



FACE RECOGNITION BASED VEHICLE STARTER USING RASPBERRYPI

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Abstract:

Face recognition is changing its way into the new cars in an attempt to increase safety and convenience. For car ignition and to prevent from robberies, there are numerous possibilities for using facial recognition in cars. Obviously, there is a need for the new, dependable safety measure that would keep car owners at peace when they're not around their cars. Face recognition could give that redundant layer of safety and help reduce thefts. Face recognition works on a simple and non-obstructive principle. To implement this project a variety of lightning conditions and run-on mobile phones or handheld PCs like raspberry pi is used. A camera is placed to capture the faces and for scanning, then the images captured are stored in dataset. Here the face detection system takes multiple photos of the person and stores this data into its database. First task is scanning, when the face is detected by the camera the system compares the face with the images stored in the database and give access to predefined functionalities, similar as the authorization to ignite the car. If the person is already registered then it starts the vehicle or if it identifies the person as invalid user then the system can notify the owner and access is denied and the ignition doesn't take place. Car owners can also set up authorizations or restrictions for other people, alike as family members. This helps in prevent car thefts and provide with better control of their cars.

1. INTRODUCTION:

With the continuous improvement of science and technology, face detection and recognition are applied in more and more fields, such as the verification of identity by each application's face scanning, the monitoring system of the bank self-service cash machine, the face unlocking of a mobile phone, and the new face-brushing technology of Alipay.

All need to pass the detection and recognition technology for the face. Under the prospect of the gradual diversification of the technology, face detection and recognition have become a closely related aspect of our lives. Face detection and recognition technology not only make life easier and faster but also add a touch of fun to technology. Through the face of a series of operations such as unlocking the phone, paying for the face, and intelligently identifying, using high-tech technology to ensure the security of our property and identity and to realise the combination of technology and life, it is a vital part of our lives.

In this work, the method of biometric identification for access to vehicles will be used as a tool that can provide security and as the driver's profile. The facial recognition system will be used as authorised by means of camera users installed on the system. The proposed system will then decide whether the person is an authorised person or an unauthorised one. Furthermore, an intelligent systems approach is used to develop an authorized person model based on their face.

Face recognition is a biometric fashion that involves determining if the image of the face of any given person matches any of the face images stored in a database. This problem is hard to solve automatically due to the changes that various factors, similar as facial expression, aging, and indeed lighting, can cause on the image. Among the different biometric ways, facial recognition may not be the most reliable, but it has several advantages over the others. It's extensively used in various areas similar as security and access control, forensic medicine, police control, and attendance operation systems.

The various ways for marking attendance are

- 1) Signature- based system
- 2) A fingerprint- based system
- 3) Iris Recognition
- 4) RFID- based system
- 5) Face Recognition.

Amongst the above techniques, face recognition is natural, easy to use, and doesn't require aid from the test subject.

1. It's a series of several affiliated problems that are solved step by step. 1. To capture a picture and discern all the faces in it.
2. Concentrate on one face at a time and understand that indeed if a face is turned in a strange direction or in bad lighting, it's still the same person.
3. Determine various unique features of the face that can help in distinguishing it from the face of any other person. These characteristics could be the size of the eyes, nose, length of the face, colour of the skin, etc.
4. Compare these distinctive features of that face to all the faces of people we formerly know to find out the person's name.

Our brain, as a human, is made to do all of this automatically and presently. Computers are unable of this kind of high- level generalization, so we need to teach or programme each step of face recognition independently. Face-recognition systems fall into two orders verification and identification.

2. METHODOLOGY:

2.1 Existing Methodology:

With the advancement of technology, electronic keys becoming the mainstream way of vehicle unlocking.

As the priority certificate for the vehicle to unlock, the electronic keys must be carried by the user or the vehicle cannot be opened or started. The keys falling into the wrong hands

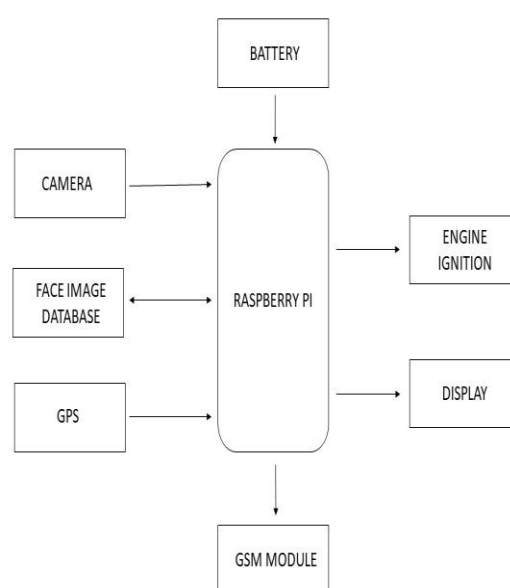
often leads to the theft of the car.

The system proposes a method of vehicle unlocking based on face recognition including a hardware scheme and software algorithms based on deep learning.

Also, if any intrusion takes place it will alert us by buzzer which is attached to the vehicle.

2.2 Proposed Methodology:

The car security system of today has not shown satisfactory results for car owners. The safety technique of using an alarm is still easy to break since GPS and cellular providers are not fast enough to avoid theft, especially when the engine is on. Therefore, it is necessary to increase the security of the cars to ensure their safety from theft. One solution to the existing problem is to apply the security system, which can only be activated by an authorised person. The biometric identification system is one of the solutions to authorise the person. In this project the method of biometric identification for access to vehicles will be used as a tool that can provide security and as the driver's profile. The facial recognition system will be used as authorised by means of camera users installed on the system. The proposed system will then decide whether the person is an authorised person or an unauthorised one.



The idea is targeted at controlling a security system which is integrated with vehicles to decrease the chance of vehicle theft. The proposed system is executed using Raspberry pi and Face Recognition. The vehicle will contain a camera. Camera will be used for face recognition and the scanned face will get stored in a dataset. First the camera captures the user, if it matches a registered user, it shows a green box around the face with the name in the output. If it matches with the user face, the ignition takes place. Using the microprocessor, it will compare the user face which is already saved in the dataset. If any unregistered user appears in front of the camera, it automatically sends a notification to the user as an alert message.

3. SYSTEM TOOLS:

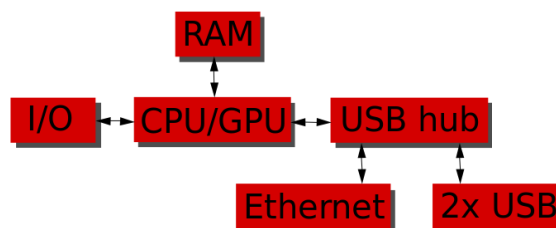
3.1 RASPBERRY PI:

The Raspberry Pi is a series of credit card sized developed in the UK by the Raspberry Pi Foundation with the intention of promoting the tutoring of introductory computer wisdom in seminaries. The original Raspberry Pi and Raspberry Pi 2 are manufactured in several board configurations through certified manufacturing agreements with Newark element14 (Premier Farnell), RS Components and Ego man. These companies vend the Raspberry Pi online. Ego man produces a interpretation for distribution solely in China and Taiwan, which can be distinguished from other Pies by their red colouring and lack of FCC/ CE marks. The tackle is the same across all manufacturers. The original Raspberry Pi is grounded on the Broadcom BCM2835 system on a chip (SoC), which includes an ARM1176JZF- S700 MHz processor, Video Core IV GPU, and was firstly packed with 256 megabytes of RAM, latterly upgraded (models B and B) to 512 MB. The system has Secure Digital (SD) (models A and B) or Micro SD (models A and B) sockets for charge media and patient storage.

In 2014, the Raspberry Pi Foundation launched the Compute Module, which packages a BCM2835 with 512 MB RAM and an MMC

flash chip into a module for use as a part of bedded systems

HARDWARE:



In the above block diagram for model A, B, A+, B+; model A and A+ have the lowest two blocks and the rightmost block missing (note that these three blocks are in a chip that actually contains a three-port USB hub, with a USB Ethernet adapter connected to one of its ports). In model A and A+ the USB port is connected directly to the SoC. On model B+ the chip contains a five port hub, with four USB ports fed out, instead of the two on model B.



3.2 CAMERA:



The Camera used is a Quantum QHM495LM 6 Light Webcam for Laptop/Desktop.

Inbuilt sensitive microphone and image sensor
quality CMOS sensor

Image resolution interpolated to 25 mega pixels with 6 light sensors; 16 MP Image Resolution; USB Interface; Night Vision; USB Cable Length: 1m; Focus Range: 4 cm to infinity

Image control color saturation, brightness, sharpness and brightness is adjustable. Resolution hardware: 500K pixels.

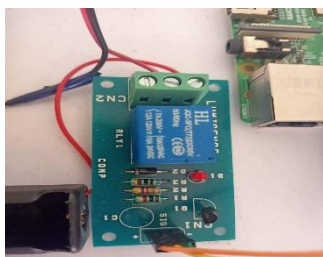
Snap shot switch for taking still pictures. Focus Range 4cm to infinity

Anti-flicker 50Hz, 60Hz or outdoor

Image quality: RGB24 or I420

3.3 RELAY CIRCUIT:

The main operation of a relay comes in places where only a low- power signal can be used to control a circuit. It's also used in places where only one signal can be used to control a lot of circuits. The operation of relays started during the invention of telephones. They played an important part in switching calls in telephone exchanges. They were also used in long distance telegraphy. They were used to switch the signal coming from one source to another destination. After the invention of computers they were also used to perform Boolean and other logical operations. The high end operations of relays bear high power to be driven by electric motors and so on. similar relays are called contactors.



3.4 GSM MODULE:

Compatible with ARDUINO, RASPBERRY PI, ARM, AVR, PIC, 8051, etc. - Can also be directly connected to computer via Serial Port (Use GSM Tester or write your own Software)
Best suited for GSM based Microcontroller Projects (better than SIM300 and other GSM Modems)

Option for connecting MIC and SPEAKER directly to GSM MODEM for calls (LINE IN also available)

Supports communication through RS232 with DB9 Connector, TTL Pins & I2C Pins

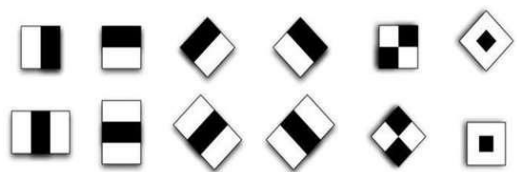
CALL SMS GPRS facility - MIC input, LINE input & SPEAKER output pins



4. ALGORITHM AND METHODS:

4.1 HAAR:

Using the Haar feature- grounded cascade classifiers is an effective object detection system proposed by Paul Viola and Michael Jones in their paper, "Rapid Object Detection using a Boosted Cascade of Simple Features" in 2001. It's a machine learning grounded approach where a cascade function is trained from a lot of positive and negative images. It's also used to descry objects in other images. A Haar cascade classifier is a classifier which trains a machine learning for detecting objects in a picture or a video. Haar belongs to Haar-suchlike features which is a weak classifier and will be used for the face recognition. A weak classifier is a classifier which is only slightly better than a arbitrary prediction. A Haar-suchlike feature is a rectangle which is resolve into two, three or four rectangles. Each rectangle is black or white.

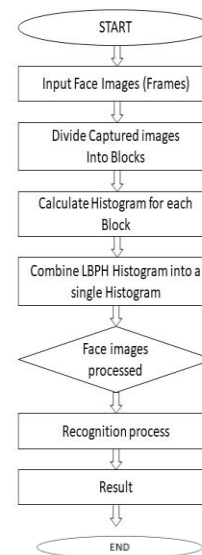


The extracted combination of features will be used for detecting faces in pictures or videos. The features are tried to be matched only in a block of pixels defined by a scale. The scale can be a square of 232x232 pixels, which is the dimension of the image taken for feature extraction in our system. Each feature of the combination will be tried to match block by block. If one of the features does not appear in the block, the research on it will be stopped. The remaining features will not be tested because the machine concludes that there is no face in this block. Then, a new block is taken, and the process is once again repeated. This method tests all the blocks of pixels with the researched combinations in the cascade classifier.

4.2 LBP:

For the facial recognition process, the LBP algorithm is used. For the facial recognition process, the LBP algorithm is used. A great advantage grid of LBP is that it's illumination invariant. However, scene all the pixel values would go up but the relative difference between these value remain will be the same, If you change the lighting scene. Original double Pattern (LBP) is an effective texture other which labels the pixels of an image by threshold neighbourhood of each pixel and considers the value as a double number. When LBP is combining the histogram to grams of acquainted gradients (HOG) descriptor, it in the detection performance vastly on some datasets. Using the LBP combine histograms, to grams we can represent the face images with a simple data vector. The LBP requires 4 parameters, namely radius Neighbours Grid X, Grid Y. The radius is used to make the indirect original double pattern and represents the radius around the central pixel. The first step is to convert the image to grayscale. Next is to obtain a window of 3x3 pixels for the image, with the intensity of each pixel denoted by any value from 0-255.

A central value is then selected to be used as the threshold value, which will be used to define the new values from 8 neighbours, as shown in the figure above. If the intensity of the centre pixel is greater-than-or-equal to that of its neighbour, then we set the value to 1; otherwise, the value is set to 0.



5. WORKING PRINCIPLE:

The idea is targeted at controlling a security system which is integrated with vehicles to decrease the chance of vehicle theft. The proposed system is executed using Raspberry pi and Face Recognition.

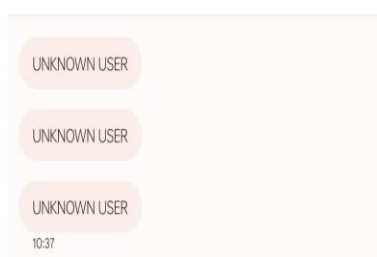
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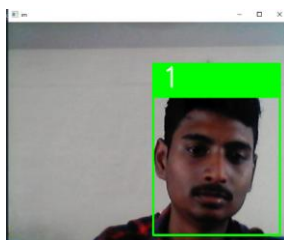
If any unregistered user appears in front of the camera, it automatically sends a notification to the user as an alert message and also sends the unknown's person picture to the registered user via-email.

6. Project Output Images:



Initially, a program is written to generate the images. The program consists of certain libraries such as Haar cascade algorithm and Local Binary pattern which is used to store the images in database and the LBP help to differentiate the real-time images and the template images. Users can refer to the real-time images to access the quality and capture a candidate image manually. In the backend, a face position detection is executed in a loop. If there is no face or more than one face in the image, the algorithms cannot able to capture the candidate image. The algorithm is capable of vehicle-unlocking. During the tests on the simulation, it specifies and differentiate the registered /unregistered user to unlock the vehicle. The simulation is running at the accuracy of 99% on the test set of LBP face dataset, which is higher than the recognition ability of a normal human. It recognizes number of images which can be stored in dataset about the input size.

7. RESULT:



8. CONCLUSION:

Safety and comfort as a part of human factor play important role in nowadays advance automotive technology. Security system on a vehicle, as one of the safety aspects, is susceptible from an unidentified person. The conventional security system has potential to be lost, stolen or duplicated by someone.

Due to that reason, biometric method can be one of the solution the authentication for driver by using their face is one of the potential solutions. The detected face is then processed in the system which will recognize the face of the authorize person.

The experiment shows the system reliable to recognize the authorize person, since it has good accuracy.

Basically, this system works to improve the lives of people with memory impairments. Capturing live images from a camera and applying different techniques of face detection and recognition will reduce manual or traditional work. In the project system, by creating an interface, the dataset has generated. The images are trained using the Haar cascade and the LBPH classifier. After completing training, it will successfully detect and recognise faces and non-faces by comparing the images collected in real time with dataset images

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