Maestría en Ingeniería en Sistemas y Computo Inteligente

Title

System of artificial vision for facial emotion recognition

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1. Introduction

Emotions play an important role in human communications and have a great importance on perception and decision making. Within interpersonal communication emotion recognition is present in 93% according to (Ratliff & Patterson, 2008). An emotion is linked to a facial expression to Paul Ekma, He established a list of six basic emotions from a cross-cultural study in Papua New Guinea, these are happiness, anger, fear, sadness, surprise and disgust.

For human-computer interfaces, it is important to perform tests in order to know what is the expectation of the user with respect to the software.

2. Objectives

General Objective

- Creating a system for emotion recognition that supports evidence of design information, using computer vision and machine learning

Specific Objectives

1. To Build an interface that allows to manage the prototype of the emotions recognition system
2. To characterize facial images using the methods of LBP and Gabor Wavelets to assess their performance in automatic recognition
3. To evaluate three machine learning methods for emotion recognition

3. Method

- Creating a set of images with different facial expressions
- Implementation of face recognition and feature extraction with PCA, LBP and Gabor Wavelets
- Creating .arff files type to use Weka
- Implementation of machine learning methods such as SVM, ANN and K-nearest neighbors
- Development of interface manipulation of the system

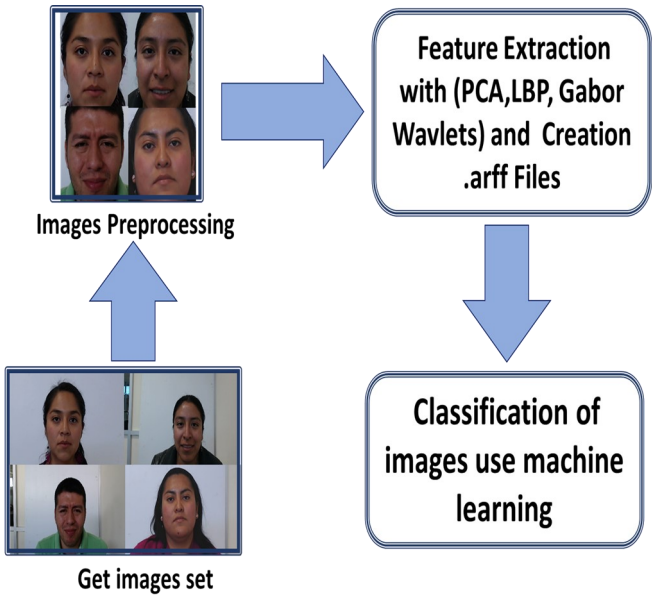

Figure 1. General Methodology for testing techniques of characterization and machine learning.

Figure2. Reconstruction of images using principal component analysis, and local binary patterns

4. Results

In order to evaluate the methods for the characterization and classification, we create a set of 218 images, divided into 109 images with neutral expressions and 109 images with facial expressions (happiness, anger, disgust). The results for experimenting with methods of classification (K-nearest neighbors, SVM, AAN) using PCA and LBP can be observed in figures 3 and 4. PCA were used 43 principal components and LBP management 256 features.

For the experimentation with PCA classification method that best performance was obtained using ANN, with 76% accuracy, as well as, In experimenting with LBP, the machine learning method with best performance was SVM with 69.91% of accuracy.

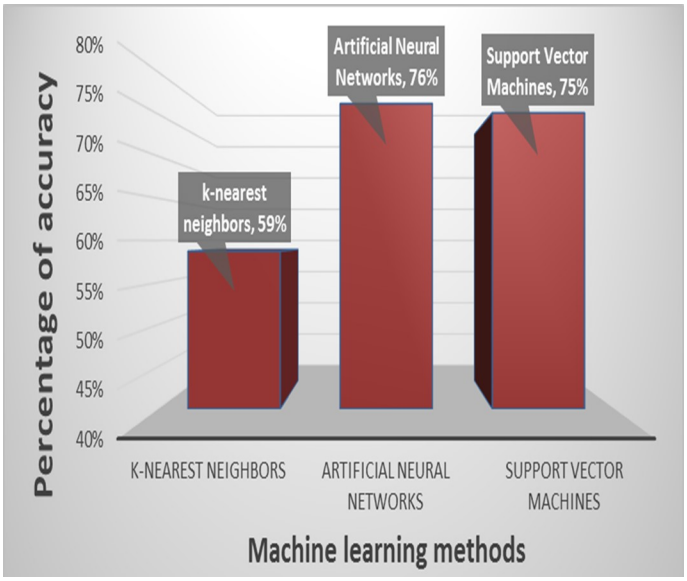

Figure 3. Experimenting with PCA using 43 principal components for classification of facial expressions implementing SVM, K-nearest neighbors and ANN

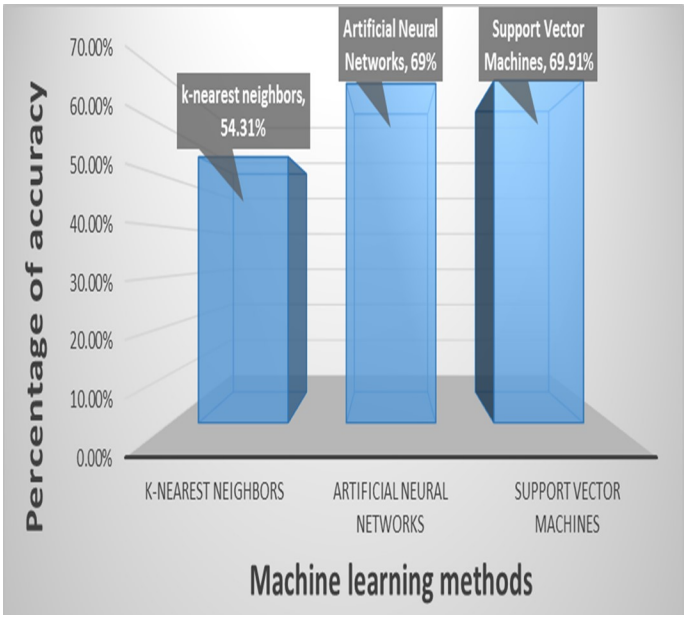

Figure 4. Rseults of experiments using LBP as a method of characterizing and applying machine learning algorithms (SVM, k-nearest neighbors and ANN)

In the figure 5. We can see the interface of the prototype. This developed in C ++ under Qt-creator platform and OpenCV libraries. This prototype is in the initial part and is configured to recognize happy expressions

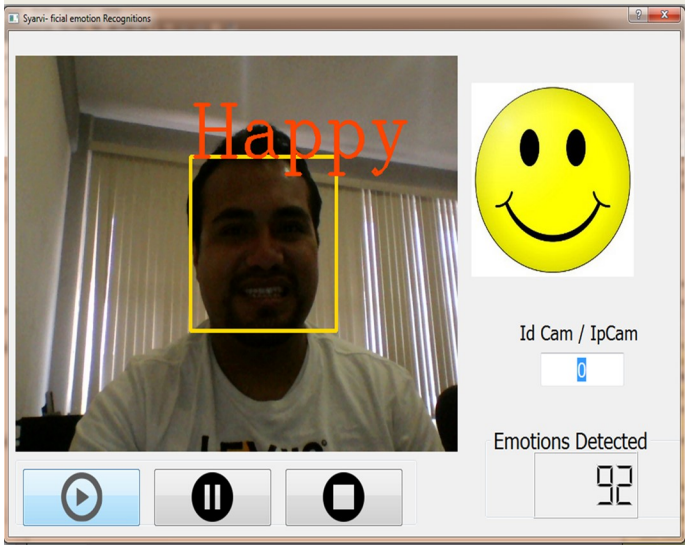

Figure 5. Administration interface of the prototype developed in QT-creator with OpenCV libraries

5. Conclusion

Preliminary results have shown that the best machine learning methods for emotion recognition are ANN and SVM, with 76% using PCA and 69.91% using SVM. We can also observe that the method of k-nearest neighbors in all experiments obtained the lowest scores, with 59% with PCA and 54.31% with LBP.

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