Abstract

Convectional method of identification based on the possession of ID cards or exclusive knowledge like a social security number or a password are not all together reliable. ID cards can be lost forged or misplaced; password can be forgotten or compromised. But a face is undeniably connected to its owner. It cannot be borrowed stolen or easily forged. Face recognition technology may solve this problem since a face is undeniably connected to its owner expect in case of identical twins. The system can then compare scans to records stored in a central or local database or even on a smart card. The software first captures an image of all the authorized persons and stores the information into the database. The system then stores the information into the database.

Face recognition has received significant attention because of its numerous application in access control, law enforcement, security, surveillance, Internet communication and computer entertainment. Although significant progress has been made, the state-of-the-art face recognition system held satisfactory performance only under controlled scenarios and they degrade significantly when confronted with real-world scenarios.

Introduction

In recent years, biometric-based techniques have emerged as the most promising options for recognising individuals. These techniques examine an individual's physiological and behavioural characteristics in order to determine and ascertain their identity instead of authenticating people and granting them access to physical domains by using password, PINs, smart cards, tokens or keys.

The information age is quickly revolutionizing the way transaction are completed. Every day action are increasingly being handled electronically, instead of with pencil and paper or face to face.

This growth in electronic transaction has resulted in great demand for fast and accurate user identification and authentication. Access codes for buildings, banks accounts and computer system often use pins for identification and security clearances. Using the proper PIN gains access, but the user of the PIN is not verified. When credit and ATM cards are lost or stolen, an unauthorized user can often can come up with the correct personal codes. Despite warnings, many people continue to choose easily guessed PINs and passwords: birthday, phone number and social security numbers. Recent cases of identity theft have heighten the needs for method to prove that someone is truly who he/she claims to be. Face recognition technology may solve this problem since a face is undeniably connected to its owner expect in the case of identical twins.

Face recognition is one of the least intrusive and fastest biometrics compared with other techniques such as fingerprints and iris recognition. For example, in surveillance systems, instead of requiring people to place their hands on a reader (fingerprinting) or precisely position their eyes in front of a scanner(iris recognition), face recognition systems unobtrusively take pictures of people’s faces as they enter in a defined areas. There is no intrusion or capture delay, and in most cases, the subjects are entirely unaware of the process. People do not necessarily feel under surveillance or their privacy being invaded.

Application of Face Recognition

Many published works mention numerous application in which face recognition is already utilised including entry and egress to secured high-risk spaces such as border crossings, military bases and nuclear power plants, as well as access to restricted resources like computers, networks, personal devices, banking transactions, trading terminals and medical records. On the other hand, there are other application areas in which face recognition has not yet been used; furthermore, the current commercial markets have so far only scratched the surface of the potential. The potential application areas of face recognition technology can be outlined as follows:

- Automated surveillance, where the objective is to recognise and track people who are on a watch list. In this open world application, the system is tasked to recognise a small set of people while rejecting everyone else as being one of the wanted people.

- Monitoring closed circuit television (CCTV) the facial recognition capability can be embedded into existing CCTV networks, to look for known criminals or drug offenders, then, authorities can be notified when one is located. In other word, if the face recognition system is employed, it can alert authorities to the presence of unknown or suspected terrorists or criminals whose images are already enrolled in a gallery. Moreover, it can be used for tracking down lost children or other missing persons.

- Image database investigation, searching image database of licensed drivers, benefit recipients, immigrants and police booking, and finding people in large news photograph and video collection, as well as searching in the face book social networking website.

- Sketch-based face reconstruction, where law enforcement agencies in the world rely on practical methods to help crime witnesses reconstruct likenesses of faces. These methods range from sketch artistry to proprietary computerised composite system.

- Forensic application, where a forensic artist is often used to work with the eyewitness in order to draw a sketch that depicts the facial appearance of the culprit according to his/her verbal description.

- Airplane -boarding gate, the face recognition may be used in places of random checks merely the screen passengers for further investigation.

Problems and Objectives

Problem:

The problem of face recognition can be stated as follows: Face Recognition human facial features like the mouth, nose and eyes in a full frontal face image. We will be adapting a multi-step process in order to achieve the goal. To detect eye face region we will be using a skin-color segmentation method. Morphological techniques will be adapted to fill the holes that will be created after segmentation processes. From the skeletonization processes, a skeleton of the face will be obtained from which face contour points could be extracted. We will be using opencv platform to recognize the face. Firstly, it will take the sample of the face and convert into gray image and train itself to match the face in the real world scenario. We will use several different facial- images to test our methods.

Objectives:

a. Trying to find a face within a large database of faces. In this approach the system returns a possible list of faces from the database. The most useful applications contains crowd surveillance, video content indexing, personal identification (example: driver license), mug shot matching etc.

b. Real time face recognition: Here, face recognition is used to identify a person on the spot and grant access to a building or a compound, thus avoiding security hassles. In this case the face is compared against a multiple training samples of a person.

Advantages and disadvantages

Advantage:

a. This software can be used for security purposes in organization and in secured zones.

b. The software stores the faces that are detected and automatically marks attendance.

c. The system is convenient and secure for the users.

d. It saves their time and effort.

Disadvantages:

a. The system don't recognize face properly in poor light, which needs higher version of camera including night mode infrared.

b. It can only detect face from a limited distance max (1m).

Hardware requirement

Raspberry pi 3:

The Raspberry pi is a series of small single-board computers developed in the United Kingdom by the Raspberry Pi Foundation to promote teaching of basic computer science in schools and in developing countries. The original model became far more popular than anticipated, selling outside its target market for uses such as robotics. It does not include peripherals (such as keyboards and mice) and cases. However, some accessories have been included in several official and unofficial bundles. The organisation behind the Raspberry Pi consists of two arms. The first two models were developed by the Raspberry Pi Foundation. After the Pi Model B was released, the Foundation set up Raspberry Pi Trading, with Eben Upton as CEO, to develop the third model, the B+. Raspberry Pi Trading is responsible for developing the technology while the Foundation is an educational charity to promote the teaching of basic computer science in schools and in developing countries.

Computer	A Raspberry Pi
Storage	SD Card and a SD card reader to image the OS [These days laptops have inbuilt card readers]
Power supply	5 volt micro USB adapter, mostly your android phone charger would work
Display	An TV/Monitor with DVI or HDMI port
Display connector	HDMI cable or HDMI to DVI converter cable
Input	USB Mouse
Input	USB Keyboard

Camera:

In order to meet the increasing need of Raspberry Pi compatible camera modules. The ArduCAM team now released a revision C add-on camera module for Raspberry Pi which is fully compatible with official one. It optimizes the optical performance than the previous Pi cameras, and give user a much clear and sharp image. It attaches to Raspberry Pi by way of one of the two small sockets on the board upper surface. This interface uses the dedicated CSI interface, which was designed especially for interfacing to cameras. The CSI bus is capable of extremely high data rates, and it exclusively carries pixel data. The camera is supported in the latest version of Raspbian, Raspberry Pi's preferred operating system. The board itself is tiny, at around 36mm x 36mm. The highlight of our module is that the Lens is replaceable compared to official one, making it perfect for mobile or other applications where size and image quality are important. It connects to Raspberry Pi by way of a short ribbon cable. The camera is connected to the BCM2835/BCM2836 processor on the Pi via the CSI bus, a higher bandwidth link which carries pixel data from the camera back to the processor. This bus travels along the ribbon cable that attaches the camera board to the Pi.

Software requirement

Opencv3:

OpenCV (Open Source Computer Vision Library) is released under a BSD license and hence it's free for both academic and commercial use. It has C++, Python and Java interfaces and supports Windows, Linux, Mac OS, iOS and Android. OpenCV was designed for computational efficiency and with a strong focus on real-time applications. Written in optimized C/C++, the library can take advantage of multi-core processing. Enabled with OpenCL, it can take advantage of the hardware acceleration of the underlying heterogeneous compute platform.

Adopted all around the world, OpenCV has more than 47 thousand people of user community and estimated number of downloads exceeding 14 million. Usage ranges from interactive art, to mines inspection, stitching maps on the web or through advanced robotics.

Python 3 IDE (spyder):

Spyder is a powerful scientific environment written in Python, for Python, and designed by and for scientists, engineers and data analysts. It offers a unique combination of the advanced editing, analysis, debugging, and profiling functionality of a comprehensive development tool with the data exploration, interactive execution, deep inspection, and beautiful visualization capabilities of a scientific package.

Beyond its many built-in features, its abilities can be extended even further via its plugin system and API. Furthermore, Spyder can also be used as a PyQt5 extension library, allowing developers to build upon its functionality and embed its components, such as the interactive console, in their own PyQt software. Spyder is an open source cross-platform integrated development environment (IDE) for scientific programming in the Python language. Spyder integrates with a number of prominent packages in the scientific Python stack, including NumPy, SciPy, Matplotlib, pandas, IPython, SymPy and Cython, as well as other open source software. It is released under the MIT license.

Phpmyadmin:

PhpMyAdmin is a free software tool written in PHP, intended to handle the administration of MySQL over the Web. PhpMyAdmin supports a wide range of operations on MySQL and Maria DB. Frequently used operations (managing databases, tables, columns, relations, indexes, users, permissions, etc) can be performed via the user interface, while you still have the ability to directly execute any SQL statement.
To ease usage to a wide range of people, phpMyAdmin is being translated into 72 languages and supports both LTR and RTL languages. PhpMyAdmin is a mature project with a stable and flexible code base; you can find out more about the project and its history and the awards it earned. The phpMyAdmin project is a member of Software Freedom Conservancy. SFC is a not-for-profit organization that helps promote, improve, develop, and defend Free, Libre, and Open Source Software (FLOSS) projects.

Linux Environment (Raspbian):

Raspbian is a free operating system based on Debian optimized for the Raspberry Pi hardware. An operating system is the set of basic programs and utilities that make your Raspberry Pi run. However, Raspbian provides more than a pure OS: it comes with over 35,000 packages, pre-compiled software bundled in a nice format for easy installation on your Raspberry Pi.

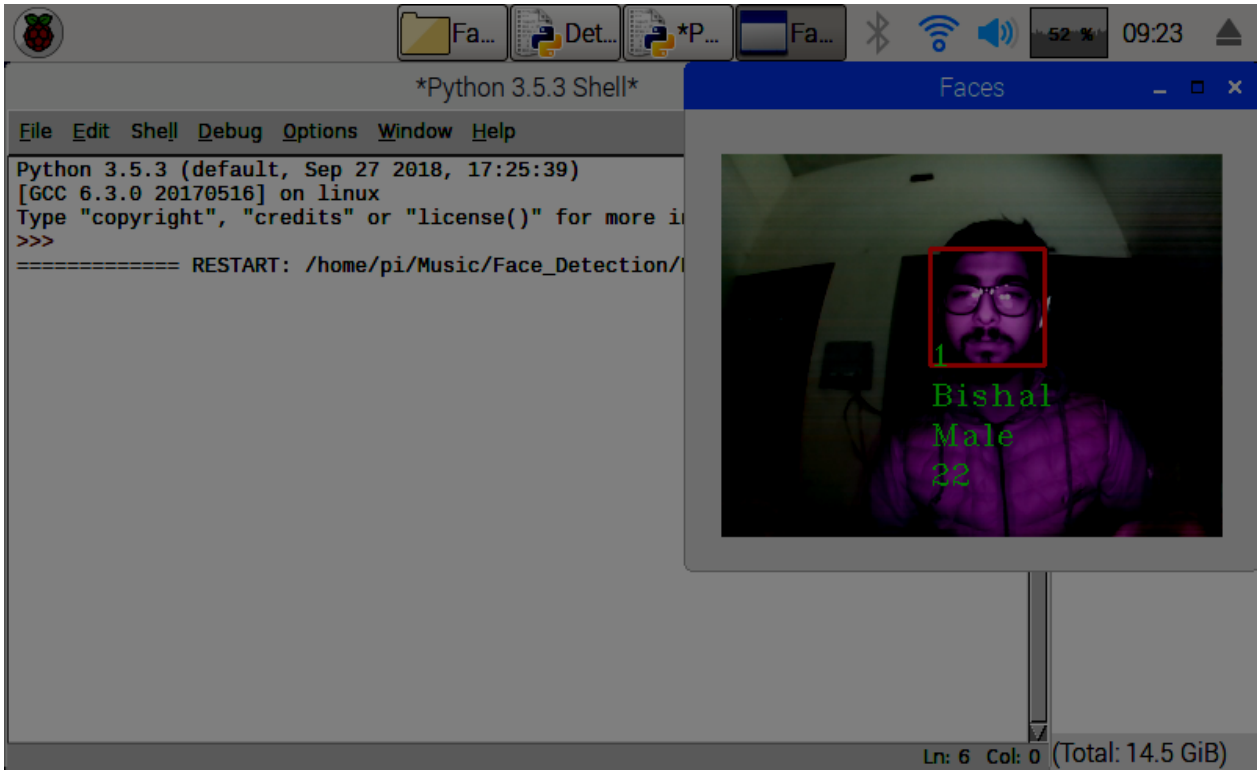
The initial build of over 35,000 Raspbian packages, optimized for best performance on the Raspberry Pi, was completed in June of 2012. However, Raspbian is still under active development with an emphasis on improving the stability and performance of as many Debian packages as possible. To use raspberry pi you should be familiar with the Linux environment. You should learn basis about Linux operating system.

Maria dB database:

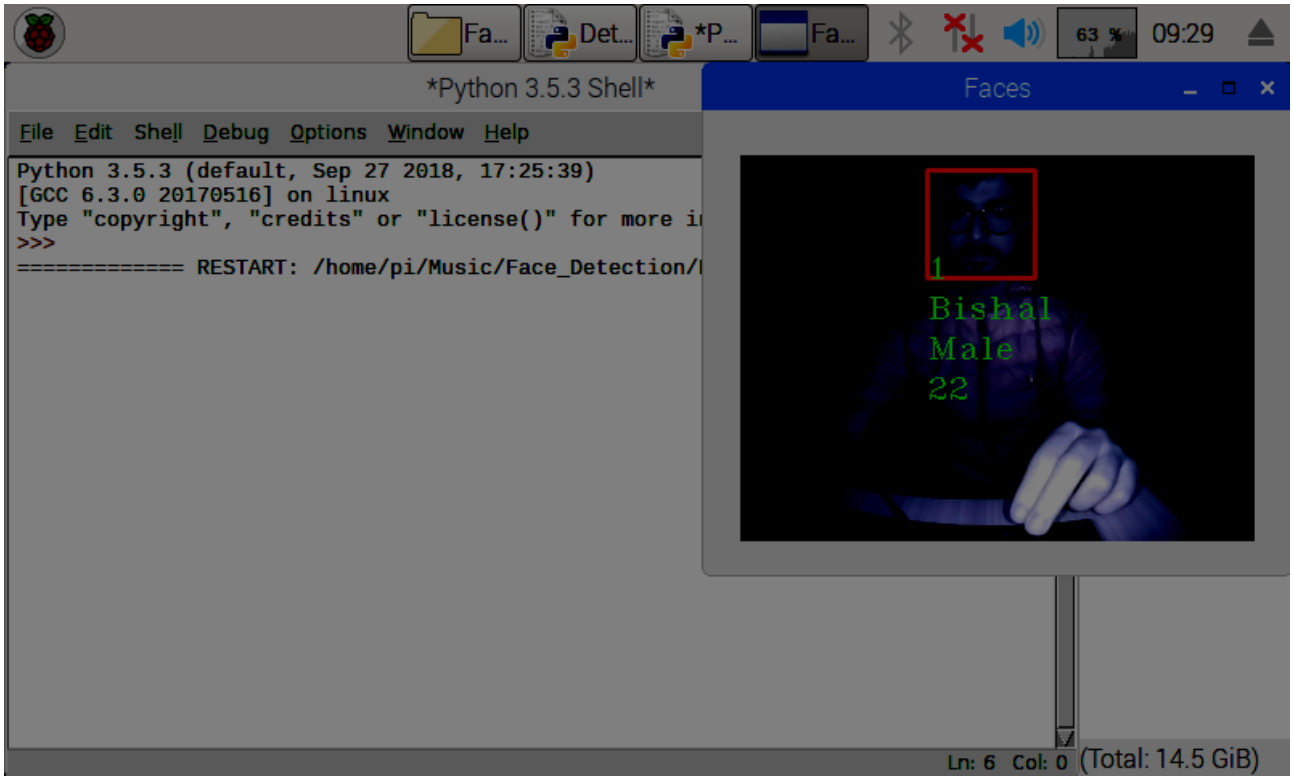
Maria DB Server is one of the most popular database servers in the world. It’s made by the original developers of MySQL and guaranteed to stay open source. Notable users include Wikipedia, WordPress.com and Google. Maria DB turns data into structured information in a wide array of applications, ranging from banking to websites. It is an enhanced, drop-in replacement for MySQL. Maria DB is used because it is fast, scalable and robust, with a rich ecosystem of storage engines, plugins and many other tools make it very versatile for a wide variety of use cases. Maria DB is developed as open source software and as a relational database it provides an SQL interface for accessing data. The latest versions of Maria DB also include GIS and JSON features.

Screenshots:

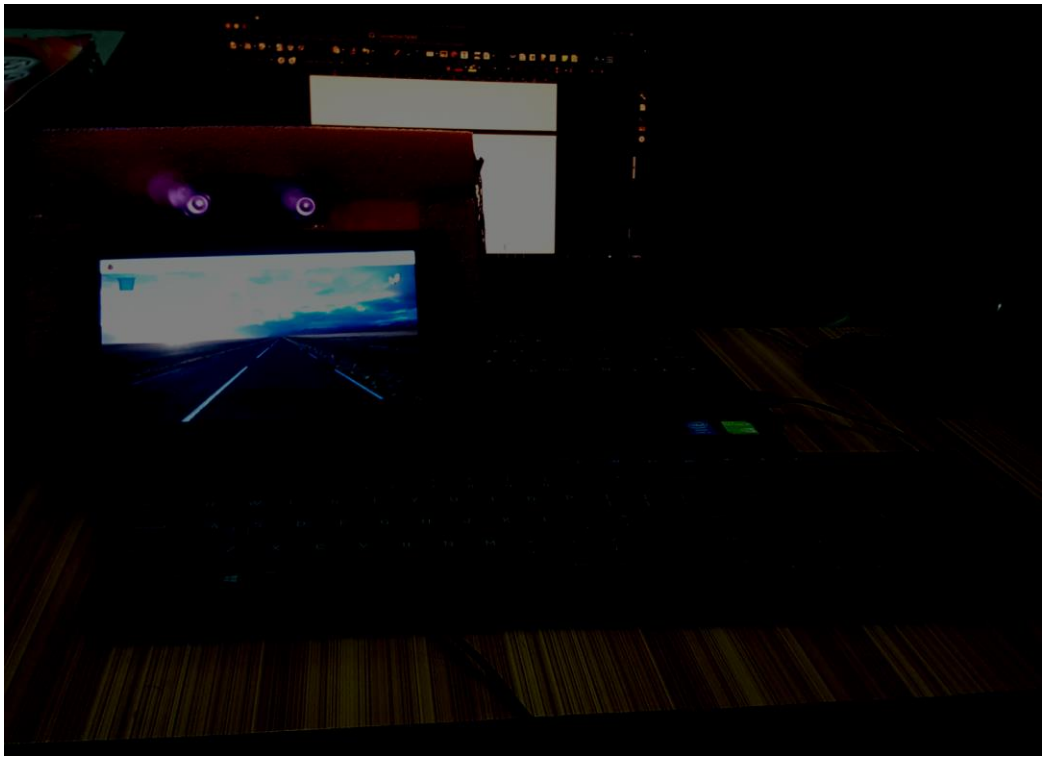
Detection of Face:



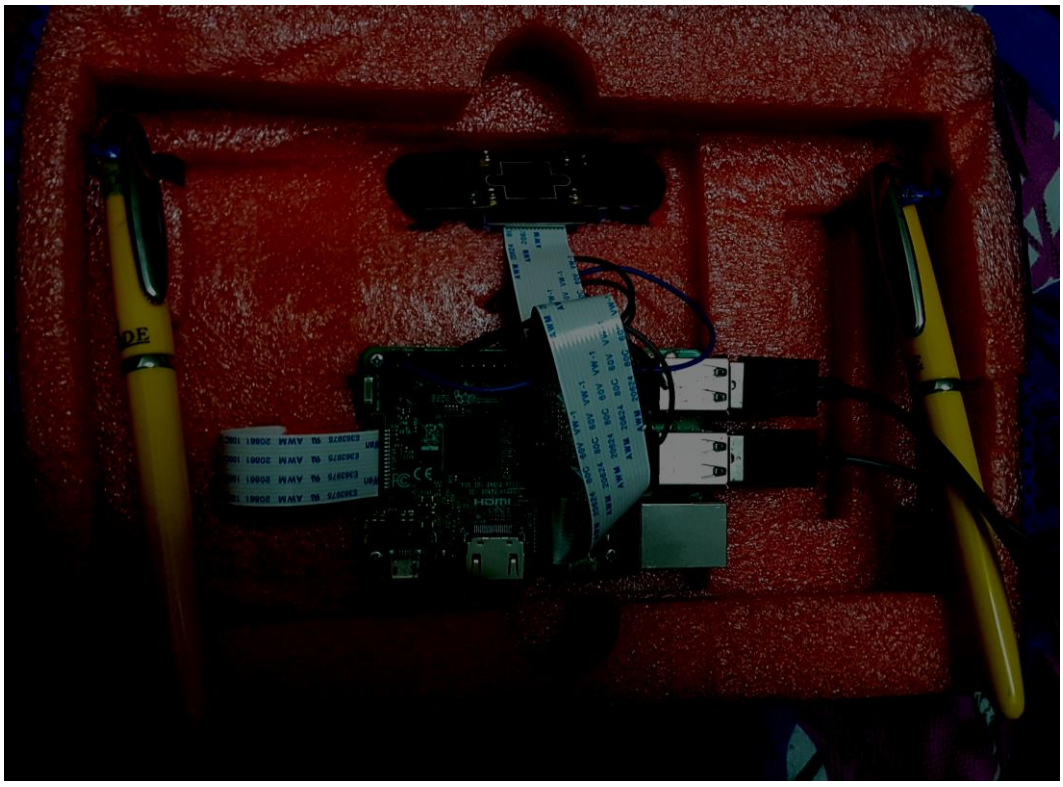
Night mode:



Front face of device:



Back face of device:



Conclusion

Face recognition is a challenging problem in the field of computer vision, which has received a great deal of attention over the past years because of its several applications in various domains. Although research efforts have been conducted vigorously in this area, achieving mature face recognition system for operating under constrained conditions, they are far from achieving the ideal of being able to perform adequately in all various situation that are commonly encountered by application in the real world.

The system with manual face detection and automatic face recognition did not have a recognition accuracy over 40% to 60%, due to the limited number of Eigen faces that were used for the PCA transform. This system was tested under very robust conditions in this experimental study and it is envisaged that real-world performance will be far more accurate.