CMPE 450/490 Capstone Design Project

Facial Recognition

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Overview

This facial recognition system searches a video stream for a recognizable face and presents the user with the picture containing the face. It is designed to be extremely compatible with existing hardware, working with any camera with composite video out and presenting its interface to any web-capable device via the device's on-board web server.

The System also keeps an database of faces and names. Each time a face is found, the database is searched and if a matching name is found, it is displayed to the user.

If no matching name is found, the user is prompted to enter one, which will be saved in the database for future recognition.

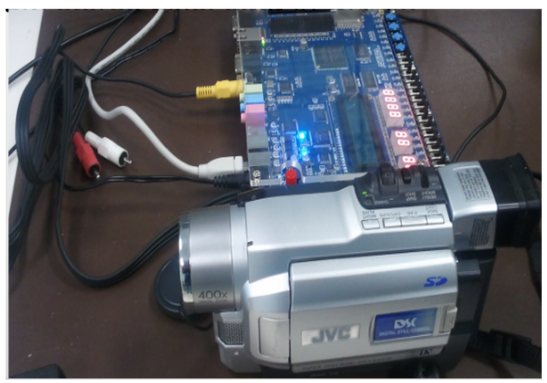

Fig. 1 The Facial recognition system

Facial Recognition

The facial recognition is done with the OpenCV open source facial recognition algorithm. It scans an image for facial feature markers, such as the eyes, the tip of the nose and the center of the mouth.

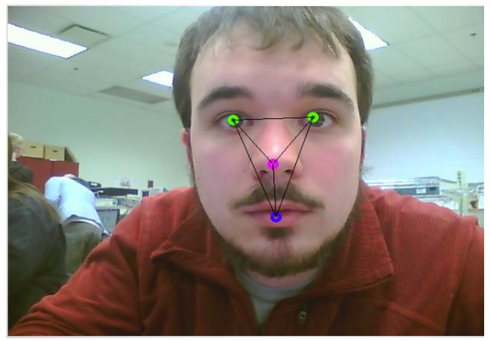

Fig 2. A face that has been recognized

Video Monitoring

The device extracts images from the connected video camera. This involves a conversion from an analog YPbPr signal to a digital YCbCr signal, and finally to both a 16-bit RGB color image and a 8-bit greyscale image.

The RGB image is converted to Bitmap format so it can be displayed in the interface. The greyscale image is used by the facial recognition algorithm

Fig 3: Color and Greyscale Image

Web Based Interface

In the interest of compatibility, the system uses a web-based interface. The device connects to a network via the on-board Ethernet connection, and the device can be monitored from any Javascript-enabled web browsing device, such as a computer, tablet or smart phone.

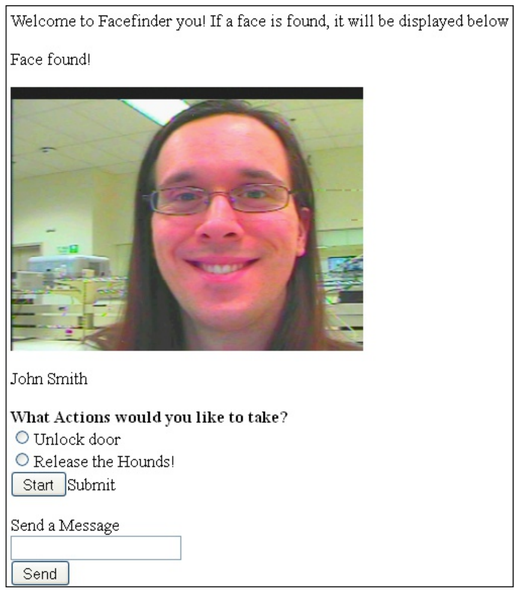

Fig 3: Example of Web Page Interface

The interface is a simple web-page that automatically updates when the device recognizes a face. The image with the face is then displayed in the website, along with the name (if found), and a list of actions the user can perform in response. These include the ability to send a message to be displayed on the board, such as a greeting.

If the name of the person is not found, the user is prompted to enter and submit it to the web-page. The name and face will then be stored in the device's database.

Face-Name Database

Facial feature measurements and names are saved on the board. These measurements are: eye to eye, left eye to nose, right eye to nose, left eye to mouth, right eye to mouth, and nose to mouth.

All measurements are proportional to the distance between the eyes, giving the device the ability to recognize a face at a wide range of distances from the camera.

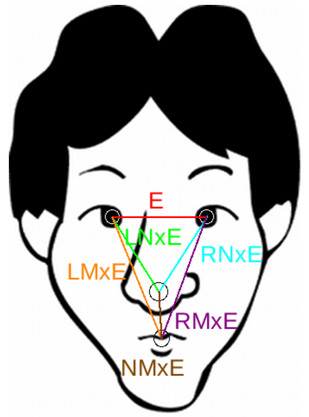

Fig 4: Relative Facial Measurements

Motivation

We wanted to experiment with facial recognition, as well as expand our understanding of web-based services and image processing.

This device can be used as either an automatic doorbell system or as a person-identification system in a low security environment.