Industrial Applied Data Science
18-19 October 2018
Lugano @SUPSI – Palazzo dei Congressi
www.ftal-conference.net

Real-Time Detection of Micro-Expressions through New Feature Selection for Helping Doctors to Know Their Patients

Topic: Life Sciences and Healthcare

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Abstract

Through time, face, facial expressions and micro expressions detection has been evolving. Many studies have been made to reach a high accuracy software where people can rely on. Still until now we do not have a proper tool that can help this detection. In this paper, we show a new way for feature extraction in the aim of improving the emotional state where we take the difference between the points detecting the face and the difference between the frames over the time. A neural network has been used for the machine learning to detect the emotion.

1. Introduction

Nowadays with the technology evolving and the world moving towards the usage of machines and electronic devices, the mentality of the people is changing. Many doctors tried to understand their patients while working with them. Specifically speaking with psychologists, they might have the hardest problems with the communication with their patients. Even though humans can recognise what others are trying to express, yet some hidden emotions can be so hard to understand. Yet these hidden emotions create some involuntary facial micro expressions; but these micro expressions have major issues. Micro expressions are short and fast. Many studies and papers introduced many ways to detect micro expressions but not so many have studied the feature extraction. In this paper, we propose a feature selection that will help to achieve promising results.

2. Related work

In this section, we present already existing micro expression detection and feature selection systems. The most used approach is the local binary pattern from three orthogonal planes (LBP-TOP) where the usage of a threshold for neighbourhood of each pixel transformed into binary as in Guo in 2014 [1],Huang 2015[2]. We have other studies where they use the division of the face into regions of interest ROI, where some of them used the 3D gradient descriptor as Polikovsky did in 2009[3] or the Spatio Temporal Local Texture Descriptors SLTD, with Multiple Kernel Learning MKL classification, Pfister 2011[4]. All these studies been made but micro expressions are involuntary and rapid, thus we are working with sensitive data, which means binary transformation can be delicate because it is sensitive to noise thus a small change or a bad calculation can lead to high error rates. As well for the region division where while taking different part of the

face some border can be important and not taken into consideration. Providing long histograms slows down the recognition speed especially on large-scale face database, which makes it hard to analyse and synthetize the result of the emotion felt or expressed during a 1/25 seconds.

3. Proposed Method

We need to be more realistic and efficient without losing any precision of the face. We need fast processing to make it a real-time application, thus the calculation of the changes in the face known as the action units AUs have to be fast. We use 68 points face detection algorithm [5] for each frame of a video, that detects the eyes, eyebrows, nose, mouth and jawline. Then for each AU difference between the points related to it is calculated over a single a frame and through the video flux frames, the calculation is a normal Euclidian distance over the x and y coordinates. On this point, we have calculated the difference we need to detect the emotions expressed. We are working with the CASME II database to do our tests. Afterwards after finding all the distances needed, a machine-learning algorithm implemented over the data we have, we are using Neural Network to cluster our data. Our contribution is reaching around 60-70% accuracy.

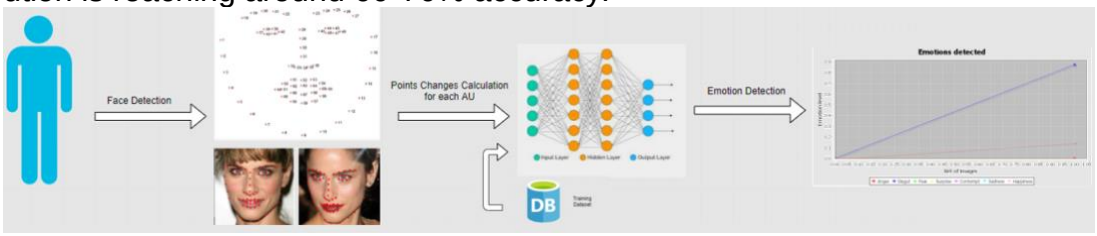

Figure 1 : Micro Expression System Contribution

4. Conclusion

In this paper, we have shown that the presented contribution shows a new way for feature selection. This feature selection have advantages as being fast to be processed, second it do not lose any face details since it takes the whole face into consideration. Moreover, we can see the changes happening in the hidden emotion of humans, which will be a solution for the doctors to be able to understand their patients. As for future work, on this algorithm we still have many concepts to add, by adding the number of points of the face detection. Trying different machine learning algorithms. Calculation of the changes over the curves instead of point that might be more accurate.

5. References

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