Face Tracking: An approach for face identification, recognition and tracking for low-cost environments

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Abstract. *Applicable facial identification and recognition are great trends nowadays, representing a powerful tool needed in various application domains. Its use varies from authentication purposes, business intelligence, emotion recognition, and security services. For this last one, a very desirable application is the use of several cameras geographically sparse, where specific individuals can be recognized for crowded environments. This paper proposes the use of face recognition and identification to help in the development of a low-cost tool. A dataset with several face photos was built to simulate our experimental environment. The obtained preliminary results demonstrate the feasibility of the proposed approach for security applications.*

1.Introduction

Facial recognition is a technique for identifying and recognizing people in images and videos. Through the processing of images and the study of computational vision, it is possible to determine the location of several faces, compare them against datasets, and identify people, even in the presence of crowded environments [1]. The primary studies date from the 1960s, where faces were used extremely for simple measurements, in which any change of parameters interfered with their operation. Currently, some research attempts to solve the aforementioned problems over the literature. In [2] an approach was developed for the identification of facial markings for face recognition. In this study the authors proposed facial marks for improving face recognition, as well as new methods and algorithms to optimize face detection by facial mark patterns. In [3] another approach for facial recognition based on invariant features was proposed. This work uses the facial features, like eyes, nose and mouth, facial texture and skin color. In [4] a different approach is described, where the traditional Viola-Jones method was used for face recognition. In this paper we present the preliminary results of a face recognition application, specifically designed for face matching and recognition of specific individuals for security environments regarding a low-cost application.

2. Proposed Approach

The proposed approach for face recognition uses the Dlib Library combined with the well-know OpenCV library. Dlib is library that contain machine learning algorithm and tools, that help in the creation of complex software for solving real world problems.
OpenCV is a Open Source Computer Vision Library specifically designed for digital image processing, pattern recognition and computer vision algorithms. It is widely used

for object detection, patterns detection, image matching and security application. Our computational approach for face recognition uses the aforementioned libraries in a combined manner, according to the following computational pipeline:

A database of faces was generated from the collection of photographs of volunteers in our university laboratory. Fifteen JPEG-formatted photos were gathered in the projetc's source dataset directory;

• An application implemented in the Python Programming Language loads the images into the database. Faces features are extracted using the method of Histogram of Oriented Gradients (HoG), and only metadata information corresponding to the feature vector is stored for comparison purposes;

• For each frame, which in our experiment was captured from a HP Webcam HD- 4110 - autofocus widescreen Full Hd 1080P (1920x1080) color depth 24 bit true color focus. A two-step procedure was used: (i) face is localized in the image using the aforementioned HOG method; (ii) for each face, face features method extracts relevant information for matching with the previously stored faces;

• Final step is the recovering information for the known faces.

3. Preliminary Results

The preliminary obtained results for face recognition and identification can be visualized in the Figure 1. Face localization on the scene is very effective, as shown in the results presented at the left and right sides, respectively. For each face, a yellow box is placed around the localized face, associated with its corresponding label/name at the bottom side of the box. Additional video of our approach can be find online[1]

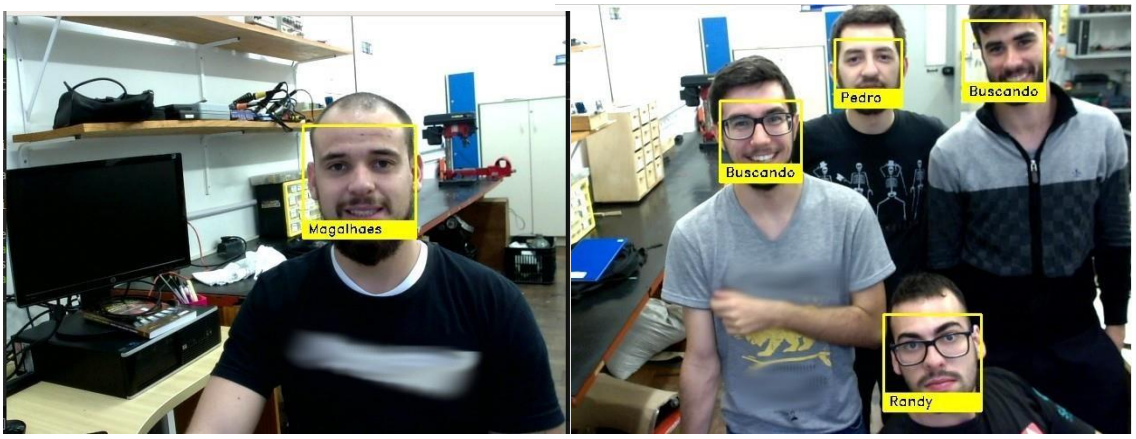

Figure 1. Preliminary experimental results obtained by the proposed face recognition approach

Experiments were executed on a regular laptop (Dell Intel I7, 4GB), with no graphics card support (GPGPU). We used the aforementioned Webcam to grab the scene and detected the faces, recovering its labels effectively almost in realtime.

4. Final Remarks

This abstract paper demonstrated the obtained preliminary results of a face recognition system for security applications using a low-cost environment. Besides preliminary, precision is acceptable demonstrating the proposed approach is able to be used as real application for security purposes in indoor environments. The further works must

1 https://drive.google.com/file/d/1MnTSX-XQO2LzvN-ctuDs3Ga2Zk8toTvt/view

include a large dataset to verify the feasibility and robustness of the presented approach, as well as test its scalability for a set of several cameras running simultaneously.

References

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