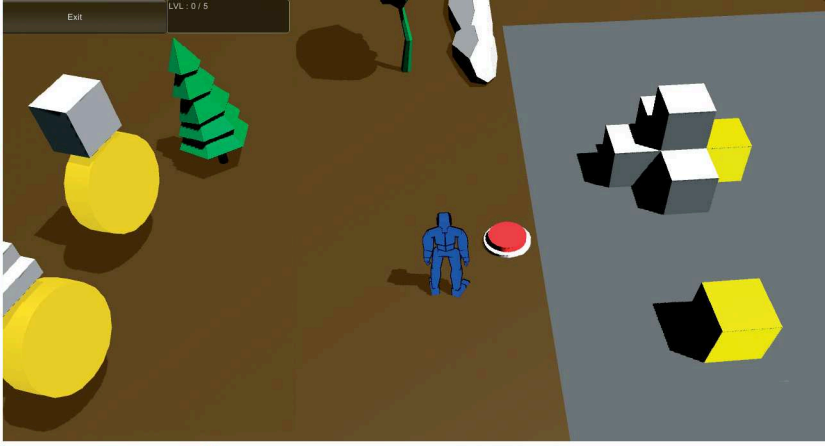
The SGs we began to build were created to help all children develop their decision-making abilities. We focused on some specific executive functions, especially important in the primary school creative and manual activities. The idea that SGs can train executive functions is not new and several games were created for this task. However, most of them were designed for disabled or brain-damaged people (game: Reset, 2013, Brain game Brian) with positive effects on patients with ADHD **[3]** or neuronal damages **[4]**. Our hypothesis is that SGs could also help children with no specific brain disorder to develop their executive functions in an educational context. The functions we focused on are:

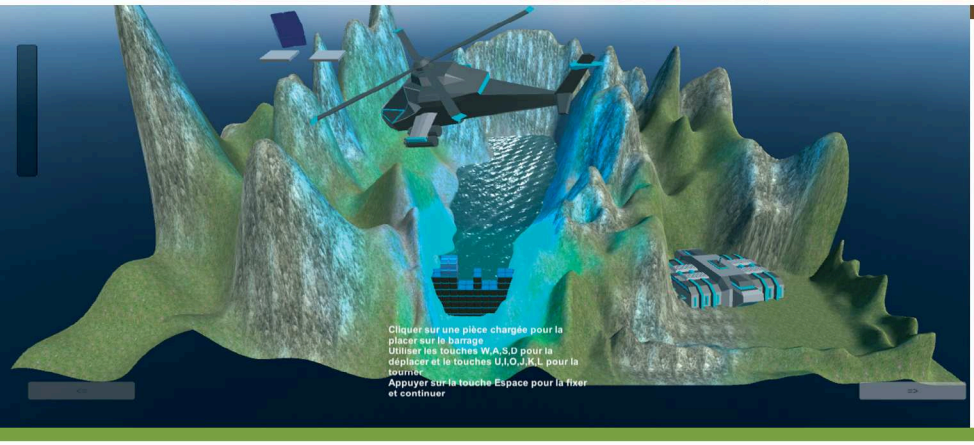
- inhibitory control: capacity to override a stimulus in order to choose another behaviour;
- cognitive flexibility: ability to change mental activity from one cognitive task to another;
- planning: ability to plan successive and complex tasks;
- divided attention: ability to realize simultaneous actions;
- working memory: remembering recently learned elements and reusing them in another context.

GAME DESCRIPTION

The main game objectives concern the object-creation activity and we have not yet focused on the manual phase (i.e. object production). We rather aim at developing children abilities to conceptualize (2D and 3D) objects through different activities. Each game proposes some activities linked with executive functions and object conceptualization training. One action type consists in observing and manipulating virtual objects. Others, more complex, concern problem solving. Some games especially







train cognitive flexibility by changing the demanded tasks. Other construction-based games, exert planning. The research was developed along two axes: a programming research on video game creation and the research question "how to introduce activities and exercises into SGs that can develop children abilities to design objects?"

THE COLLECTED DATA

Another objective is to provide teachers with a tool to understand better children progress in these activities so as to offer more differentiation in the pupils learning processes [5]. The collected data can help teachers identifying the pupils learning difficulties and adapting their lessons to the children real needs. Therefore, it is necessary to match the game results and process with defined parameters. A table of specification (TOS) was used to indicate the player's mastery levels evolution. To confirm this table, we worked with different specialists at HEP-VD.

NEXT RESEARCH STEPS

The next research tasks will be about skill transfer from SG to real object production. Do these games, based on executive functions such as training and learning, help children improve their abilities in conceptualizing 3D objects? Are skill transfers possible in real object conception? This project main future challenges will be to develop the platform with more SGs and several game levels and test these improvements on a wider scale so as to gather more data and check our hypothesis.

REFERENCES

[1] Quinche, F. (2013), *Game based learning, Serious game et éducation*, Berne, educaGuide, p. 48

[2] Quinche, F., D. Leuba (2016), *A serious game to teach design to children*. in S. Gobron, Gamification and serious games, NIFFF symposium, Neuchâtel, éd. He-Arc, pp. 28–29

[3] Prins, P. J. M., Dovis, S., Ponsioen, A. J. G. B., ten Brink, E. L. & van der Oord, S. (2011). *Does a computerized working memory training with game elements enhance motivation and training efficacy in children with ADHD?* Cyberpsychology, Behavior & Social Networking, 14, pp. 115–122.

[4] Kesler, S., Hosseini, H., Heckler, C., Janelsins, M., Palesh, O., Mustain, K. & Morrow, G. (2013), *Cognitive Training for improving executive function in chemotherapy-treated breast cancer survivors*, Clinical Breast Cancer, vol.

[5] Rychen, D.S. and Salganik L.H. (2000), *Definition and Selection of Competencies: Theoretical and Conceptual Foundations (DeSeCo)*, Background Paper Neuchâtel: DeSeCo Secretariat. Paris:OECD

20 REHABILITATION BY MIRROR THERAPY THROUGH VIRTUAL REALITY IN SYMBIOSIS WITH A ROBOTIC DEVICE

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Traditional mirror therapy consists in visualizing the reflect of a healthy limb in a mirror to give the impression to the brain that paretic limb is moving. The therapy primary purpose is to stimulate the patient's brain. In this procedure, mirror neurons, discovered by neurologist Vilayanur Ramachandran [1] and implied in the mimicry process and then in the learning and evolution process of individuals, are stimulated to improve the patient performance.

The study main goal is to experiment mirror therapy and immersion through a predefined serious game in coordination with the Lambda robotic device. The principal difference with the conventional therapy, in addition to the fact that the virtual limbs are represented to the patient, is that his paretic limb is really moving thanks to the robotic device. The consequence is that both the proprioceptive and the visual feedback are coherent.One noticeable feature is the possibility to bring some support for the patient and adapt this support to help him realize the movements. Moreover, serious games with objectives are available in a virtual environment in order to improve the patient motivation and being closer to functional movements.

A paper on a virtual reality game has been published, based on cycling as a rehabilitation tool for the lower limbs [2]. It highlighted the importance of a visual feedback in order to remind the patients to focus on the task and improve his commitment as well. This aspect let stroke patients increase their performance along the weeks. This limbs vision, relaying back three information types (movement visualisation, the performance and the context) plays an important role in motor recovery.

The principal difference with the conventional therapy, in addition to the fact that the virtual limbs are represented to the patient, is that his paretic limb is really moving thanks to the robotic device.

The view presented to the patient should not necessarily be at first-person sight, as [3] suggests by demonstrating that during multisensory conflict in front of a virtual body or a virtual limb, the patient feels as if it was his own limb. The camera position in the virtual environment is not determining, whereas the patient interaction with the virtual character is.

There exists a particular concern for patients not supporting HMDs. Therefore, a single flat screen in which the game can also be launched is available. This is not an issue according to [3] because a pure realism is not mandatory for the patient to feel immersed. Too many details can even distract the patient from his main task. We must therefore find the good trade-off between simplicity and immersion.

Considering the game purpose, two kinds of possible objectives are displayed. The first implies free moves and represents a horizontal semi-transparent cylinder allowing the patient to reach it with

his feet. The second one is the representation of flexion and extension goals on the articulation by a colored arc to cover. In both cases, when the patient reaches the goal, it is updated into a new one to continue the exercise. A game with the same principle of random objectives has been experienced in **[4]**, with the PHANTOM haptic device targeting upper-limb stroke patients. After several weeks, patients have shown a significant better ability in the game, in terms of execution precision and speed.

Another important aspect was to deal with communication between the robot and the virtual environment in order to lower latency. Indeed, this element is key for the neurorehabilitation in order to provide a coherent feedback to the brain and for the patient appropriation of the virtual limb. **[5]** explains that the lag depends on participants but is considered to be noticeable and bad for the immersion in 100% of the patients if it is higher than 100 milliseconds. The actual implementation can reach a 20-millisecond refresh rate on both the haptic and the visual feedback, because the software architecture, code and tools have been fully optimized. According to this study, less than 10% of the patients will notice it.

As a conclusion, although the therapy has not been yet tested on stroke patients, we can confidently assume, based on the literature and previous experiments that this application will bring a new dimension to usual serious games in rehabilitation and help patients recover faster.

REFERENCES

[1] Vilayanur Subramanian Ramachandran, *Mirror neurons and imitation learning as the driving force behind the great leap forward in human evolution,* from the Third Culture, 2000.

[2] C. Yin, Y. Hsueh, C. Yeh et al., *A Virtual Reality-Cycling Training System for Lower Limb Balance Improvement,* BioMed Research International, 2016

[3] Bigna Lenggenhager, Tej Tadi, Thomas Metzinger, Olaf Blanke, *Video Ergo Sum: Manipulation Bodily Self-Consciousness,* American Association for the Advancement of Science, 2007

[4] J. Broeren, M.Georgsson, M.Rydmark, K.Stibrant Sunnerhagen, *Virtual reality in stroke rehabilitation with the assistance of haptics and telemedicine,* Proceedings of the 4th international conference on disability, virtual reality and associated technologies (ICDVRAT), pp. 71–76

[5] Jason J. Jerald, *Scene-Motion and Latency-Perception Thresholds for Head-Mounted Displays,* PhD Thesis, University of North Carolina at Chapel Hill, 2009

ROUNDTABLE

GAMIFICATION & SGS - ROLE & IMPACT ON SWISS UNIVERSITIES

In the last few years, gamification and serious games related topics have started appearing in university classes and research projects. However, the creation of serious games and applications using gamified approaches requires multidisciplinary competences that often cannot be found in a single institution. Think of video games where software developers, graphical artists and musicians have to collaborate closely. In addition, the serious component has also to be effective to develop serious games. The collaboration with specialists from different domains is, therefore, necessary (medicine, psychology, physics... or cocktail making). The goal of this roundtable, that represents the perfect moment for exchange and discussion, is to discuss with students and professors coming from different domains and backgrounds which role the Swiss universities can play and the long-term impact on the pedagogical approaches and research projects.

Chair: Stefano Carrino
HE-Arc, HES-SO | Neuchâtel

SESSION EDUCATION 11H15-12H40

In this round table, we will question the serious games use impacts in different educational fields. Can serious gaming renew teaching and learning? Are they also used with children? Which are the most common pedagogical games used by teachers? Which are the key elements to produce a stimulating and motivating SG for students? Is serious gaming a common practice in Swiss educational institutions, i.e. schools, universities, professional world?

CHAIR: FLORENCE QUINCHE | HEP-VD | LAUSANNE

21 ADVENTURES-MAT, A NEW CONCEPT OF SERIOUS GAME USING AUGMENTED REALITY

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CONTEXT

Following the trend of Virtual Reality (VR), Augmented Reality (AR) has gained popularity due to the high computing capacity of mobile devices such as smartphones and tablets and popular mobile games such as Pokemon Go [1]. Both VR and AR display 3D computer-generated images to players. VR only uses VR glasses such as Oculus Rift from Facebook or HTC Vive from HT immersing a player into his own world [2]. Differentiated from VR, the AR concept is to superimpose computer-generated 3D images into the player real world [3]. This could be achieved by displaying 3D content on AR glasses such as Microsoft Hololens or by using the smartphone/tablet camera video feed, which are available in a large scale. The players can then interact with the 3D content on the device screen. One AR advantage over VR is the possibility to share easily one's experience with friends and/or colleagues. Most of the available AR applications are either playful and interactive such as Pokemon Go or very educational to show 3D models of anatomical parts or cars. To the best of our knowledge, there is no educative and interactive game for children groups using AR to convey educational content. We believe that such games could help them learn new content in an innovative way.

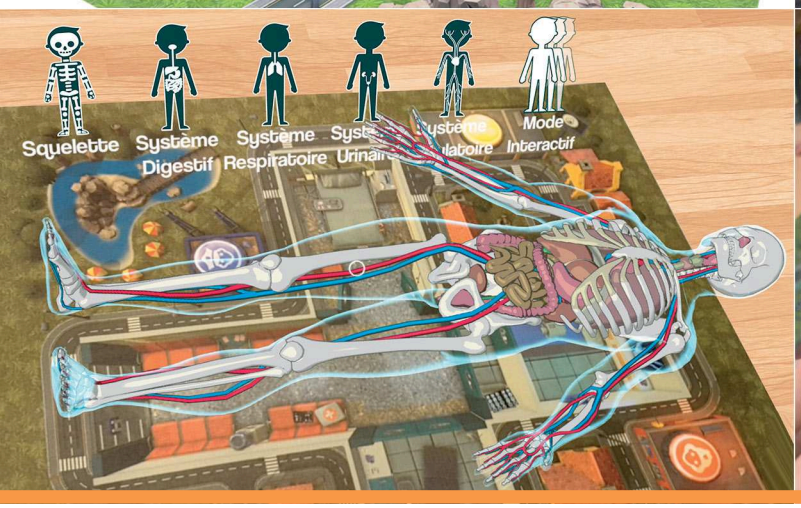
PROPOSED SOLUTION

In this paper, we propose to develop a new concept that merges interactions and playfulness of serious-game-targeted AR with a strong educational component. To make the concept alive, we reconsider the idea of playmat that every kid has in his/her room on which he/she can play with small figurines and/or cars. We augmented this play mat with a mobile app proposing educational content based on the play mat theme. As a proof of concept, we developed a 1m by 1m play mat and an AR mobile app on the medical theme.

The play mat features a large hospital in a small town including a fire-fighter, an ambulance and a police station. The AR mobile app teaches the hospital world, the anatomy and the emergency services phone numbers to 6 to 12 year-old children.

To make the concept alive, we reconsider the idea of playmat that every kid has in his/her room on which he/she can play with small figurines and/or cars.

The mobile app uses the play mat as an anchor to show AR content. Without the associated play mat, players cannot access any educative content of the app. Following the principles of serious games, the app has three playing modes. The first playing mode is the "Discovery" mode where players can explore the hospital or the human body. In the hospital, players can move their smartphone or tablet on top of the play mat to go from one room to another and learn the different equipment names. When selecting discovery of the human body, the app displays a full body directly on the play mat.



By moving the smartphone or the tablet on top of the mat, the player can navigate through the different human body anatomical structures. For example, the mobile app displays the names of bones and organs when the centre of the tablet is above the selected structure. The second playing mode is the "Quiz" mode. This mode tests what the players learned in the discovery mode. Players can play alone or against three other players. The app asks each player where an anatomical structure is located and the player must point on it. If the player answers correctly, the selected structure turns green and he gets one point. If the player does not answer correctly, the structure turns red and the correct structure turns green so the player can learn the right answer. At the end of each question, the current player hands the tablet to the next player. Depending on the quiz results, the app can unlock content in "play" mode. The "play" mode is the third one where playfulness is the key. A player can play small games in the virtual town. One of the games is "First Responders": fire strikes a house, someone calls the ambulance and the player must answer the calls. The play mode goal consists in getting a light educational value while having fun.

CONCLUSION

We presented this new concept to 120 children from 6 to 12 years old in Valais and feedback was very good: they all wanted to play. Primary school teachers tested the play mat by using it during the lesson to enhance courses. A line of products will be further developed with other topics taught in class.

REFERENCES

[1] Clark A. M. and Clark M. T. G., *Pokemon Go and Research: Qualitative, Mixed Methods Research, and the Supercomplexity of Interventions,* International Journal of Qualitative Methods, vol. 15, no. 1, p. 1609406916667765, Feb. 2016.

[2] Kipper G. and Rampolla J., *Augmented Reality: An Emerging Technologies Guide to AR.* Syngress/Elsevier, 2012.

[3] Aukstakalnis S., *Practical Augmented Reality: A Guide to the Technologies, Applications, and Human Factors for AR and VR.* Pearson Education, Limited, 2016.

22 GETTING THE PUBLIC INVOLVED IN QUANTUM ERROR CORRECTION

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The Decodoku project seeks to let users get hands-on with cutting-edge quantum research through a simple puzzle game of the same name. The design of the game is explicitly based on the problem of decoding surface codes [1]. In this paper we provide a short postmortem for Decodoku v1.0-4.1.

The project has two main aims:

- To give players a taste of what it is like to be a scientist. We aim to show them the kind of problems tackled by researchers working in the field of quantum error correction, and how to go about solving them. The game-based nature of the endeavour makes this experience accessible even to those without significant scientific or mathematical knowledge;
- To allow the players to actually contribute to science.

We mostly expect users to be casual gamers. They will download Decodoku (and its sister games, Decodoku:Puzzles and Decodoku:Colors) knowing that there is a scientific background based in quantum technologies. By playing the games, they should hopefully realize that this science is not so mysterious as they might previously have imagined, and will then engage more readily with issues relating to quantum technologies in future. Such a result is regarded as meeting the primary aim of the project, even if the player chooses not to engage further.

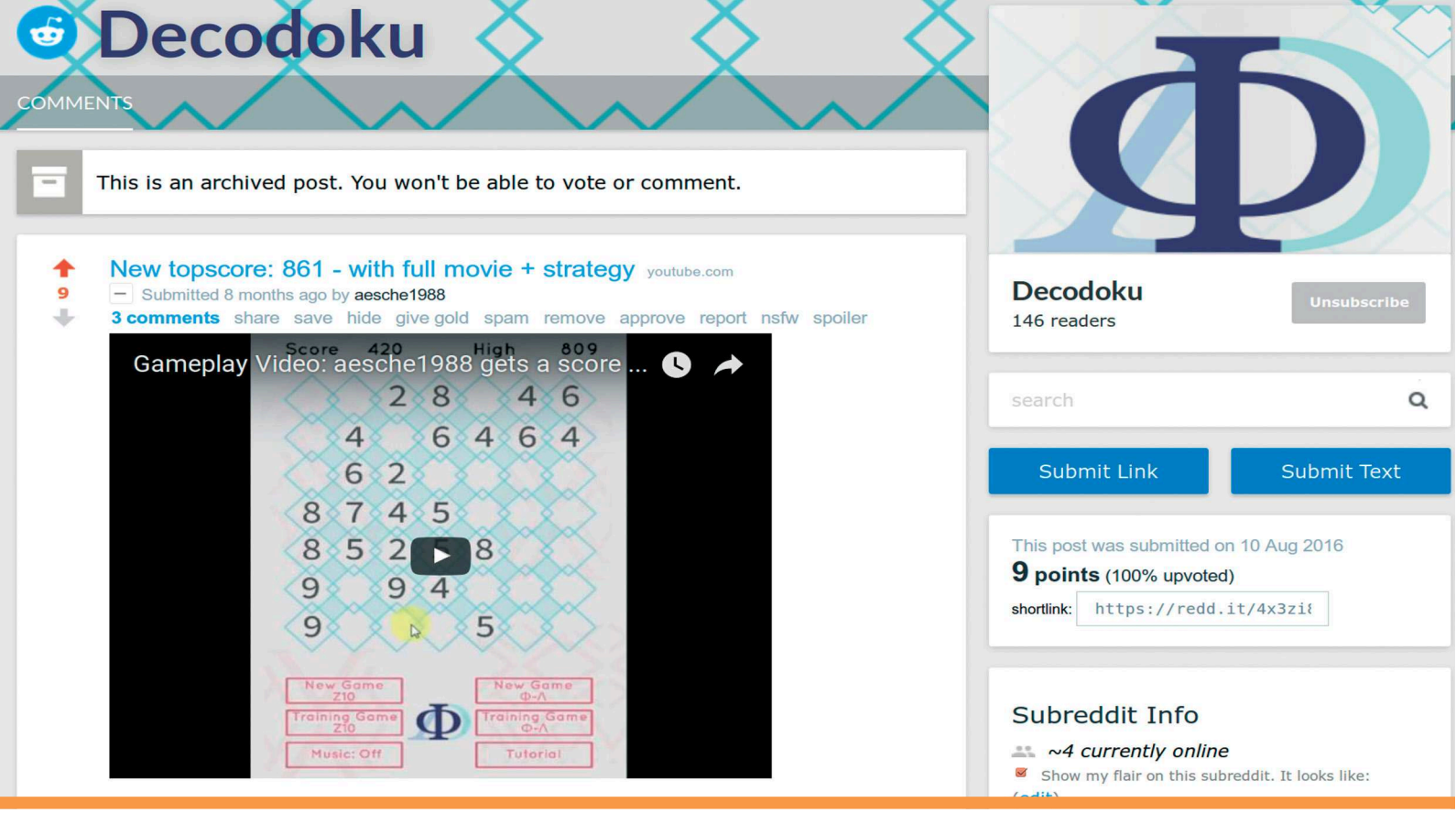
A fraction of players will go beyond this and will seek to learn how to obtain the highest score by comparing their results and methods with other players. It is those for which the secondary aim of the project is relevant.

In Decodoku no data regarding game play is gathered. This is unlike other quantum citizen science games, such as 'Quantum Moves' [2], where players generate data to be analysed by professional scientists. In Decodoku it is up to the players themselves to analyse their method and generate a scientific result.

By playing the games, they should hopefully realize that this science is not so mysterious as they might previously have imagined.

This may sound like a difficult burden for the players, but it is nothing beyond what is often seen in player behaviour. For any sufficiently popular game, a subset of players will systematically strive to find an optimal strategy. They share their insights, evaluate the results of others and build upon them. This parallels the problem solving, dissemination, peer review and overall 'social knowledge construction' [3] process of professional scientists. For instance, an analysis of forum discussions for 'World of Warcraft' was made in [4].

For Decodoku, interested players were encouraged to discuss their methods on the project message board [5]. Within the first few months it was found that the favoured methods of dissemination were primarily text-based. Gameplay videos were rare and were always devoid of commentary, other than explanatory text. In response we updated the game (v4.0) to make it easier to good text-based explanations. The updated game created saved files, which provided a text-based record of all moves, and also allowed players to make annotations.



This provided us with a number of high quality results. The insights they brought are currently being used and built upon in scientific research within our group at the University of Basel. Thus the secondary aim of the project was certainly fulfilled.

However, the number of such results was small. Though this was partly due to the limited userbase, we should also assume that more results would have been gathered if users found it easier to contribute.

The solution to this problem is not obvious: the nature of the scientific problem means that players must reflect upon and explain their strategies in order to contribute and cannot be replaced with any in-game automated process. Furthermore, any attempt at gathering such information in-game should be careful not to leave casual gamers with the impression that science is demanding and technical, since this would reduce the success of the project main aim.

In the current version (v 5.0) some efforts have been made to address this issue. This includes an interactive tutorial which suggests possible moves. It is hoped that this will make the game more accessible for casual gamers, but also provide potential citizen scientists with a reference point when analysing their method. For example they could look at which suggested moves they do or do not use, and what they do and is never suggested, etc.

In conclusion, the Decodoku project gives casual players a taste of the science behind quantum computing and scientific method and allows more involved players to truly work as scientists themselves. Despite success on both counts, we have found that trying to serve both player types at once can be a great challenge. We hope that these experiments will be of use in the future development of similar projects.

The author ackowledges the NCCR QSIT for its support.

REFERENCES

[1] Wootton, J. R. *Quantum memories and error correction* J. Mod. Opt. 59, 20, 2012.
[2] Sørensen, J. J. W. H. et al. *Exploring the quantum speed limit with computer games* Nature 532, pp. 210–213, 2016.
[3] Chinn, C. and Malhotra, B. *Epistemologically authentic inquiry in schools: A theoretical framework for evaluating inquiry tasks* Sci. Ed., 86: pp. 175–218, 2002.
[4] Steinkuehler, C. and Duncan, S. J. *Scientific Habits of Mind in Virtual Worlds,* Sci. Educ. Technol. 17: 530, 2008.
[5] Reddit board *The Quantum Alliance:* www.reddit.com/r/decodoku

UNIVERSITÉ DE GENÈVE
FACULTÉ DE PSYCHOLOGIE ET DES SCIENCES DE L'ÉDUCATION
Technologies de formation et d'apprentissage (TECFA)

23 CAN WE BE MOTIVATED TO LEARN ALGEBRA WITH A SERIOUS GAME?

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CONTEXT

For many adolescents, mathematics and algebra are problematic. Middle school students often find it difficult to build meaning from symbols and their manipulation [1]. Young students who encounter mathematical difficulties have usually a low level of self-ability in mathematics and self-efficiency in solving algebra problems. They can be reluctant to engage in mathematic activities. Furthermore, middle school students often struggle to find meaning and intrinsic motivation in schoolwork [2]. They arrive at an age with growing needs of autonomy and choice, whereas their new middle school environment is usually more rigid with few opportunities to exert control and choice.

In this context, it seems to be particularly relevant to design a learning environment that would motivate and engage young adolescents. Many claims have been made in favour of the potential benefits of educational computer games on commitment and learning, but we know little about the different forms of commitment to educational games; scarce scientific evidence exists for their efficiency from a learning-outcome perspective. The link between playing pleasure, game immersion and learning is not well established and not quite automatic [3].

Young students who encounter mathematical difficulties have usually a low level of self-ability in mathematics and self-efficiency in solving algebra problems.

Serious games combine two dimensions (game and learning content) that players do not necessarily favour the same way: they can have more interest in one dimension than in the other or grant more value to one of the two dimensions. Will students who have an interest for games but not mathematics be more committed than in traditional school tasks and be more likely to stay motivated during the whole game? Conversely, will students who are less interested in games but who appreciate mathematics be more reluctant to engage in a mathematical game or show some interest due to the learning content? In my thesis work [4], I investigated how motivation to learn and engage in an educational game relates to the experiential qualities reported by learners, in-game behaviour and learning.

METHOD

A video game in elementary algebra, Algebra Mystery, was developed and tested by 95 junior high school students, aged 13–15 from Geneva, Switzerland. Algebra Mystery is a game in which learners play the role of a scientific investigator. To enter the lab they must open doors by solving equations. Then, a case involving three stolen paintings must be solved, requiring the use of equations. To identify the painting dimensions, players must tie a 3D package with "known" and "unknown" strings according to the data in the word problem. In parallel, they can write the corresponding equation.

The students had to answer a questionnaire and take an algebra test before and after the game. The pre-test consisted in a survey about learners' attitudes towards mathematics and value given to the game as a means of learning mathematics. It was followed by an algebra test that had similar problems to those they would encounter in the game. The post-test included a questionnaire on the activity perception (satisfaction, gained knowledge feeling and some flow indicators) and an algebra test, similar to the pre-test one.

RESULTS

We produced different student profiles using a clustering method. We showed that some learners were more game-oriented, others more interested in the learning content and some were neither interested by one or the other. Unfilled expectations were found to impact negatively commitment and performance in the game. However, the students least confident in mathematics, who had nevertheless some interest in it, showed engaged behaviour during the entire session of the game. They felt they had gained some better knowledge in algebra and, compared to the other profiles, progressed the most in solving algebra problems post-test. In conclusion, the different profiles correspond to different types of expectations and motivations that will determine the level of engagement in the game activity and learning.

REFERENCES

[1] Kieran, C., *Learning and teaching algebra at the middle school through college levels. Building meaning for symbols and their manipulation.* In F. K. Lester (Ed.), Second Handbook of Research on Mathematics Teaching and Learning. Charlotte, NC: I.A.P, pp. 707–762, 2007.

[2] Rathunde, K. & Csikszentmihalyi, M., *Middle school students' motivation and quality of experience: A comparison of Montessori and traditional school environments.* American Journal of Education, 111(3), pp. 341–371, 2005.

[3] Wouters, P., Van Der Speck, E., & Van Oostendorp, H., *Current practices in serious game research: a review from a learning outcomes perspective.* In T. M. Connolly, M. Stansfield, & L. Boyle (Eds.), Games-based learning advancements for multi-sensory human computer interfaces: Techniques and effective practices, pp. 232–250, 2009.

[4] Sutter Widmer, D., *Conception et évaluation d'un jeu vidéo en algèbre: Apprentissage, motivation et usage de la visualisation dans un environnement aux représentations multiples.* Thèse de doctorat. Université de Geneva, 2017.

24 TEACHERS' MOTIVATIONS TO INTEGRATE VIDEO GAMES IN THE CLASSROOM

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Why would a teacher from the canton of Vaud decide on his own to use video games in his classroom? I tried to answer this question in my Master's Thesis by finding which factors positively influence this choice. To do so, I interviewed five teachers and qualitatively analysed their statements [1].

In the first place, it is important to mention that video games are not good or bad for learning: they are a tool that can be used in multiple ways by teachers. As Groff says, "The real barriers to implementating this pedagogy in today's schools are the attitudes and beliefs of education stakeholders that create a culture where it is challenging for educators who would want to try this, to feel as if they have space, time and opportunity to do so." [2] With this in mind, I decided to use interviews as my research method to see how teachers, as professionals, decide to use video games in their classroom despite the negative representations that exist in the education world. This particular point of view puts the teachers in the core of this study and not just video games on their own.

The first factor is the gamer's history. Every teacher I interviewed played video games since his prime childhood, developing a mere familiarity with the games in general. This does not mean that they are still playing a lot today nor that they see themselves as experts. But they are comfortable enough with video games to use them as a pedagogical tool. For them, video games are a normal and daily hobby, like many others such as reading, watching movies or playing sports. Furthermore, it is a media like any other and should be treated as such. This leads them to say that video games are an important part of the popular culture, and of their own culture. Its use is absolutely logical and normal, because it is an object that has been present in their everyday lives for years [3].

The second factor is the perception they have of their students as being a part of the digital native generation. The teachers I interviewed tend to perceive their students as more gamers than they really are. For them, every child is connected and plays video games on a regular basis. With this point of view, using video games in the classroom is interesting because it involves a well-known realm to the students and helps them focus on learning. [4]

Video games are a pedagogical tool which is not very often used although it brings novelty and freshness to daily habits.

The third factor is the need to solve specific school issues. For most of the teachers I interviewed the issue is motivation. By using video games in the classroom, they try to bring some extra motivation and help their students enter the learning process. An English teacher even used a video game to renew a pedagogical sequence she believed was out of fashion and boring, for her students as well as for herself. Another teacher tried to bring video games in his classroom to increase his students interest in maths, a school subject he believes is not much appreciated nowadays. Finding new ways to solve problems can be seen as innovative, according to several authors such as Garant. Teachers, by using video games in the classroom, are innovating even though they declare that they are not; for them, playing is a very old and well known pedagogical tool. [5]

The fourth factor is the teachers' willingness to value video games as a relevant and useful pedagogical tool. By using video games in their classroom, they want to prove their colleagues and other teachers that it is a valuable tool that should be more often used. This is how they fight the negative image video games have in education and more widely in society. Their experience is not only personal and ground-based, but also has a wider pedagogical purpose.

The last factor is the possibility to vary teaching practices. Video games are a pedagogical tool which is not very often used although it brings novelty and freshness to daily habits. The variety of practice is a very important factor for the teachers I interviewed, as it can involve different students in different ways and may encourage them into the learning process.

It is important to note that the five teachers I interviewed made their "classroom video games" experience within the framework of University. For four of them, it was a part of their Master's Thesis. In this situation, being helped by an experienced teacher and a video game specialist (in their cases Florence Quinche) may have eased the development of these pedagogical sequences.

REFERENCES

[1] Wastiau, P., Kearney, C., & Van den Berghe, W. (2009). *Quels usages pour les jeux électroniques en classe?* European Schoolnet. Consulté à l'adresse http://goo.gl/zS13ZN

[2] Groff, J., Howells, C., & Cranmer, S. (2012). *Console Game-Based Pedagogy: A Study of Primary and Secondary Classroom Learning through Console Video Games.* International Journal of Game-Based Learning, 2(2), pp. 35–54. Consulté à l'adresse http://goo.gl/vyjlq7

[3] Sandford, R., Ulicsak, M., Facer, K., & Rudd, T. (2006). *Teaching with Games*

[4] Gurr, A. (2010). *Les jeux vidéo et le défi d'engager la génération numérique. In Jeux et simulations éducatifs: Études de cas et leçons apprises* (p. 165-180). Presses de l'Université du Québec.

[5] Garant, M. (1996). *Modèles de gestion des établissements scolaires et innovation. In Systèmes scolaires et pilotage de l'innovation. Émergence et implantation du changement* (pp. 57–87). De Boeck, Bruxelles.

ROUNDTABLE

HOW CAN SGS CONTRIBUTE TO RENEW EDUCATIONAL APPROACHES?

In this session, motivation will be discussed in three papers. Indeed, SG are often presented as tools to increase learners' motivation as well as their autonomy in educational processes. D. Sutter-Widmer investigates SG impact on school students motivation to learn algebra. She points several player profiles, linked with the students relation to maths and video games. L. Favre will analyse another aspect of motivation: teachers using SG. He interviewed educators who implemented video games in their teaching. Another topic concerns the technical innovations used to renew educational SG. A. Widmer and T. Crausaz will present a research on an AR game designed to teach medical knowledge and emergency services to children. J. Wootton will comment the serious game creation and adaptation process to learn about scientific processes and quantum computing. This SG aims at developing reflexivity on thinking strategies and problem solving.

Chair: Florence Quinche
HEP-VD | Lausanne

UNIVERSITÉ DE GENÈVE
FACULTÉ DES SCIENCES
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SCIENCE AND VIDEO GAME, HAND IN HAND

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professor at the University of Geneva to launch the new version of EVE Online, a video game aiming to bring together science and entertainment. The objective: by manipulating real scientific data, tens of thousands of players think of conquering the galaxy, while they are mainly improving scientific research in the field of astrophysics.

EVE Online **[1]**, a Massively Multiplayer Online Roll Playing Game (MMORPG) designed 13 years ago by the Icelandic company CCP **[2]**, wishes to associate enthusiastic intergalactic video game fans with research in astronomy. In order to do this, CCP offers an original solution: the introduction of real astronomical data in the game. At the instigation of the Massively Multiplayer Online Science (MMOS) **[3]**, a Swiss-based start-up based in Monthey, CCP asked the Observatory of the University of Geneva to introduce into the game curves of light obtained by instruments seeking transits. When a planet passes in front of its star, it causes a mini eclipse called transit. The decrease in luminosity of the star due to this transit is then identifiable and gives information on the presence of a planet, its diameter, its period, its habitability, etc.

The light curves measured by satellites enter hundreds of thousands of computers, and although they are able to quickly and efficiently detect transits, they are struggling to identify atypical transits. For this kind of recognition, the human eye remains the sharpest tool. Applying the principle of citizen science, CCP decided to involve EVE Online players to analyze transits from the artificial satellites COROT and KEPLER. The principle is simple: EVE Online being a game of galactic conquest, the player can suddenly face an unknown planetary system and will then have to analyze the light curves to see if the system contains planets, and if so, what type, whether they are habitable or not, and so on. Once the analysis is done, its results are compared with the players' results. If several players reach the same conclusion, the information is transmitted to the Observatory of the University of Geneva for further research.

The game designers call on a "guru" to present the science underlying the light curves analysis so that the players know what they need to look for. CCP has already tested the concept with the introduction of the Human Protein Atlas project, where the Swedish biologist Emma Lundberg explains how the cyber player must identify proteins on photographs and why this is important for research. In EVE Online, the principle is identical. Michel Mayor, who discovered the first exoplanet in 1995, lends his image to explain to the players how they should proceed and what is the advantage of this approach for planetology.

"The biggest challenge of citizen science sites is the long-term commitment," explains Attila Szantner, co-founder of MMOS, "these sites are only effective if they regularly solicit amateur scientists". With EVE Online this permanent "advertisement" is not necessary, since players are connecting without anybody suggesting them to. It is true that EVE Online brings together about half a million players,

of whom 40'000 are online 24 hours a day. This makes for a hardworking and enthusiastic workforce for a job that can often be tedious, even impossible, if it has to be carried out by a small group.

To launch the game, Michel Mayor will present the basic principles of exoplanet research and discuss the prospects that a game such as EVE Online can offer to research. He has been present at the Fan Fest of EVE Online, which brings together several thousand of players every year in the great hall of the Reykjavik opera at the beginning of April. Michel Mayor has then been filmed in his role of professor "guru" so that his avatar can be shaped and included in the game.

REFERENCES

[1] EVE Online: www.eveonline.com

[2] Icelandic company CCP: www.ccpgames.com

[3] Massively Multiplayer Online Science: mmos.ch

SESSION POLITICS, ECOLOGY & ECONOMY 14H30–15H40

Games are finding their way into every aspect of our society. Understanding that play is an essential factor of human learning and increases game's acceptance and perceived value in a broader context. Political, ecological and economical issues and problems are now communicated as playful experiences, helping people to get a grasp of complex systems and allowing them to take on new perspectives. Both Gamification and Serious Games hold great potential for future improvement since we can all contribute to a solution once we are able to understand the problem.

CHAIR: PHILOMENA SCHWAB | STRAY FAWN STUDIO | ZURICH

HAUTE ÉCOLE D'INGÉNIERIE ET DE GESTION DU CANTON DE VAUD
www.heig-vd.ch

25 FOREST DEFENDERS: HAVE FUN WHILE FIGHTING DEFORESTATION

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Land use change is a significant threat to protected areas, biodiversity and the continued provision of important ecosystem services to society. Yet deforestation continues at an alarming rate. Left unchecked, deforestation destroys natural ecosystems, endangers wildlife and wreaks havoc on the freshwater systems on which we depend for clean, safe drinking water **[1]**. In the face of climate change and the potential impact of forest conversion on human communities, scientists and world leaders are working to curb the continued loss of the world's tropical forest. Decision makers at multiple scales (local, national or regional) are hungry for information on land-cover change, requiring the information to be as accurate and recent as possible in order to prioritize interventions and act upon new land-cover change patterns in a timely manner.

In the face of climate change and the potential impact of forest conversion on human communities, scientists and world leaders are working to curb the continued loss of the world's tropical forest.

So, since 2012, "Terra-i: An eye on habitat change" (http://www.terra-i.org) has been a monitoring system that uses remote sensing and GIS technologies to provide land cover change data for Latin America and the Caribbean. Since 2016, the tool scope has been extended to encompass the whole tropics, including Asia and Africa into the analysis. It can generate predictive models supported by the use of neural networks and satellite data of vegetation indices (NDVI / MODIS) and precipitation (TRMM and GPM), as well as detect, from 2004 to the current year, the deviation from the normal natural cycle of vegetation over time that can be associated with anthropogenic impacts. The tool-generated data enable the user to determine when, where and how often the region is experiencing change.

Terra-i algorithms work mainly in an unsupervised manner **[2]**. They exploit historical data to build a set of models of vegetation dynamics, which are used to track major changes in vegetation. To filter noisy data due to clouds in the environment, Terra-i pre-processes time-series of vegetation indices, but the only means to fully assess the detection of a new deforestation site is by validating it through the comparison of high-resolution images of the same region, but from different years, or by fieldwork. The Terra-i team has used both techniques to fine-tune the current system, but they can be annoying or expensive. Inspired by the successful use of games to solve complex problems **[3]**, we conceived a game for Android devices called Forest Defenders (Fig.1) in a way to incite satellite images comparison and crowdsource deforestation detections validation.

Forest Defenders is a classical tower defence game where the goal is to try to stop enemies from crossing a map by building traps to slow them down by placing towers, which shoot at them as they pass. Enemies and towers have varied abilities and costs. When an enemy is defeated, the player earns coins, which are used to buy or upgrade towers. Choosing the tower type and position is the essential

game strategy. In Forest Defenders, the game starts with a first phase, during which the player looks for deforested areas by comparing satellite images from the same area taken at different dates. What the player identifies as deforestation is then stored into a server for further analysis. If they match the detections obtained by the deforestation tracking system, the player gets a power-up that helps her defeat enemies more easily. The second phase is a classical tower defence game.

To ease satellite images comparison, we overlap them in such a way that the player's task consists in identifying a colour change from dark to light green. However, the player has to use some further contextual information to avoid false positives. For instance, isolated pixels in the middle of the forest cannot be deforested, or sometimes the shadow of a cloud makes a region appear dark green, when it is not. The rationale behind our approach is that regions detected as deforested in Terra-i should be tagged as deforested in the game, otherwise, this might indicate false positive detections. Furthermore, regions that are tagged several times in the game but that were not detected by Terra-i, might indicate false negatives. The game prototype **[4]** has not yet been massively diffused, but is available online and has been mainly used during open days in our school and at the King's College of London.

REFERENCES

[1] Barlow, J. et al. *Anthropogenic disturbance in tropical forests can double biodiversity loss from deforestation.* Nature 535.7610 (2016): pp. 144–147.

[2] Reymondin, L. et al. *A methodology for near real-time monitoring of habitat change at continental scales using MODIS-NDVI and TRMM.* Submitted Remote Sensing of Environment.

[3] Cooper, S. et al. *Predicting protein structures with a multiplayer online game.* Nature 466.7307 (2010): pp. 756–760.

[4] "ForestDefenders": www.iict-space.heig-vd.ch/ape/forestdefenders

26 SMART2FRY: A DOUBLE ECO-PROJECT

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CONTEXT

Alpsens is a spin-off of the Swiss Federal Institute of Technologies (EPFL). PERL Prize award winner in 2005 and certified by the CTI start-up label in 2007, Alpsens is developing innovative technologies for food safety in QSR (quick service restaurant) and restaurants especially in food oil, energy and human resources monitoring.

Today Alpsens is a key player in the world of food oil quality monitoring thanks to the agreement of one of the big three deep fryer manufacturers in 2014 and approval of the fast food worldwide leader in 2016.

INNOVATION: SMART2FRY THE DEEP FRYER REVOLUTION

Today, a deep fryer is more or less a tank with a heating element controlled by a thermostat. In this context, Alpsens has detected the unmet customer needs: create an "automatic" and smart deep fryer.

The product we developed is rethinking the fried-food industry towards ecology, food safety and financial savings and transforms a deep fryer into a smart production unit which optimizes the cost of food oil, energy and human resources. This innovation will mark a breakthrough in the field of the deep fryer industry passing from a deep fryer to a real self-learning production unit.

FOOD OIL MANAGEMENT

The Smart2fry is able to measure in real time the Total Polar Compounds (% TPC). In Europe, most countries have a regulation indicating a maximum TPC percentage not to be reached in a deep fryer. In Switzerland, the Swiss Food Act controls frying oils and fats in restaurants and catering facilities and gives guidelines on food preparation and sale. The Swiss Office of Public Health has issued that frying oils must not contain more than 27% of polar compounds. With the help of the Smart2fry deep fryer, the food oil monitoring will happen in real time or by samples from the filter system. Thanks to this technology, the deep fryer will monitor food oil, optimizing its life duration, reducing cost and carbon footprint. Compared to a usual human monitoring system, the Smart2fry deep fryer can measure 8600 times more than a human in one day.

ECOLOGY AND SAVINGS

The Smart2fry system analyses its heating curves, its ignition (the turn-on and -off guidelines) and modifies the fryer management in order to reduce energy costs, oil consumption and carbon footprint. In terms of electricity saving, the main problem in kitchen is the human training and flexibility: in order not to forget to switch on a deep fryer or another kitchen equipment, people switch them on too early. The Smart2fry deep fryer will be able to analyse in real time different curves and guidelines to propose the customer when to switch the deep fryer on and off. Heating elements are very power consuming and optimizing their management is the best way to reduce electricity consumption and carbon footprint.

IN TERMS OF GAMIFICATION

To the best of our knowledge, food industry is not yet aware of serious games or, in this particular project, gamification **[1]** potentials which is another reason to study and develop opportunities in this very large market.

Our central idea is to hide gamification processes in the 'smart' user interface (based on emotional model) of the employee directly involved with the fryer: the cook. The GUI should not propose a fancy graphic with blinking patches and colours. It has to keep a friendly but professional appearance with a real serious efficiency and efficacy. Nevertheless, we plan to indirectly add an entertainment side to motivate cooks to pay extra attention, especially to oil quality and ratio between frying-product time and fryer-in-use.

We use a specific chart to show how the moment of changing the oil can credit different points depending on the oil quality: if it is changed before 15% TPC, the oil is wasted; between 15 and 25% the score is credited by minor positive points; after 27% the oil is potentially harmful for the customers. High scores can only occur within a short range, between 25 and 27%. The information about scoring could easily be transmitted to the manager and a pecuniary advantage could be an obvious and direct motivation. For large companies, another motivation could be to become the "greener cook", which could be a proof of quality of the restaurant, and also an incentive for the cook who could get a bonus.

Even better than personal reward, we believe that with such a gamified fryer, restaurants would be able to promote the quality of their menus with "economy and ecology" labels, for instance: eat healthy food and simultaneously protect the planet!

REFERENCES

[1] Huotari, K., & Hamari, J. (2012). *Defining Gamification – A Service Marketing Perspective* (PDF). Proceedings of the 16th International Academic MindTrek Conference 2012, Tampere, Finland, October 3–5.

27 FROM THE STUDENTS CONTESTS TO EFFICIENT R&D TO CREATE INNOVATION

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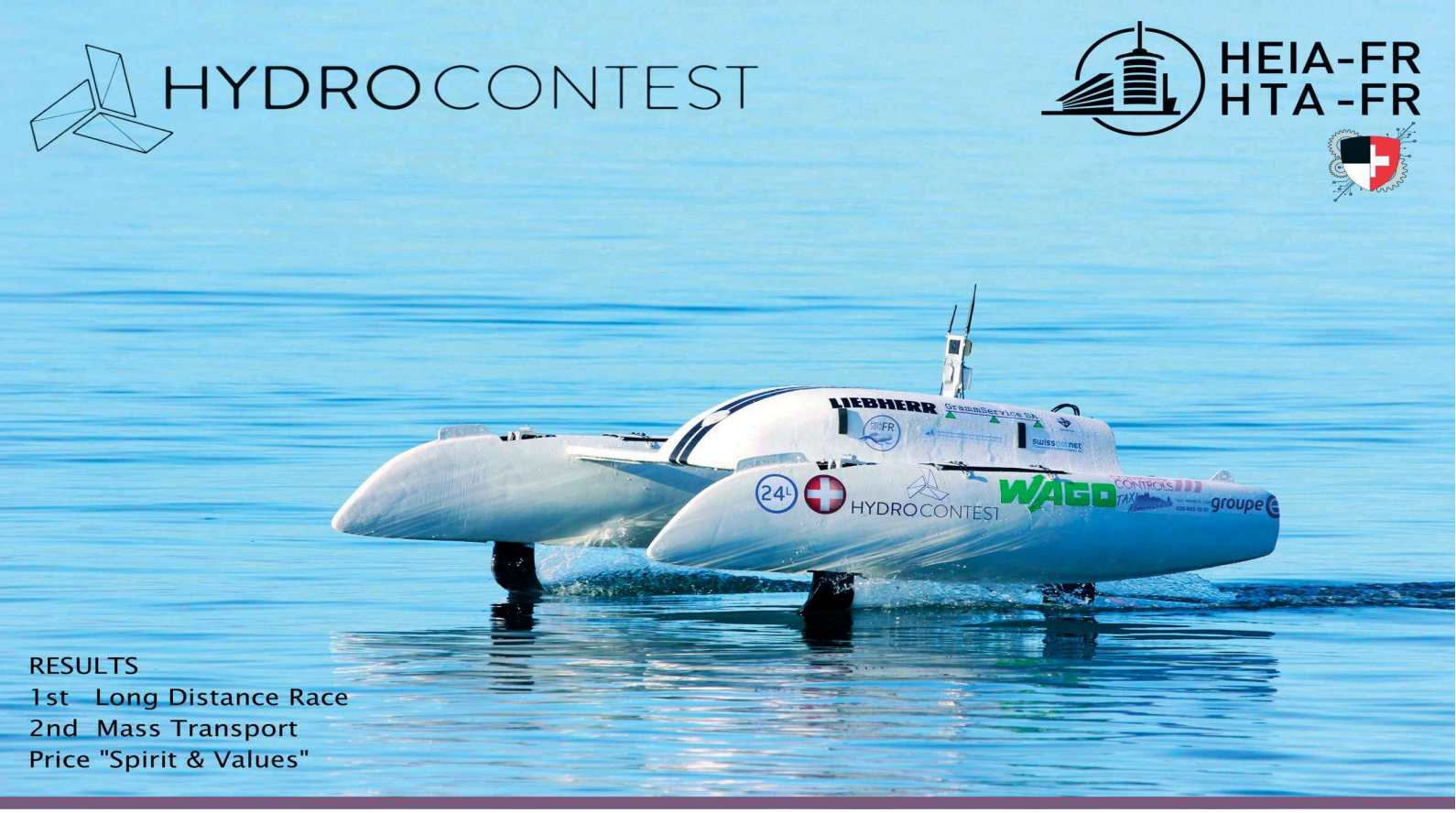
HEIA-FR has successfully experimented the contest as a part of its methodology to teach engineering sciences. During the second Bachelor year, the students can take part to three contests: Hydrocontest **[1]**, Eurobot **[2]** and a "home-made" contest. The group notion as a social action network is developed to achieve winning performance in a positive atmosphere.

At this stage of their education, the HEIA-FR students have enough knowledge and skills to start designing and producing their first prototypes and put them in operation. When they become industry-working engineers, they are expected to develop innovative products to win market shares against their competitors. This process is vital for companies and it may lead, in today's highly competitive global world, to a stress increase, with the adverse effects that can be observed in a significant and growing number of organizations: performance and motivation loss, diseases and burn-out. Not knowing how to deal with the complexity of a product development under time and performance constraints and innovation necessity can be a significant source of stress with its adverse effects, particularly within weak social action network. Innovation comes from research and this last from questioning the present and daring to explore new fields, as an individual and as a group. In a contest, the question needs to lead to adding enough qualities or skills to the prototype to be ahead of other competitors. In a way, there are not many differences between a research team in a contest and one in an industry.

The core necessity for each student is to grow in confidence to achieve proper results as an individual and as a group.

The contest is therefore a proper way to experiment innovation development with limited adverse effects but the only necessity to run the contest. The competition notion is introduced, but in a different way than in most firms, leading to a more positive pressure letting creativity to be limited by less boundaries. The right to lose the contest is very important, as it must be accepted that there will be only one winner. But taking part to the race also brings the achievement of having realized an operational prototype and having learnt more by comparing the prototype results and performance with those of others and interacting with other groups. Beyond that, a group has been formed as a social action network in which each individual has given a contribution and has grown to reach a higher level of expertise and confidence (in oneself and in the group). The team has a systemic value when the group performance has been increased beyond the sum of what could be achieved by each member separately. Each one has a mission and is motivated and committed to the general mission and thus to each sub-missions. "One for all and all for one" as the Musketeers from Dumas would have said. Considering these achievements as results and their sustainable value, winning the contest actually hides the real key objectives that will stay even if the contest has not been won. How to use this experience to find new ways to undertake research and development? According to Schumpeter, innovation must combine invention and market success: invention and success are the contest finishing line.



In order to achieve results, some hygiene rules are necessary to define contests and organize teams to be successful:

- The contest needs to be properly defined and rules must be clear, sustainable and maintained throughout the competition.
- People must behave as gentlemen, share high human values and be ready to exchange viewpoints and help each other.
- The team must be based on the will to perform beyond its current limits.

The students will learn the whole process complexity from the creation to an operational prototype. This is not only a matter of acquiring and combining knowledge, but also learning how to manage a project and work in a team. The core necessity for each student is to grow in confidence to achieve proper results as an individual and as a group. Each individual needs to take responsibility within the group and the group must be an effective social network, each action being defined by a proper interaction and analysis between the members of the self-organized group. The quality of the links between individuals in the group is a key success factor that goes beyond the quality of the individuals. The commitment to focus on the mission and try constantly to concentrate on the most important things among all is a key to achieve results.

Finally, competing is a great opportunity to develop individuals and group to address performance improvement and innovation development by establishing the process to follow to achieve a winning product and creating (and consolidating) the group to do so. It has been observed that students being involved in such a contest as Hydrocontest have spent more time and effort to learn and experiment, but have grown fast as individuals and as a group. After this positive experience, they can provide values to the future groups they will join in their professional life.

REFERENCES

[1] Hydrocontest is an international competition to promote the development of less energy-consuming ships: www.hydrocontest.org/fr

[2] Eurobot is an international competition of student-made autonomous robots: www.eurobot.org

ROUNDTABLE

ETHICS AND PAYING THE BILLS

Many innovative new products hit the market every day. Some claim to have an ethical background, striving to improve the world in one way or another. How important is money for people who try to innovate in ecological topics? Is it possible to preserve a motivation of improving the world in an environment controlled by investors? Where does the money for ecological projects come from and how should it be used? We share our opinion and shed light on good and bad industry examples.

Chair: Philomena Schwab
Stray Fawn Studio | Zurich

SESSION ART & CULTURAL INHERITANCE 16H10–17H35

In an attempt to reach new audiences, art and cultural institutions begin to embrace digital game design techniques to address issues outside the gaming context. At the same time, typical gamification techniques are often not the best way to create games that engage with people in various contexts such as urban space, interactive storytelling, technical and social innovation as well as education. Badges and achievements are not fun by themselves. New forms of engagements might be better triggered through an experimental and transdisciplinary approach to gamified interaction. How can we measure successful gamification within art and/or cultural heritage? What are appropriate means to design in and for these contexts?

CHAIR: GORDAN SAVICIC | HEAD, HES-SO | GENEVA

28 ST-URSANNE PROJECT

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PROJECT CONTEXT

The celebration of Ursanne's 1400th death anniversary will be taking place throughout 2020 in St-Ursanne. In this context, the parish president contacted the leader of the "Art and Technology" project of the HE-Arc Ingénierie to gather the event different elements in a conceptualised and long-term approach.

The heart of the project consists in revisiting and valorising the legacy of Ursanne whose stay on the banks of the Doubs from 610 or so to his death set in 620 governed the place fate. Indeed, with his coming the monastery and later the town, identically named, developed considerably during the Middle Ages to radiate beyond the territory boundaries. The valorisation of the existing heritage must take place in the spirit of the place and character and must revisit this material and immaterial heritage in function of its input for the 21st-century visitor (inhabitant of St-Ursanne, Clos du Doubs, Jura or elsewhere).

The jubilee is composed of an event and a long-term part. It targets foreign visitors as well as local ones. As a matter of fact, one of the main goals is to see that the inhabitants adopt the roots and the historical, cultural and spiritual past of the region **[1]**. The project targets a high quality of the site presentation, a highlight of its genuineness as well as "à la carte" information intended for a wide range of visitors (well-informed amateurs, walkers, families, pilgrims, pupils, etc.).

SITUATION ANALISIS

The built space includes the collegiate church, the cloister and the lapidary museum. In 1984 the St-Ursanne collegiate church was meticulously restored. Its South portal, entirely carved and painted, is one of the big Romanesque artworks in Switzerland. Seemingly, the carvings were realised by Romanesque masters who worked on the Basel Cathedral. The history (and context) of the buildings, the constitutive elements of the collegiate church and cloister are not showcased for the visitor.

The lapidary museum of St-Ursanne, opened in 1982, lies in the old St-Pierre church. It hides the biggest number of Merovingian and Carolingian monolithic sarcophagi of Switzerland (found during the archaeological digs of the sixties, seventies and eighties) as well as architectural and sculptural Romanesque elements, originating from the ancient constructions of St-Ursanne and which are not showcased: their interpretation being reserved to the initiated and no dig result accessible.

The collegiate church treasure is stored in a small room (access via the choir) and a garage in town. Its archiving is being finalised. There are more than 300 items (paintings, clothes, cult objects, ex-voto, handwritten documents, etc.). Their historic, artistic value and condition have not been assessed yet. The preservation measures and the positioning of these objects must still be defined.

OBJECTIVES

This project is an example of interdisciplinarity of the HE-Arc teaching sectors as three of them are concerned (engineering, management and preservation-restoration). Currently, the buildings representing the "soul" of St-Ursanne are managed by the St-Ursanne parish that owns it. This commemoration represents a rare opportunity to give a long-term life to a product by maintaining and financing it.

The accepted pre-concept contains three main themes: the man, the message and the place. This event concept and facilities should enable to launch a new dynamics around the town. It includes the following aspects:

- a better visibility (and understanding) of the history of the man and place [2]
- an increased number of visitors
- job creation

The study led by the "Imaging" skill group (Engineering) should let us better apprehend the interaction place/visitor.

One innovative aim consists in replacing on-site indexations and descriptions by a Serious Game to reduce the visual impact on the building and better preserve the site [2]. We also want to manage and adapt the information according to the visitor's age and add relays with the different city actors (e.g. game prize can be collected or consumed at a local retailer) [3].

The heritage site represents one of the Jura Arc hot spots in terms of tourist development potential. Apart from the built and natural frame of the city, already well valued by the tourist house of St-Ursanne, the religious site combines a high historic and symbolic value. For the moment there is no data about the attendance rate of the church nor any managing tool to highlight it.

The Jura Arc region development depends on the region capacity to develop strong tourist products and St-Ursanne certainly combines all the necessary potentials to be transformed in product while respecting its living vocation of religious remembrance place.

REFERENCES

[1] Beeton S., *Community development through tourism*, Landlinks, 2006

[2] Ballagas R., Kuntze A. and Walz S. P., *Gaming Tourism: Lessons from Evaluating REXplorer, a Pervasive Game for Tourists*, Indulska J., Patterson D.J., Rodden T., Ott M. (eds) Pervasive Computing. Pervasive 2008. Lecture Notes in Computer Science, vol 5013. Springer, Berlin, Heidelberg, 2008

[3] Xu F., Weber J. and Buhalis D., *Gamification in Tourism*, Information and Communication Technologies in Tourism 2014, pp. 525–537, 2013

29 DART 17: A LABORATORY FOR INTERACTIVE EXPERIMENTS, OBJECTS AND TOOLS IN THE SILICON VALLEY

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Projects in design, art, research and technology with an entrepreneurial spirit can apply with their interactive projects to DART 17 – the new one- to three-month incubation program in the heart of San Francisco. In a tailor-made program, attendees can test and further develop their prototypes in areas of virtual reality, augmented reality, games or smart objects. It will help expand their network with technology companies, industry experts and investors. DART 17 **[1, 2]** is the brainchild of five Swiss organizations: swissnex San Francisco **[3]**, Swisscom, Pro Helvetia **[4]**, the "Engagement" **[5]**, and the Gebert Ruef Stiftung **[6]**.

In today's world, start-up funding is primarily geared towards technology companies and quick commercialization. This is not necessarily the right environment for designers and creatives, but their perspectives are particularly important. Even the best technologies are empty without the ideas that brought them to life. We are seeking creative minds that can push the edge of potential in new media.

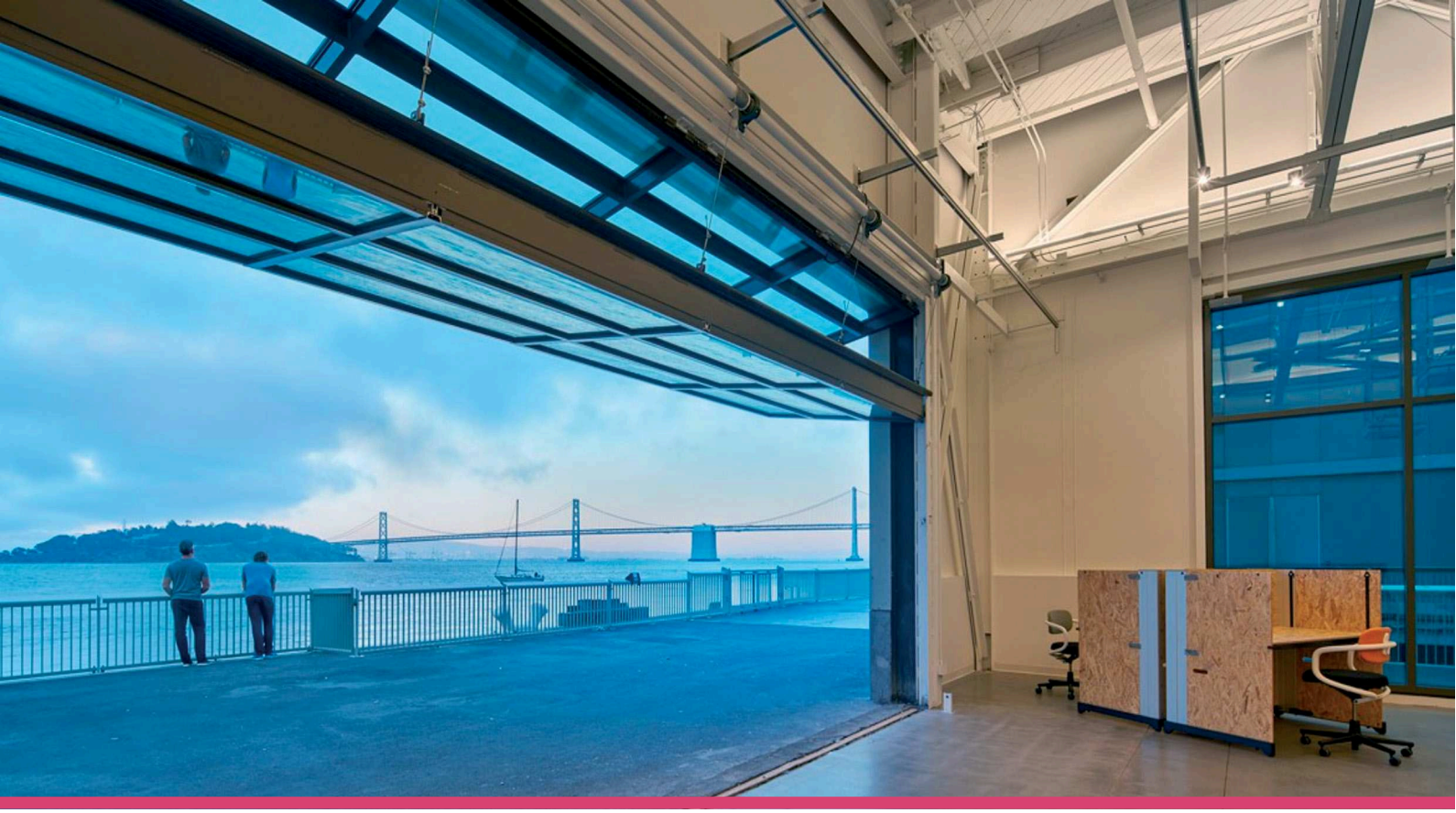
The creative economy is growing and the field of interactive technologies is leading the way. There is a wide encouragement of creative projects in universities and art colleges. However, few programs teach entrepreneurial skills that help these ideas become financially sustainable. DART 17 bridges the gap to link creative projects from Switzerland and all over the world with the right resources in the Silicon Valley.

There is a wide encouragement of creative projects in universities and art colleges. However, few programs teach entrepreneurial skills that help these ideas become financially sustainable.

DART 17 – Design, Art, Research, Technology – is an initiative from swissnex San Francisco, Swisscom, the Pro Helvetia Swiss Arts Council, Engagement Migros and Gebert Ruef Stiftung. DART 17 offers the opportunity to explore new ideas for one to three months in the Silicon Valley. Working in the heart of the international market, meeting entrepreneurs will further develop their prototypes, receive direct feedback and expand their network with technology companies, creatives and investors. DART 17 is housed on Pier 17 of San Francisco waterfront in the brand new swissnex building and shares the premises with Swiss tech startups, companies such as Nestlé, Swisscom, SwissRe and Logitech, and university representatives from the ECAL, the UniGE and EHL.

"A customized program is drawn up for each of the various projects, including preparation training, mentoring, coaching, workshops and a $5,000 grant," said Arijana Walcott **[7]** of Swisscom and cofounder of DART 17. "In addition, matchmaking and profile-enhancing events are also organized in the US. DART 17 offers participants the ideal conditions to successfully develop their projects."

"When designers, artists, researchers and technology specialists come together in an open setting, new ideas and innovations emerge," said Sophie Lamparter of swissnex San Francisco and cofounder of DART 17. "Switzerland in particular has enormous creative potential, as we've seen over the past



few years with the successes of projects and startups such as the famous VR bird simulator 'Birdly' (https://goo.gl/AnSLFZ) by Somniacs, the facial recognition technology 'Faceshift' that was acquired by Apple (https://goo.gl/xZErKs) or MindMaze (http://goo.gl/3qOpD5), a med tech start-up that combines EEG and VR and which recently became Switzerland's first unicorn."

Max Rheiner, interaction designer and Somniacs founder, believes the San Francisco location was essential to his startup success. "Showing the first 'Birdly' prototype in San Francisco two years ago had a huge impact," he said. "The media attention and positive feedback from VR industry leaders like Google, Oculus or HTC Vive motivated us to create our start-up, Somniacs, around it. Such a rapid testing would not have been possible in Switzerland."

"Swiss creatives such as VR bird simulator 'Birdly', the spatial storytelling studio Apelab (http:// goo.gl/vmMdFJ) or ArtAnim (http://goo.gl/79TFkH), who create virtual reality experiments with motion capturing, have considerably benefited from the successful partnership with swissnex San Francisco and Pro Helvetia. Thanks to the San Francisco location, the projects not only gained visibility, most also realized their enormous potential here on the US West coast. With DART 17 and the strong partners behind it, we are pursuing the same strategy that has helped write some of the greatest success stories of young Swiss creatives trying to make their mark on the future of digital technologies and immersive media" , stated Sylvain Gardel, Head of Impulse programs at Pro Helvetia.

REFERENCES

[1] DART 17, website and applications: www.dart17.com

[2] Impact Hub Bern: bern.impacthub.net/2017/01/02/dart-17-ein-testlabor-fuer-interaktive-erlebnisse-objekte-und-tools-im-silicon-valley-geht-auf-tour-de-suisse

[3] Swissnext San Francisco: www.swissnexsanfrancisco.org/initiatives/dart17/, Sophie Lamparter, sophie@swissnexsf.org

[4] Pro Helvetia: prohelvetia.ch/en, Sylvain Gardel, sgardel@prohelvetia.ch

[5] Migros' engagement, development fund: www.engagement-migros.ch/en, Sylvie Reinhard, sylvie.reinhard@mgb.ch

[6] Gebert Ruef Stiftung: www.grstiftung.ch/en.html, Pascale Vonmont, pascale.vonmont@grstiftung.ch

[7] Swisscom: Arijana Walcott, arijana.walcott@swisscom.com

hdk
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30 DESIGN CHALLENGES OF SERIOUS URBAN GAMES: INSIGHTS FROM KONG BASED "STAIR QUEST" THE HONG

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Designing serious games is always fundamentally challenging as they combine "serious" and "entertaining" goals: Which game mechanics are rewarding enough to motivate the players to engage in an applied game? **[1, 2]** "Stair Quest" game design process was accomplished by a small game design team at the Zürich University of the Arts (ZHdK) **[3, 4]** in collaboration with the research project „Hong Kong Stairs Archive" (HKSA) **[5]**. In the following we will present and discuss the impact of game-mechanical, narratological and technical aspects on the game design process.

One of the goals of "Stair Quest" was to lead to an exhibition of the HKSA in May 2017 in Hong Kong **[6]**, where a variety of artifacts and research insights on the stair culture topic would be displayed. Beside generating awareness for the exhibition, the game also aimed, from the "serious" game perspective, at inviting users to contribute to the research project with creative player content and research-related data for the +3000 stairs.

While the macro game mechanics would have the players repeatedly visit numerous stairs on Hong Kong island with their smartphones, the micro game mechanics were designated to be: adding stair related personal photos and stories, confirming/denying the existence of handrails, counting steps and defining the specific type of the 12 possible stair categories. To add a "fun" factor, we decided to allow the most frequent visitor to a certain stair to be its "Stair Master" who could name the stair. For all of these actions players would get points, allowing them to compare their individual progress with others in the leaderboard. While these parameters had been set quite easily, the motivational design was still unclear. Especially, with stairs being a mere passing-by location, certainly not an exciting place to visit at first-hand: For what reasons would players actually want to do all that?

Beside generating awareness for the exhibition, the game also aimed, from the "serious" game perspective, at inviting users to contribute to the research project with creative player content and research-related data for the +3000 stairs.

To meet these challenges, we brought in a defining mythological narrative that turned the players into "Stair Guardian". By "reviving" stairs, they would help set free the soul of the long forgotten protective dragon of Hong Kong – which had died thousands of years ago in an epic fight. Its shattered body had rained down on the city of Hong Kong, and the pieces became stairs over time (also mentioned in the trailer **[3]**).

As a second incentive we brought in a collaborative game mechanic and connected it to the level system: Even though we kept the leaderboard and the individual ranking, several players would be needed to interact on the same stair in order to complete it. Also, points (now: Dragon Dust) had

to be accumulated by a number of players in order to progress and to level up together. The game progression was – tying together narrative and game mechanics – visualized by the image of a Dragon which got puzzled together in 8 levels (8 being a happy number in Chinese culture).

Technically, building an urban game for Hong Kong also posed a number of challenges: we initially wanted to build the game as an app, but the risks involved with the slow release process on app stores as well as most users' inertia when it comes to downloading yet another app, led us to build this game as a browser application. This, in turn, brought about rather severe graphical limitations and complexity inherent to cross-browser development. In retrospect, we question whether it was the right decision to switch from an app- to a browser-centric approach.

Since the game was developed off-site, finding realistic test conditions was another challenge: Hong Kong, with its many skyscrapers and narrow streets, severely impacts the precision of GPS location services with precision dropping as low as 300m. Combined with a high stair density, in the play tests players could often not determine which stair they were visiting. Adding stair polygons to show the stair exact dimensions somewhat eased that issue.

All in all, the requirements of the research project in combination with the technical constraints posed a very challenging game design frame which we met as smartly and elegantly as possible.

REFERENCES

[1] Sicart, M., *Defining Game Mechanics*. In: Game Studies, volume 8 issue 2, December 2008. http://goo.gl/iA0dJJ

[2] Götz, U., Kocher, M., Bauer, R. et al. (2016). *Challenges for Serious Game Design. Designing the Game-Based Neurocognitive Research Software "Hotel Plastisse"*. In: De Gloria, A. & Veltkamp R. (Eds.). Games and Learning Alliance. Springer LNCS 9599, 4th International GALA Conference 2015 (Rome, Italy), pp. 323–328.

[3] http://goo.gl/3yJXXU (last retrieved April 18th, 2017). The Stair Quest design team consists of following members: Kocher M. (project lead, game design), Schmidlin S. (programmer, game design, graphics), Zeng M. (graphics). The project is funded by the Zürich University of the Arts (ZHdK), http://goo.gl/jdPvjl

[4] For previous urban game projects of the team in Hong Kong in 2016 see: www.connectingspaces.ch/projects/lab/urban-gaming

[5] Hong Kong Stairs Archive: www.stairculture.com

[6] Always at the edge of things and between places. Exhibition of the HSKA Project: http://goo.gl/FsVFTt

31 VIDEO GAME CREATION TO TEACH HISTORY

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The starting point of "Communizm" was the following: "Can I accommodate in my teaching practices two of my passions: history and video games?". Nevertheless, the aim did not consist in leaving the pupils alone in front of a computer without an appropriate frame and follow-up. Additionally some video games types did not seem adapted to school objectives. For instance, a reflex-, swiftness- and competition-based game like FPS ("First Person Shooter") will not be very useful if the teacher's intention is to propose a reflection- and analysis-centred activity to his pupils. Thus the teacher must relevantly choose, but unfortunately it is not easy to find a video game adapted to teaching history and some topics seen in class.

I faced this issue when I came to show totalitarian systems to my students. Indeed, there are lots of movies on dictatorships, inspired by reality or fictitious, but I wanted to try a new approach with a video game. As I was not satisfied with the tested games during my research, I went on with my thinking: "Can the teacher produce a video game, accessible to most of his students, compatible with the study program and working on any computer of the Vaud school even without having programming or modelling skills or any specialised software?" I decided anyway to try using what I had. I did some reading and listed the different features of totalitarian regimes: citizen surveillance, propaganda, repression, ideology prevalence in all life aspects, etc. **[1]**. I wished my pupils to identify these negative features and "experience" them through the game atmosphere and mechanics. This particular point was the one that pushed me to use a serious game. Video games and their virtual environment bring elements that a documentary or a movie do not necessarily have: non linearity, feeling of immersion and, most of all, interactivity. The student, who has the opportunity of exploring and directly interacting with this environment, can become an autonomous learning actor **[2]**, progressing at his own pace, choosing his itinerary and experimenting some situations.

Video games and their virtual environment bring elements that a documentary or a movie do not necessarily have: non linearity, feeling of immersion and, most of all, interactivity.

The method I used to realise the game was strongly empirical and needed many attempts. As I didn't have any adapted software nor time to get trained, I changed the program focus I knew, Microsoft Powerpoint, to use it as the "Communizm" base. I created this serious game to mimic the Point and Click games (e.g. "Myst" produced by Cyan Inc. Studio) because this mechanics can easily be understood and reproduced with hypertext links. A first person view, where the player discovers his environment with his character's eyes, is also a good way to strengthen identification and immersion **[3]**. Moreover, these links do not dictate a nervous or quick game rhythm and let more room to observe and explore the virtual environment. As for the contents, I wanted the pupils to be able to look up documents (books, posters, regulations) and visit many locations, like a factory, a school or a house. Finally I wanted to

CRÉATION D'UN JEU VIDÉO POUR ENSEIGNER L'HISTOIRE

add life to the different scenes composing the game by including characters, animated objects and sound effects. As I didn't have time or capacity to realise all the visual and sound elements, I had to use pre-existing internet and copyright-protected resources. Most animated characters and sceneries used in "Communizm" are screenshots or video captures from the video game "Arma II", produced by the Bohemia Interactive Studio", to which I added pictures or Google-found gif files (furniture, notices, objects, textures) whereas the videos are archive pictures taken on Youtube. However, Most of the above-mentioned elements had to be touched up: scissoring, filtering, cropping, assembling, etc. The final result is certainly a "trompe l'oeil", but both experimentations in class have shown that the pupils have considered it a game and not a disguised history textbook. Some even asked if there would be a follow-up. Unfortunately I did not have enough time to check the learning progression. Nonetheless the pooling of the discoveries by the students showed that they had identified all the features assigned to totalitarian regimes. Besides, the pupils kept totally active in the game during both 45-minute periods dedicated to this activity, without being distracted from the given task, which is encouraging. Of course, as the basic program was not adapted to such a use, the game has shown its limits and many technical or organisation problems emerged. However, "Communizm" has proven that a teacher can create something at his level with rudimentary tools.

REFERENCES

[1] Todorov, T., *Le siècle des totalitarismes*. Paris, 2010.

[2] Crinon, J. et Legros, D., *Psychologie des apprentissages et multimédia*, Paris, 2002.

[3] Natkin, S., *"Du ludo-éducatif aux jeux vidéo éducatifs", in Les Dossiers de l'Ingénierie Éducative*, 65 (3), CNDP, 2009.

ROUNDTABLE

HOW DO WE INTERACT WITH DATA-DRIVEN PLACES AND STORIES?

Data-driven forms of decision-making pose new challenges, opportunities and threats in many aspects of our daily lives. From environmental issues and other effects of the anthropocene to creative applications and digital services, can gamification empower citizens, scientists, engineers and designers? How do we ease decision-making by different stakeholders (technical and non-technical people) in increasingly complex social and spatial contexts? As we continue to roll out data-driven technologies aimed at enhancing and optimizing current structures, they might be able to tell us more about ourselves than we might be willing to admit.

Chair: Gordan Savicic
HEAD, HES-SO | Geneva

SESSIONS

A FIRST STEP TOWARDS SG FOR MSD PREVENTION, FOCUS ON ENVIRONMENT TRANSITIONS

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This project is about exploring new solutions to prevent and reduce the occurrence of Musculoskeletal Disorders (MSD). An MSD is a lesion to a muscle, articulation or the nervous system due to a repetitive work in an inappropriate position. The idea is to create a Serious Game (SG), using Virtual Reality (VR) that tracks the gestures of the player and gives feedback whenever a movement is potentially harmful or wrong.

The SG and VR motivate the user to do his exercises in a different context than his workplace. This work aims to explore virtual environment (VE) changes and their impact on the users. It has been proved that environment has an impact on stress level and that stress is strongly linked to MSDs' development.

Therefore, we choose to make the game start in a relaxing VE, that will gradually transform into his workplace. A prototype of SG has been developed in these VEs and consists in assembling robots limbs and screwing them into place.

References: pp. 17–18

VARIETAS DE BRY

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Varietas De Bry is an interactive and ludic approach to the work by Théodore de Bry, a Belgian editor and engraver from the 16th century. The purpose of the game is to have participants people discovering beautiful art work from the collection of Martin Bodmer and that has been digitalized by the Bodmer laboratory of University of Geneva.

The game metaphor is ìodd man outî. Animated engravings have been mixed together: Cannibals from Brazil are hidden in a picture from Mauritius, a polar bear ended up in Brazil, etc. The player has to travel through all the engravings and look for those anomalies. Once an intruder is found, it can be collected into an inventory. By doing so, the player uncovers and opens a way to another universe inside this Renaissance journey full of intriguing tales.

PETERPAN GAMIFIED

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haute école arc ingénierie

Hes·so

Peter Pan Gamified

Lucien Moor[1], Alain Tissot[2], François Tièche[1], Nabil Ouerhani[1]

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ABSTRACT

The Gamified app « PeterPan, a musical tale» has as an objective to extend the work of Alain Tissot (http://www.alaintissot.ch), PeterPan, which is a musical tale accompanied by an illustrated book. This extension, aimed for children from 5 to 10 years old, invite the user to play logical and musical games as an introduction into the musical world while having fun. In order to respect the didactical objective of the app, the user can discover posters containing information about instruments during the adventure. They can also play these instruments with the mixing table. Real tests have been realised in a musical school showed that the added value of the app as an extension of the musical tale in terms of motivation of the students.

BASIC IDEA

RESULTS

Four different games have been developped and tested.

The Gamified app' PeterPan, a musical tale[a] has as an objective to extend the work of Alain Tissot, www.alaintissot.ch, PeterPan, which is a musical tale accompanied by an illustrated book. This extension, aimed for children from 5 to 10 years old, invites the user to play logical and musical games as an introduction into the musical world while having fun. In order to respect the didactical objective of the app, the user can discover posters containing information about instruments during the adventure. They can also play these instruments with the mixing table.

Real tests have been realised in a musical school showed that the added value of the app as an extension of the musical tale in terms of motivation of the students.

GREAT SAM

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Great Sam is a real-life RPG. Users create quests for other users to complete them in reality. The rewards for completing quests are real. All content is user generated. All action happens in real life.

The intention is to promote social interaction and turn gamers into real-life heroes, by actually performing good deeds in reality. While using mobile technology, it drives the players to leave their screen, in order to assist one another, socialize and interact in the real world.

The game is web-based and free to play for normal players. Any user can create a quest in the platform, inviting others to complete it in reality. By completing the quest in reality, players are entitled to a prize that is tangible.The game can be used for fun or to promote a certain cause, depending on who builds the quest. The potential is immense and it is only limited by the imagination of the users.

DEADLINE

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Deadline is a hybrid game, exploring the trials and tribulations of a graphic designer. The goal is to beat the other players and finish the project before the deadline! The game is played with a set of cards and a tablet application. To advance in the game, the player has to to perform a series of required tasks.

The card game represents the professional entourage of a graphic designer. The ìSMSî cards allow the players to slow the progress of their adversaries while the ìcallî cards allow them to be blocked. Each player who is attacked can defend themselves with the inverse card of the same color.

The application plays an integral part in the game. At the beginning, a project is given to each player. The app presents the timetable and final deadline of the projects. It also allows players to select the tasks they need to perform. The application knows the progress of each player. It may not be the best strategy to take an early lead... It's up to you how you choose to play!

CROSSMOTION

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CrossMotion is a set of technologies forming a highly customized and interactive platform that provides various kind of game experiences which help improve rehabilitation of patients with disabilities. We differ in the traditional approach in the sense we work hand in hand with the therapist; studies have shown that a therapy's success is 80% made of the patient to therapist relationship thus we model our games around factual needs from the therapists.

The most important feature is that they can be adapted in real time by the therapist to better suit the patient's abilities.

ANIMATED SANDBOX AND OTHER FUN DESIGNS

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heig-vd

Animated sandbox and other fun designs

Tangible and gesture-based human-machine interaction for interactive museums and exhibitions

These fun designs take advantage of webcams to provide face recognition in a « telekinesis » table (1), wearable sensors to allow the gesture-based control of a drone (2), and Kinect cameras to allow an augmented reality experience (3,4,6) and the mirroring of the user's gestures by a humanoid robot (5). These fun designs have been exposed at the science-fiction museum Maison d'Ailleurs or during the Numerik Games festival in Yverdon, Switzerland.

(1) Telekinesis table (Stalker exhibition)

(2) Drone controlled by gestures

(3) Augmented reality game

(4) Virtual X-Ray demonstrator

(5) Mirroring of gestures

(6) Augmented reality sandbox

Design and development: J. Rebetez, H.F. Satizabal, G. Aubert, A. Cubides, D. Alvarez, E. Henchoz, and A. Perez-Uribe
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Haute Ecole Spécialisée de Suisse occidentale

This stand will present an augmented reality sandbox and a video of diverse fun designs developed by the Intelligent Data Analysis team of the HEIG-VD.

Our animated sandbox is an installation consisting of a wood box filled-up with sand, a Kinect camera and a short throw projector. The Kinect camera computes the height of the mountains and valleys, and the depth of holes in the sand. A model selects the textures that are projected over the sand, thus allowing the user to get snow on high sand mountains, water at low altitudes and vegetation in the middle. Moreover, the model uses a cellular automata to animate the vegetation and provides a day-night cycle.

We propose to also present a video of diverse fun designs including: the arcade version of the Forest Defenders game, a drone controlled by gestures (captured by worn bracelets), the kinect-based interaction of a user with an evolving virtual swarm of insects, a humanoid robot mirroring the gestures of a person, a kinect-based virtual X-ray of a person, and a ìtelekinesisî table.

MINDMOTION GO

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MindMotion GO is a virtual reality based neuro-technology platform to treat motor impairments related to stroke and other neurological disorders. Rehabilitation experts designed our games with stroke patientís needs in mind to allow them to reach their full recovery potential.

References: pp. 11–12

IOT GAMES FOR HYBRID GAMER INTERACTION

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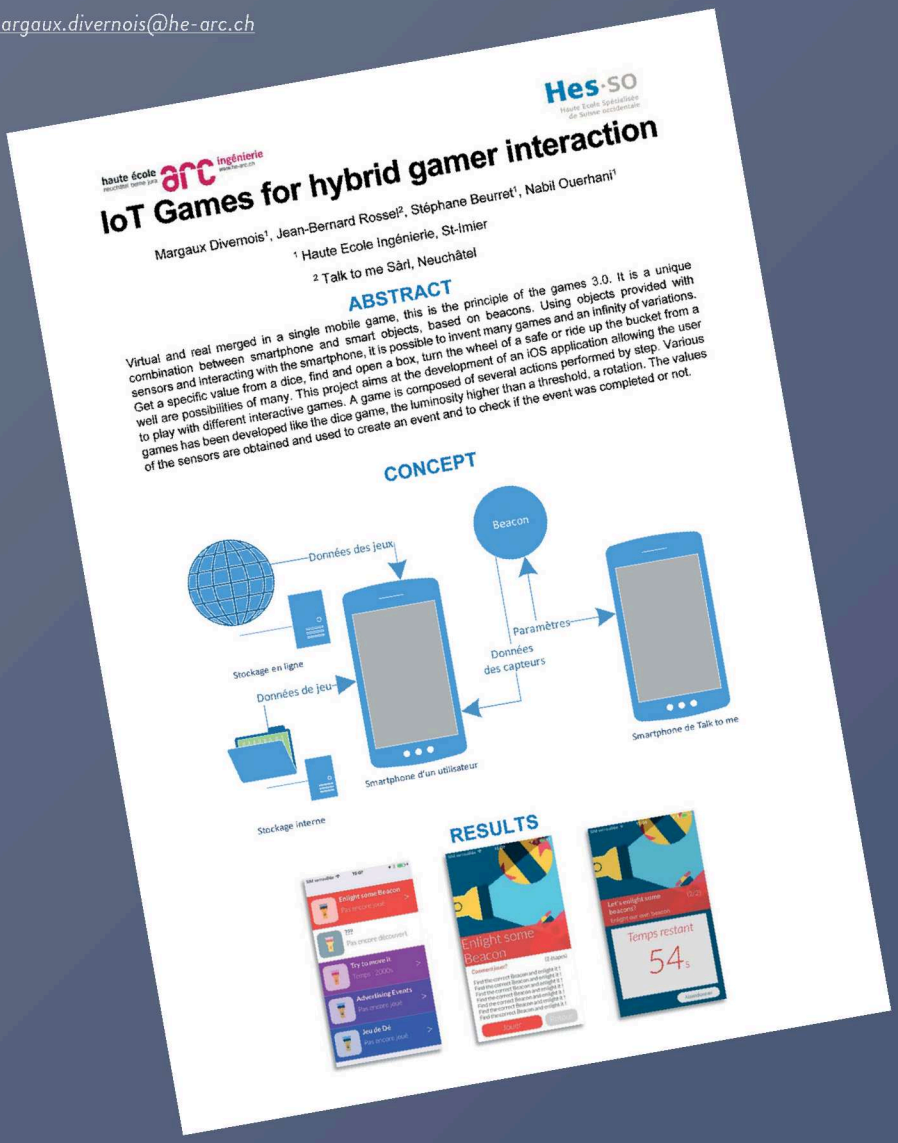

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IoT Games for hybrid gamer interaction

Margaux Divernois[1], Jean-Bernard Rossel[2], Stéphane Beurret[1], Nabil Ouerhani[1]

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ABSTRACT

Virtual and real merged in a single mobile game, this is the principle of the games 3.0. It is a unique combination between smartphone and smart objects, based on beacons. Using objects provided with sensors and interacting with the smartphone, it is possible to invent many games and an infinity of variations. Get a specific value from a dice, find and open a box, turn the wheel of a safe or ride up the bucket from a well are possibilities of many. This project aims at the development of an iOS application allowing the user to play with different interactive games. A game is composed of several actions performed by step. Various games has been developed like the dice game, the luminosity higher than a threshold, a rotation. The values of the sensors are obtained and used to create an event and to check if the event was completed or not.

CONCEPT

RESULTS

Virtual and real merged in a single mobile game, this is the principle of the games 3.0. It is a unique combination between smartphone and smart objects, based on beacons. Using objects provided with sensors and interacting with the smartphone, it is possible to invent many games and an infinity of variations. Get a specific value from a dice, find and open a box, turn the wheel of a safe or ride up the bucket from a well are possibilities of many. IoT Games 3.0 is collaboration between two Bachelorís projects, two companies ìTalk To Me SàRL and ìEM Microelectronicsî, actives respectively in the domain of digital products' development and semiconductorís manufacturing. This project is the development of an iOS application allowing the user to play with different interactive games. For this, the application get information from the advertising of the beacon or connect with it through Bluetooth Low Energy. Next to this application destined to users, another one allow to set the beaconsí parameters. A game is composed of several actions performed by step. Various games has been developed like the dice game, the luminosity higher than a threshold, a rotation. The values of the sensors are obtained and used to create an event and to check if the event was completed or not. This bachelorís thesis IoT Games 3.0 bring a new view on the multiples possibilities given from the merge of the smart objects and the games. The success of the various games, especially the dice one, allows to imagine the success of new interactive games, with or without smartphone. IoT Games 3.0, real and virtual games at once! The concept will be used for city tourism serious games.

DISCOVERING THE HISTORY OF SAINT URSANNE

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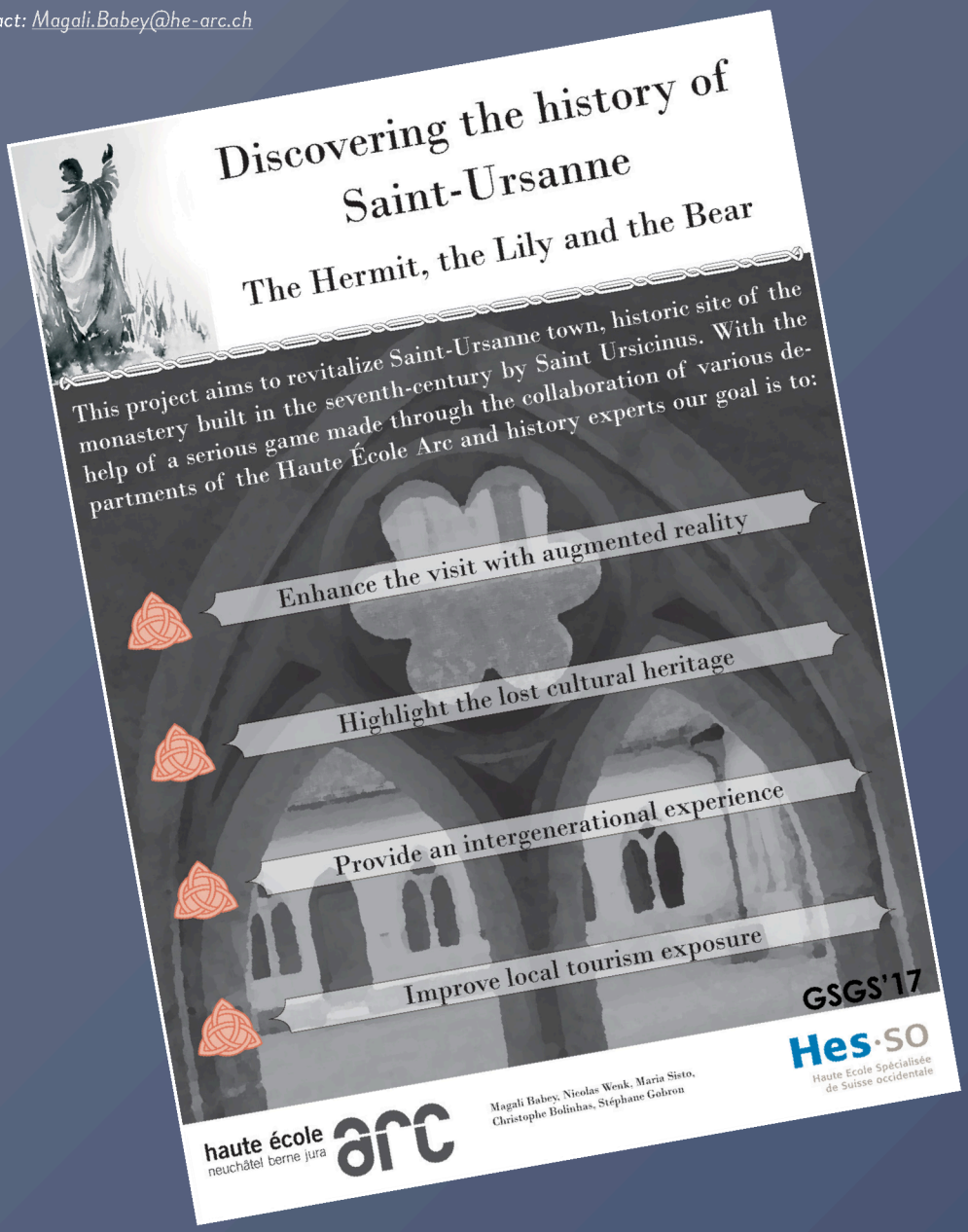

The city of Saint-Ursanne is an important piece of history in the Swiss Jura. Its medieval town with its historical and religious background makes it a remarkable place of cultural heritage. In the arrival of the 1400th death anniversary of the founder of the city Saint Ursicinus, the ecclesiastic community of Saint-Ursanne is organising a year-long celebration in 2020.

For this event, a task force is being deployed to recover the historical assets of the city and then an attracting way of exposing it to the public. In this context, the role of the HE-Arc is to create a game to introduce the historical content to the visitors of the city. Various possibilities have been explored, such as GPS exploration and virtual and augmented reality.

This lead to the prototype of a discovery game consisting of series of items in a 3D reconstruction of the cloister of the St-Pierre church which the user has to find and identify as anachronistic or not.

References: pp. 81–82

DEMODINO

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"Dinosaur Discovery" is a prototype of Serious Game allowing the discovery of the dinosaur world in a friendly and immersive environment. In this demo, you will jump right into the night of the Jurassic. Use your tablet to scan the various dinosaurs living in the scene and learn about them.

Explore the map while Pteranodons fly above your head and watch Triceratops rest under a tree. Use your flashlight to see through the night and gain points as you discover new species. Will you find them all and know everything about those prehistorical animals?

DEMOCRAPCY

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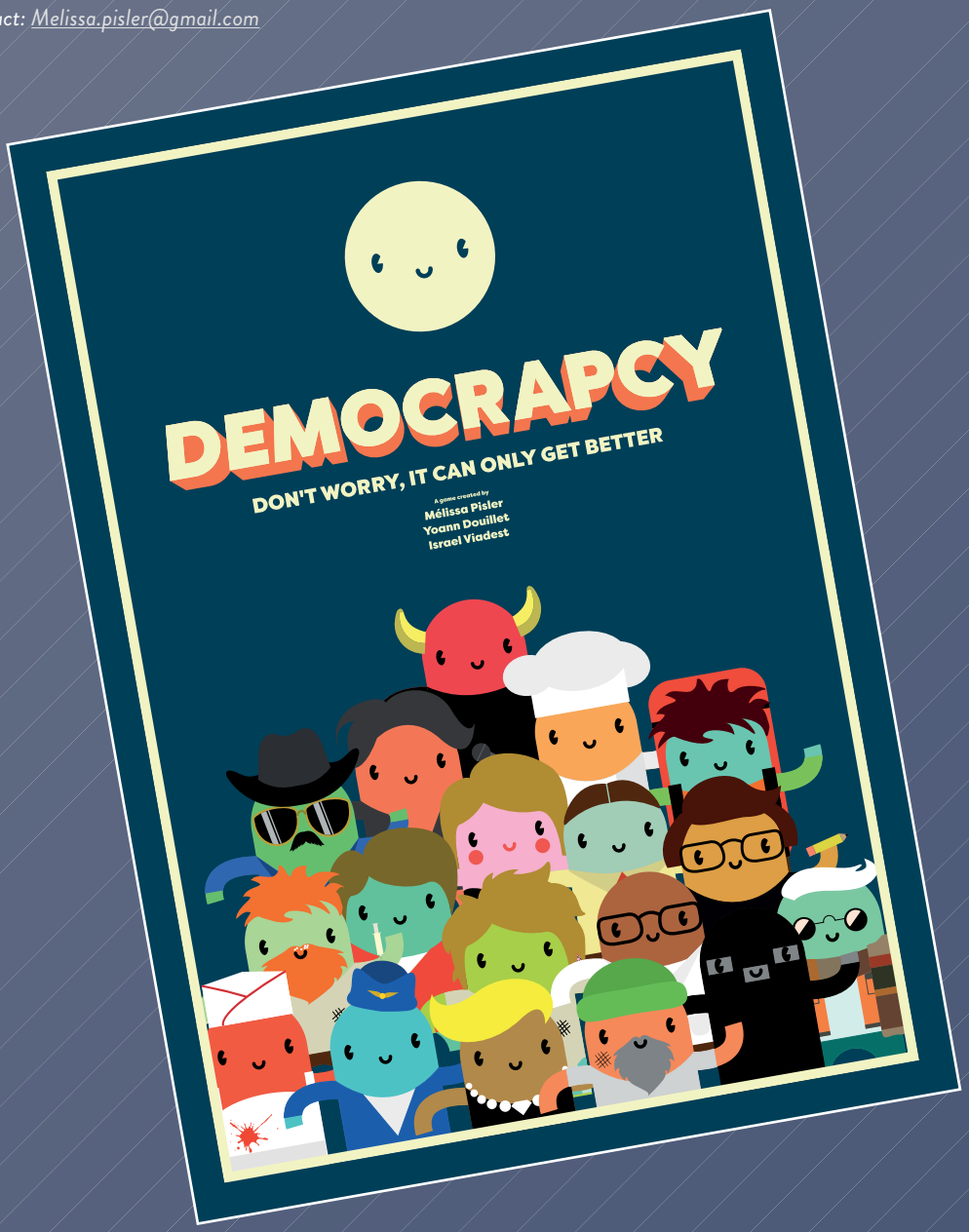

Democrapcy is a board game that parodies with humour the modern democratic system. The goal being to explore and question citizen's roles and responsibilities by giving them the possibility to vote during the game with the intention of transforming the game's rules for their advantage and/or for disadvantage the others.

Democrapcy combines competitive and collaborative mechanics, the players should cooperate with each otherto progress, having in mind that there could only be one winner.

MASSIVE, A GAME OF FOUR FORCES

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In the world of today, particle physics is reserved to the elite. It is one of the fields that is hardest to understand. Little is done to make it more achievable. Most people get lost in the alien-like scribbles and the abstract math. And every textbook risks losing the reader after the first few pages. So what can be done to counter this problem?

Games are proven to be great learning tools and provide great fun in the process. This is why I created Massive, a game of four forces. Massive is a particle science-based card game. It gives the player knowledge on the most fundamental aspects of our universe: the particles, and how they interact with one another.

The aim is simple: own the atom with the most mass and you win the game! To get to this goal, you build, attack and defend against other players using fundamental particles such as quarks, gluons, photons and more. But beware of the scientific phenomena that come and disturb a game like cosmic rays, black holes, gravity and more.

MAIN SPEAKERS
& THEIR RESPECTIVE SESSION

Andres Perez Uribe
Politics, Ecology & Economy

Antoine Widmer
Education

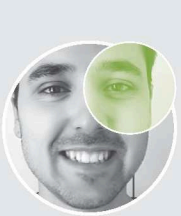
Anna-Lisa Martin-Niedecken
Training

Adam Lobel
Health

Bjorn Berg Marklund
International invited guest

Christophe Bolinhas
Art & Cultural Inheritance

Bastien Presset
Health



Gaetan Sechaud
Special Student

Florence Quinche
Social

Vera Bustomante
Chair Health

Denise Sutter Widmer
Education

Francesco Termine
Social

Jessica Friedling
Special Student

Gerald Chambon
Politics, Ecology & Economy

James Wootton
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Joris Beerda
Business Expertise

Gordan Savicic
Chair Art & Cultural Inheritance

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Maria Sisto
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GSGS'17 manager

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Shaban Shaame
Chair Business Expertise

Patrick Donaldson
Special Student

Philomena Schwab
Business Expertise

Michelle Widmer
Art & Cultural Inheritance

Sidney Bovet
Training

Olivier Reutenauer
Business Expertise

Stefano Carrino
Social

Pierre Bratschi
International invited guest

Sandy Ingram
Chair Training

Thomas Strgar
Health

Jean-Pierre Tabin
Chair Social

Valerie Pierrehumbert
Business Expertise

Remi Schaffter
Art & Cultural Inheritance

Rubén Riestra
International invited guest

Sylvain Cardin
Health

Willi Bernhard
Training

Vincent Bourquin
Politics, Ecology & Economy

MANY THANKS TO

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STRAY FAWN studio

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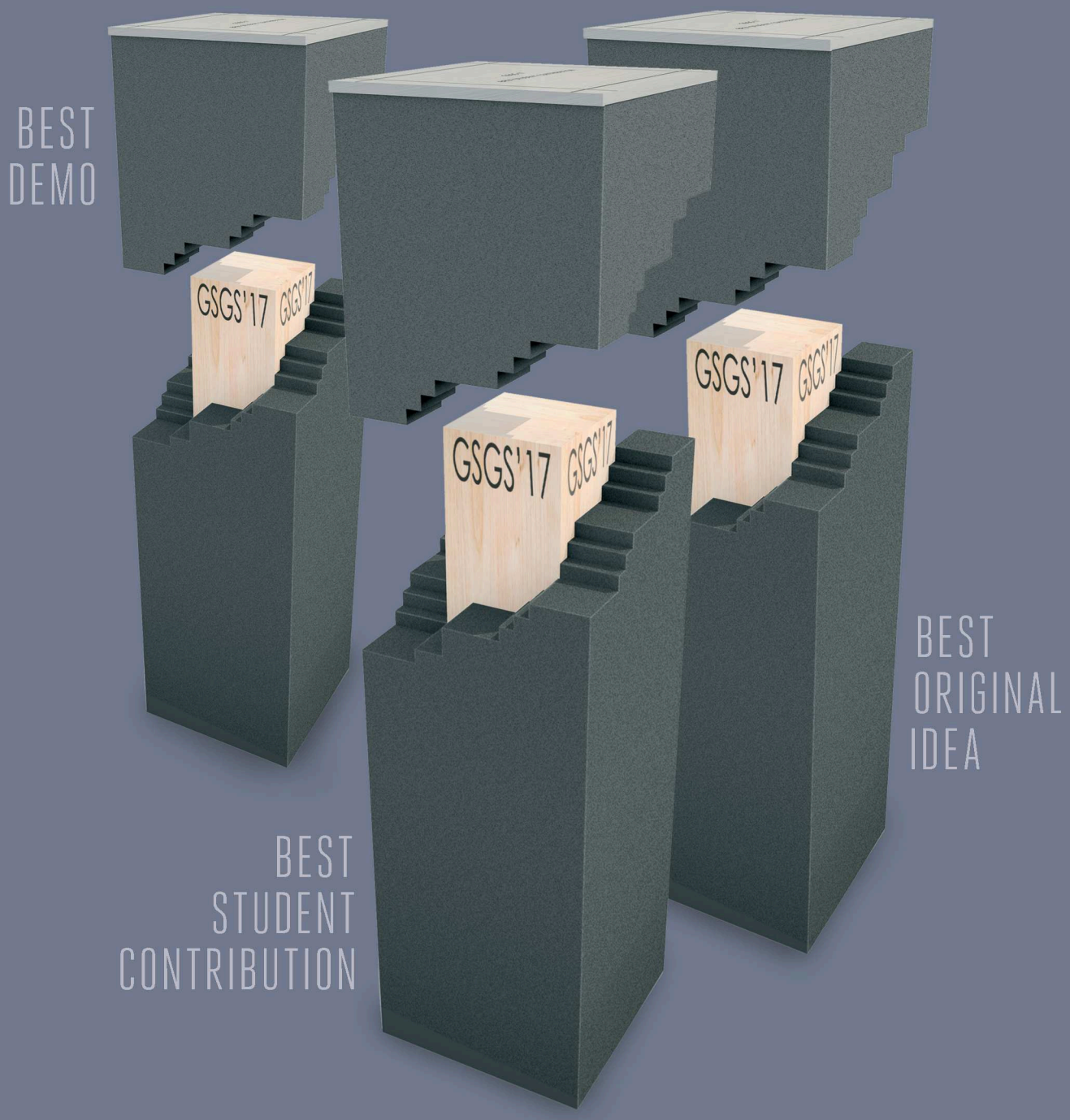

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