

A Novel Approach for Vehicle Anti-Theft System

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Abstract– Implementation of a safety system for vehicles through face recognition is to reduce the theft. The aim of the proposed system is to provide the security for smart cars from thefts or robberies using PIC microcontroller. The system works on the principle of face recognition of the driver who starts the car. Images of the persons who are all engaged to drive the car are stored in the personal computer. Driver enters into the vehicle web camera inside the car will capture the driver’s image. It will check the image with previously stored one. The microcontroller is programmed in such a way that if the corresponding result is authentic then it generates a signal to run the engine in order to start the car automatically. If the result is not authentic then it produces a signal to inform the car owner that unauthorized access with the help of GSM via SMS.

Keywords— Face recognition system, GSM, Microcontroller, Sensors, Short Message Service.

I. INTRODUCTION

At present vehicle theft is one of the serious problems in our society. Communication, biometric recognition, alarm are currently used to reduce the theft.

A small camera, GSM (Global System for Mobile communication) is placed inside the car. The security of the vehicle is obtained by face recognition system.

There are several application areas of face recognition in our real life such as identification of personnel using credit cards, passport checks, entrance control, criminal investigations, etc.

Face recognition is done by LDA (LINEAR DISCRIMINANT ALGORITHM). In this algorithm mean, variance, Eigen values of the image is calculated. This calculated value is compared to produce the recognised output. For driver’s safety sensors are used to provide an alert signal.

II. RELATED WORK

Many researchers have proposed the system for vehicle tracking and monitoring. GPS and sensors are used to locate and monitor various vehicle parameters. GSM is also used to transfer the information to the vehicle owner or a pre-defined numbers. If some unbearable situation occurs then it is possible to lock the doors or to seize the vehicle engine by sending SMS using GSM technology.

In order to safeguard the persons inside the vehicle various sensors and techniques are used. An eye blink sensor continuously monitors the number of times the driver’s eye blinks. If the count of eye blink decreases that means the

driver is in sleepy condition and then it turn off the vehicle’s ignition. One camera is used to monitor the driver’s drowsiness. Optical /Ultrasonic distance sensor to obtain the forward distance between the vehicles. Vehicle speed, steering wheel angle are monitored and the vehicle location is also tracked by using GPS.

III. SYSTEM HARDWARE DESIGN

Hardware part is shown below. The input to this hardware unit is an image captured by the web camera. The captured image may differ from posture, illumination and other environmental condition. The captured image is not suited for processing because of these difficulties. Hence LDA algorithm is used to overcome this by calculating the mean, weight matrix, Eigen vector and its value.

Program which is stored in the PC is executed in order to find the recognised person. It will produce the corresponding result. The output from the PC is used as input to the microcontroller. Microcontroller realise the input, if the input is recognised signal then it will transfer the signal to the engine. Else it will transfer the information about the unauthorised person to the vehicle owner through GSM modem.

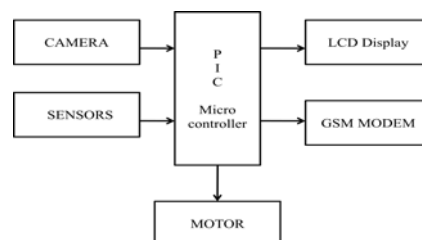


Fig. 1 Proposed block diagram

Sensors are used after the vehicle gets started. In order to find the distance of the obstacle, Ultrasonic sensor is used. MEMS sensor is used to find whether the vehicle gets crashed or not. Other one is Alcohol sensor used to find whether the person consumes alcohol or not.

A. Microcontroller:

PIC 16F877A is a family of CMOS 8-bit flash controllers. RISC type of processors has reduced instruction set. Instructions are executed virtually in each cycle. A RISC instruction set includes fewer and simpler instructions with hardwired control, simpler processor pipeline and a large number of registers. Most RISC processors have simpler

instructions, instructions that can be executed in one clock cycle, uniformed length instructions and fixed instruction format pipelining, instruction set is orthogonal(little overlapping of instruction functionality).

Technology that is used in pic16F877 is flash technology, so that data is retained even when the power is switched off. Easy Programming and Erasing are other features of PIC 16F877.

B. GSM:

GSM (Global System for Mobile Communications), is a standard developed by the European Telecommunications Standards Institute (ETSI). It is available in all over 219 countries and territories.

It operates in 890 - 960MHz. Features of GSM are Short Message Service (SMS), paging, call forwarding, call waiting, Multi-party conferencing and it is easy to encrypt the information. GSM also has the advantage of using SIM (Subscriber Identity Module) cards. The SIM card, which acts as your digital identity, is tied to your cell phone service carrier’s network rather than to the handset itself. This allows for easy exchange from one phone to another without new cell phone service activation.

C. Ultrasonic Sensors:

Ultrasonic sensor is used to find the distance of the vehicle. It emits short and high frequency signals of 20 kHz - 10MHz. Distance is measured by time of flight not by the intensity of sound signals. It covers 20mm - 10m.

D. MEMS Sensors:

MEMS sensor is used to find whether the vehicle gets crashed or not. It is used to measure the vibrations. Its operating voltage is 3 - 3.3V.

E. Alcohol Sensor:

Alcohol sensor is used to detect Ethanol in air. It is used to find whether the person consumes alcohol or not. The detectable concentration is 0.05-10mg/L. It consists of 6 pins of these 4 pins for fetching signals and 2 pins for pre-heating purpose.

F. Power Supply:

The power supply section is the important one. It should deliver constant output regulated power supply for successful working of our work.

G. LCD Display:

LCD combines the properties of both liquids and crystals. The LCD does not generate light and so light is generated by backlighting. It is easy to read in the dark. The LCD’s have long life and a wide operating temperature range.

The LCDs used exclusively in watches, calculators and measuring instruments are the simple seven-segment displays, having a limited amount of numeric data. The use of C-MOS LCD controller and driver ICs result in low power

consumption. Changing the display size or the layout size is relatively simple.

IV. SOFTWARE DESIGN

Recognition is the process of identifying a thing or person from previous encounters or knowledge. Face recognition problem is mainly divided into three parts such as Segmentation, feature extraction and decision making. Linear Discriminant analysis explicitly attempts to model the difference between the classes of data.

The flow chart of face recognition is shown figure 2. Recognised person images are maintained in the database called as training set. LDA algorithm is applied to the training set images and it is compared with the test set images.

Feature vectors of both set images are classified by means of distance calculations. The problem of finding the distance between two or more point of a set is defined as the Euclidean distance.

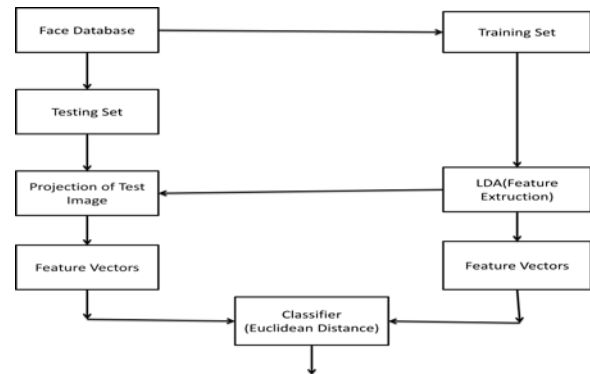


Fig. 2 Basic step of face recognition

The Euclidean distance is usually referred to the closest distance between two or more points. Finally it produces the equivalent image of the person.

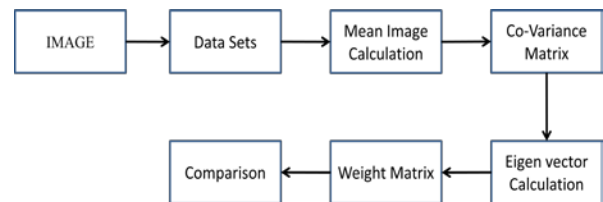


Fig. 3 Block diagram of LDA algorithm

Feature Extraction:

Feature extraction of LDA algorithm is shown in figure 3. It is used to provide effective information for distinguishing faces of different persons with respect to the geometrical and photometrical variations.

Pixel information of the images is converted to data sets of variable values. Formula to calculate the mean value is shown below.

$$y = \frac{\sum x}{n}$$

With that data values, mean is calculated to subtract the pixels which contains same information.

Co-Variance matrix is used to find variation in a collection of random points in two-dimensional space. The variance in the x and y directions contain all the necessary information.

$$Cov(x_i, x_j) = E[(x_i - \mu_i)(x_j - \mu_j)]$$

Co-variance matrix is a matrix whose element in the i, j position is the covariance between the i^{th} and j^{th} elements of a random vector.

Eigen vectors are used in the computer vision problem of human face recognition. The Eigen faces form a set of all images used to construct the covariance matrix. Classification can be achieved by comparing with the faces which are represented by the basic set.

MATLAB is an interactive system whose basic data element is an array that does not require dimensioning. This allows you to solve many technical computing problems, especially those with matrix and vector formulation, in a fraction of the time.

After getting the output from the MATLAB tool as recognised it is transferred to the Proteus software using RS232 cable.

Proteus 8 is a single application with many modules (ISIS, BOM, ARES, 3D Viewer, etc.). Modules open in tabs within the application window and then dragged and dropped to create additional windows and enable side-by-side viewing.

In Proteus tool PIC microcontroller, motor, sensors are connected in such a way that to produce the output. The output from the MATLAB tool is obtained by the Proteus through serial communication cable.

MATLAB output is as recognised then it start the motor to run, alcohol sensor and MEMS sensor is detected it stop the motor which is running. Ultrasonic sensor is detected then it will indicate the presence of obstacle in LCD display.

V. SIMULATION OUTPUT

The face recognition coding is written in Embedded C language is run on MATLAB tool. During execution, the training image database and test image are selected and their features are compared.

If the test image is matched with the training set image, then it produces the result as 'Recognised'. Otherwise it produces the result as 'Not Recognised'.

The command window is used to indicate the corresponding output which is shown in figure 4.

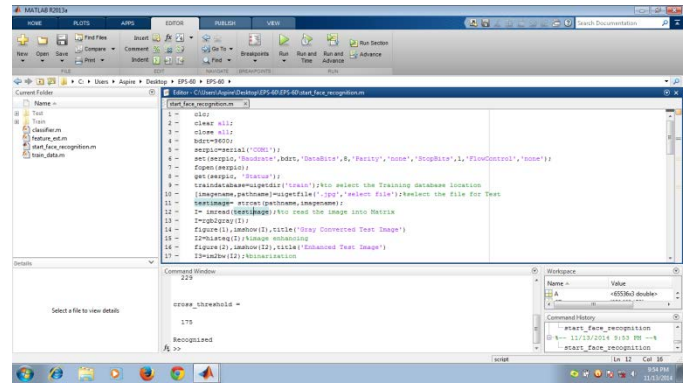


Fig. 4 Output in command window

The image captured by the camera is in colour (RGB) format, it is difficult to classify the image due to large pixel range.

Hence it is converted to Gray scale image of lower pixel range and it is further reduced to two value binary image. This binary image is quite easy to compare with the database. They are shown in figure 5.

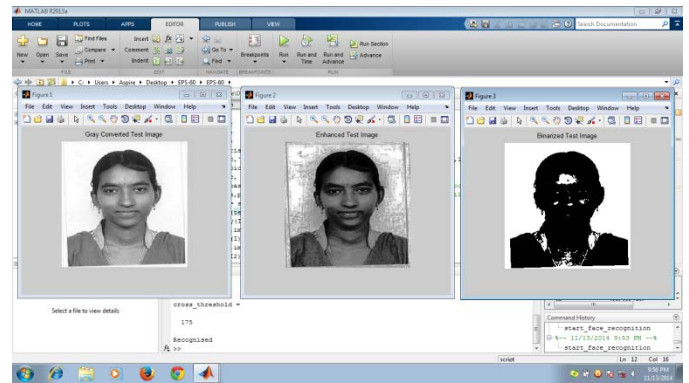


Fig. 5 Gray, Binary, Enhanced Image

Better resolution equivalent image is also obtained, from the database which is shown in figure 6. This MATLAB output act as an input to the Proteus tool.

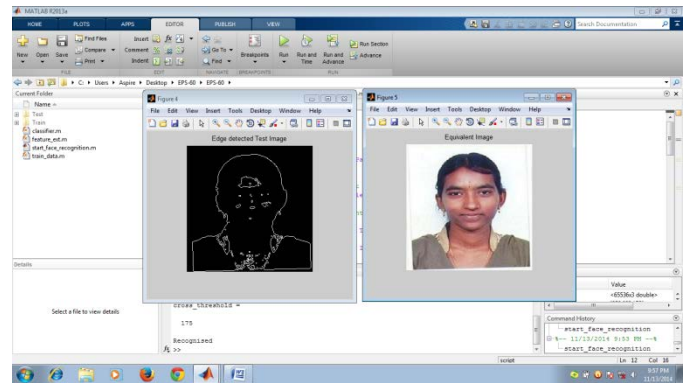


Fig. 6 Edge detected & Equivalent image

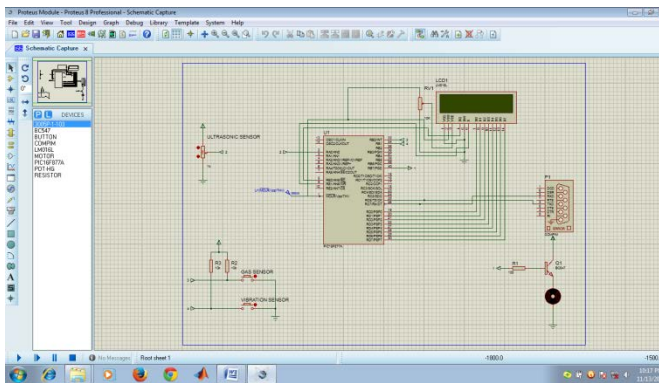


Fig. 7 Motor control & Sensors output

Figure 7 shows that connection of sensors with the microcontroller. Ultrasonic sensor is an analog device hence it is connected to the analog input of the PIC microcontroller. Alcohol and MEMS sensor are connected to the digital input-output pin. Motor, GSM modem, LCD display are connected to the PIC microcontroller.

VI. CONCLUSION

Vehicle theft can be reduced by using face recognition technique. The images of the person who are considering as a recognized are store in the PC. Test images are verified with the stored one and it will produce the corresponding result. The vehicle gets started only by the authorized user. Face recognition is done by the MATLAB coding and various

sensor outputs are analysed using Proteus software tool. Both are merged together with the help of serial communication port RS232. When unauthorized user want to start the vehicle then the controller transmit the information to mobile through GSM by serial communication port.

REFERENCES

- [1] Ashad Mustafa, Hassan Jameel, Mohtashim Baqar, Rameez Ahmed Khan, Zeeshan M Yaqoob, Zeeshan Rahim & Safdar Khan. "Vehicle Intrusion and Theft Control System Using GSM and GPS" Asian Journal of Engineering, Sciences & Technology, September 2012, volume 2, issue 2.
- [2] Pravin S. Barange, Prof. Nitin N. Mandaogade. "GPS based anti theft fleet monitoring & survilience system" International Journal for Engineering Applications and Technology (IJFEAT) Jan 2014, Page 12-14, volume 1, Issue 3.
- [3] M Rajendra Prasad , P Aswani Kumar. "An Automated Traffic Accident Detection and Alarm Device" International Journal of Technological Exploration and Learning (IJTEL) August 2012, Volume 1 Issue 1.
- [4] Saurabh S.Chakole, Asstt.Prof.Vivek R.Kapu, Asstt.Prof.Y.A.Suryawanshi. "ARM Hardware Platform for Vehicular Monitoring and Tracking" International Conference on Communication Systems and Network Technologies (CSNT) IEEE publisher in April 2013, Page757-761.
- [5] Sawant SupriyaC, Dr.Bombale U.L., Patil T.B. "An Intelligent Vehicle Control and Monitoring Using Arm" International Journal of Engineering and Innovative Technology (IJEIT) October 2012, Volume 2, Issue 4.
- [6] Zhang Wen, Jiang Meng. "Design of Vehicle positioning System Based on ARM" International Conference on Business Management and Electronic Information (BMEI) IEEE publisher, May 2011, Page(s) 395-397, volume 4.

BIBILOGRAPHY



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