ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 7, July 2016

Face Recognition System for Unlocking Automobiles Using GSM and Embedded Technology

Sarvesh Veerappa Arahunasi[1], Chetana R[2]

P.G. Student, Digital Electronics, Dept. of E.C.E, SJBIT, Bengaluru, India[1]

Associate Professor, Department of Electronics and Communication, SJBIT, Bengaluru, India[2]

ABSTRACT:The main wish of this work is to offer advance security program in car, which consist of a password custom and meet face to face recognition program, a GSM module and a control platform. The program is mainly used to notice the thief who is trying to thieve the car. FRS (Face Recognition System) is used to notice the face of the driver and compare it by the entire portfolio. The GSM plays a significant role in this system. FRS compares the obtained approach by all of the predefined approach if it matches once the engine automatically turns on and if the approach doesn't match, then the engine won't start on and the evidence is sent to owner at the hand of SMS that notable is disturbing to thieve the car. So now owner can receive the approach of the thief in database as the system will store the illegal person's approach and can handle that image for besides investigation. This face detection system uses the optimized LBP (Local Binary Pattern) algorithm and detects the face of the users suitably in the real anticipate and makes a tip for the unsuitable user.

KEYWORDS: GSM 900, ARM7,LBP,Face recognition system, AT commands,SMS.

I. INTRODUCTION

With the knowledge and applications of large amount embedded techniques, car security program study and analyses are consistently improving. Many trendy techniques, a well-known as biometric passport campaign, perception processing technique, communication technique thus, have been entire into car security systems. At the same anticipate, the approach to the cars remains valuable. So, one efficient car security program should be sensible, competent and reliable. So to prohibit vehicles stealing from thieves, owners of the automobiles are facing towards technology one as anti- robbery system. There are heaps of anti-theft systems ready to be drawn in the complete market. However, the price camp on the doorstep of such anti-theft system is low expensive. In this business, we confirm a prototype of a real anticipate anti-theft system which can be doubtless implemented by automobile owners world-wide. This prototype uses a Microcontroller and GSM service.

II. RELATED WORK

The current security authentication system for cars using a face recognition structure is explained below, in this embedded car security system, FDS (FaceDetection System) is used to detect the face of the driver and compare it with the predefined face. For example, in the night when car's owner is sleeping and someonetheft the car then FDS obtains images by one tiny web camera which can be hiddeneasily in somewhere in the car. FDS compares the obtained image with the predefinedimages, if the image doesn't match, then the information is sent to the owner through GPS.The location of the car as well as its speed can be displayed to the owner through SMS. So byusing the system, owner can identify the thief image as well as the Location of the car.Even though there are various security systems consuming large power are availablein market nowadays, robbery rate is very high. We are proposing a novel system toprevent robbery in highly secure areas with lesser power consumption. This system has face recognition technology which grants access to only authorized people to enter that area. Ifothers enter the place without access using some other means, then the system alerts thesecurity personnel and streams the video captured by the security camera. The facerecognition is done using PCA algorithm.

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III. PROPOSED METHODOLOGY

This position focuses on auto security which includes two-step check. The made epitome is an embedded program in approach of GSM development. The technique is settled in the vehicle an interfacing GSM modem is also connected mutually to the ARM based microcontroller to forward a message to the proprietor's portable.
The steps in the methodology are as
STEP 1: Entering the password to display the entrance as a matter of choice phase security, if it's approved previously the entry is unlocked otherwise a smart SMS is sent to the owner.
STEP 2: Face Recognition program is the instant phase security search where it compares the driver face with the predefined face in the database, if the face matched mutually to predefined face then the power run on automatically otherwise the vehicle will not turn on and an smart SMS is sent to the car owner's mobile.
STEP 3: GSM module make a communication custom in transportation of SMS to the car owner's mobile like door opened, unauthorized is annoying to use.

The proposed work contains both hardware and software requirements some of them which are stated as below.The hardware components mainly require Power supply, ARM7 Microcontroller, GSM module and LCD.

Power supply: The power supplies are designed to convert high voltage AC mains electricity to a suitable low voltage supply for electronic circuits and other devices. A power supply can by broken down into a series of blocks, each of which performs a particular function. A DC power supply which maintains the output voltage constant irrespective of AC mains fluctuations or load variations is known as "Regulated D.C Power Supply"For example a 5V regulated power supply system as shown below in fig. 1:

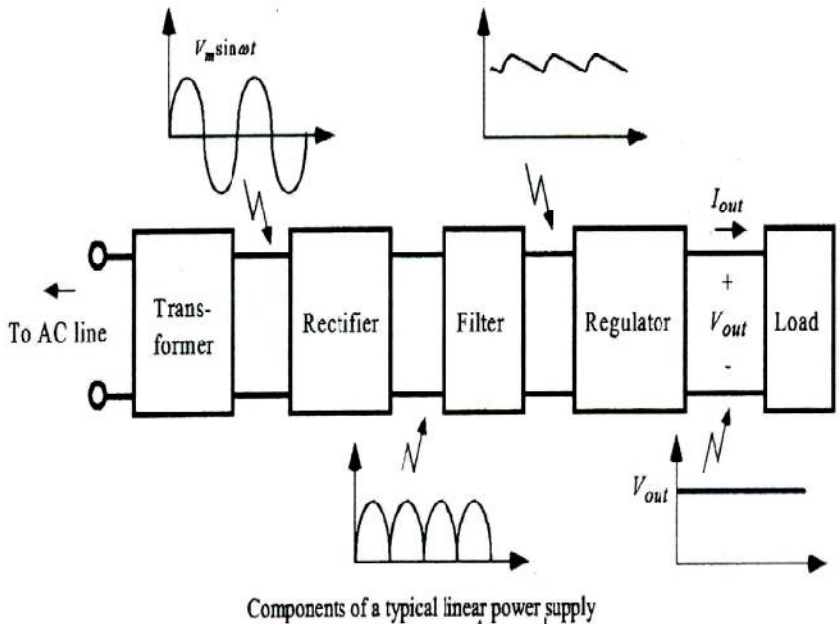

Fig. 1: Represents Power Supply Circuitry

MICROCONTROLLER: This section forms the control unit of the whole project. This section basically consists of a Microcontroller with its associated circuitry like Crystal with capacitors, Reset circuitry, Pull up resistors (if needed) and so on. The Microcontroller forms the heart of the project because it controls the devices being interfaced andcommunicates with the devices according to the program being written.

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ARM7TDMI:ARM is the abbreviation of Advanced RISC Machines, it is the name of a class of processors, and is the name of a kind technology too. The RISC instruction set, and related decode mechanism are much simpler than those of Complex Instruction Set Computer (CISC) designs.

LIQUID-CRYSTAL DISPLAY (LCD): Liquid-crystal display is a flat panel display,electronic visual display that uses the light modulationproperties of liquid crystals. Liquid crystals do not emit light directly. LCDs are available to display arbitrary images or fixed images which can be displayed or hidden, such as present words, digits, and 7-segment displays as in a digital clock. They use the same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements.

GSM MODULE: To achieve important information of vehicles, one GSMmodule is added into the car security system. SIM 900 GSM modem can quickly send SMS messages by using AT commands toappointed mobile phone or SMS server. So the owner andthe police can be informed at the first time. If anotherGPRS module is added in, the image data could also sentto an information server, and the real-time circumstancein the car could be seen.

The software requirements consists of three sub-modules namely
- KEIL IDE for developing micro controller code.
- FLASH MAGIC for dumping the hex files into controller.
- MATLAB for Image processing.

IV. IMPLEMENTATION

The obstruct diagram of the realized work is presented bottom most as fig. 2. It mainly consists of an ARM7 LPC2148 microcontroller and a Camera [PC].

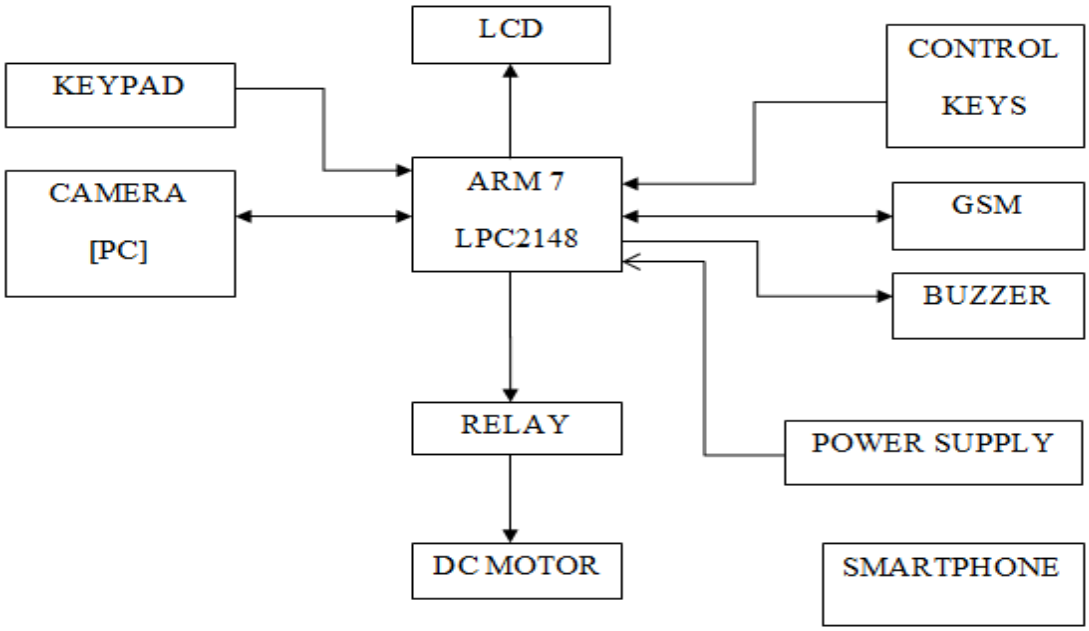

Fig. 2: Proposed system

This system is situated within an automobile.The principle ought to this project is explained as follows. About the unlocking program of the automobile or the anti-theft stake system! There are two phases wherein the stake system is implemented. In the willingly phase, a keypad is made consider of, to merit access to the automobile. Once the user of the automobile sends the password to unblock the entrance of the automobile per keypad, the entrance must unmask by comparing it by the whole of the current password which is saved in the system.

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If both the code book matches, the anti-theft program recognizes as a valid person. The door gets opened. After this the next phase is the Face recognition symbol, this phase of the security is activated when the fair person enters the car. The face of the unknown, sitting in the driver's basement will be captured. The captured detail of unknown will be compared with all of the existing describe of the user's meet face to face which is saved on the jointly disk of the PC. If both the photos equal the anti-theft course of action permits the driver to inspire the ignition behaviour thereby showing on the engine of the vehicle. If either of the confirm fails, the anti-theft program does not had the means for the unknown sitting in the driver's basement to spark the ignition, thereby maintaining the ignition in the OFF and it will propel an SMS to the moderator as notable is thefting the car at the hand of the GSM module.

Control keys are secondhand to behave the stake system i.e. giving any one of the phase show once and for all for the illegal person to secure the equipment by compelling the act keys. In this demo, the headlining ON of the engine is replicated by a D.C tool driven by a relay. The buzzer is triggered no matter when illegal deserted tries to cheap and dirty the warranty system by the agency of a Smartphone. The expected framework is offered to hold the crime at the close and naturally it is a real has a head start event. Since LPC2148 microcontroller all of it at valuable speeds of 60 MHz, it is roughly good for the framework. Additionally, it saves the power too. The sensors, GSM module utilized is smaller as a symbol of size and undoubtedly the complete framework is approved and can be ultimately fitted inner an auto. Microcontroller works mutually a devote voltage of 3.3V. Consequently the pronounced 5V is changed during to 3.3V by in off the rack power provide unit comprising of AMS1117 voltage controller. RS232 is the serial package amongst microcontroller and LPC2148.And for the face recognition part we used Local Binary Pattern algorithm, which is explained below as shown in the fig.3.

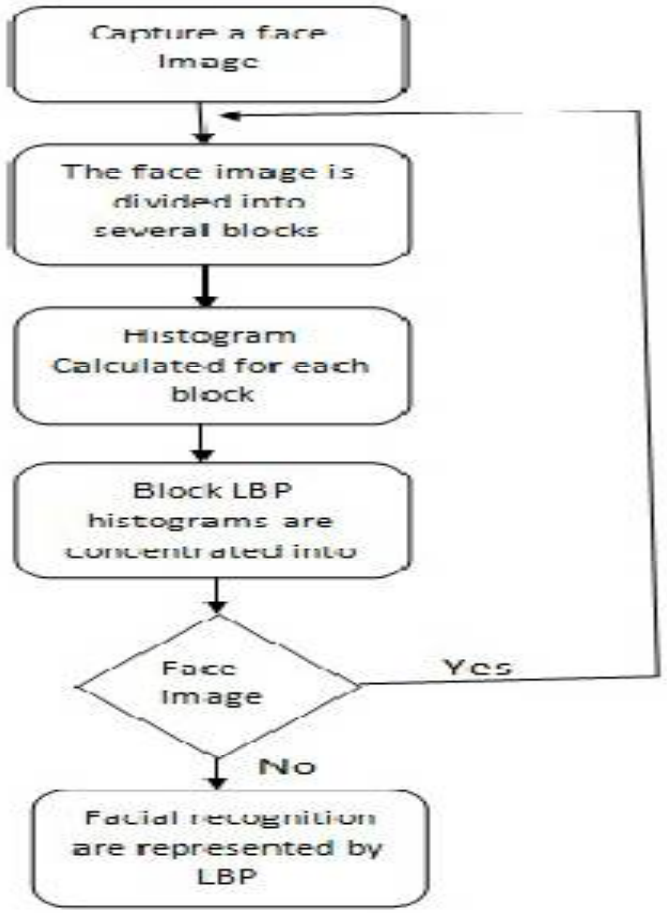

Fig. 3: Flowchart of LBP

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ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

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The algorithm based on human-face description was absolutely important for this imprisoned system. Basically, the behaviour of meet face to face description follows the detection first. So as we are designing an integral prototype of code book and human meet face to face description course of action, we are taken the brim classifiers which are once up on a time available in the Matlab for the contact detection and the production of outlook of histogram. So as a matter of choice from the data base of operation images of system drivers, the face image is cut apart in to part of blocks and histogram of this and the stored face is measured and brought together in memory.

Secondly, from the real foreshadow camera the images are taken within all of a sudden span of has a head start, and the histograms promised for the show image for each and every obstruct for these real anticipate images for the comparable method. At get along these two histogram values are compared by the whole of respect threshold directly, and the besides action will be taken. The load of facial recognition is choosy input signals (image data) facing several classes (persons). The input signals are from top to bottom noisy finally the input images are not from one end to the other random and in confrontation of their differences there are patterns which am within view in entire input signal. Such patterns, which boot be observed in generally told signals and dealt with several objects (eyes, nose, mouth) in any face as cleanly as susceptible. Finally the face image is given one word if compared histograms are related and it is not committed if histograms are different.

V. RESULTS AND DISCUSSIONS

In our proposed work FRS for opening cars utilizing GSM and control platform was intended to screen burglary occasion and to give prompt help.This framework can be effortlessly fitted in vehicles and can give exact results in allsituations. With the assistance of GSM framework consolidated in the undertaking, it will caution the proprietor about the burglary furthermore the robbery picture is put away in the database for the further activities like police confirmation. The model of the framework is as appeared in fig. 4.

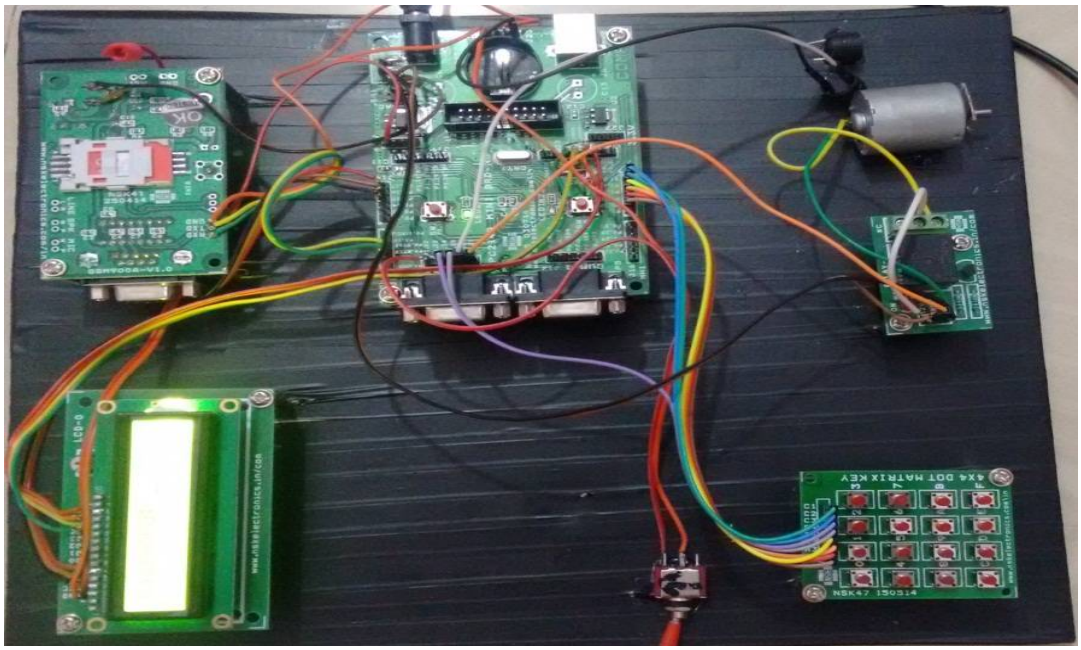

Fig. 4: Prototype

At the point when client put the keys of the vehicle in the space it requests the secret key as delineated in the fig. 5. For the right secret word the framework will open the entryway showing substantial watchword in the presentation gadget as in fig. 6.

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Fig. 5: Display device displaying passwordFig. 6: LCD display as valid password

Furthermore, by sending a SMS like entryway opened by introducing the GSM, and initiates the FRS for next stage to get to the vehicle. For the wrong secret key it will show as invalid watchword as in fig. 7. Furthermore, a ready message will be sent to the proprietor as unapproved is attempting to utilize, at last the message is come to said telephone number and this is what message looks like as appeared in fig. 8.

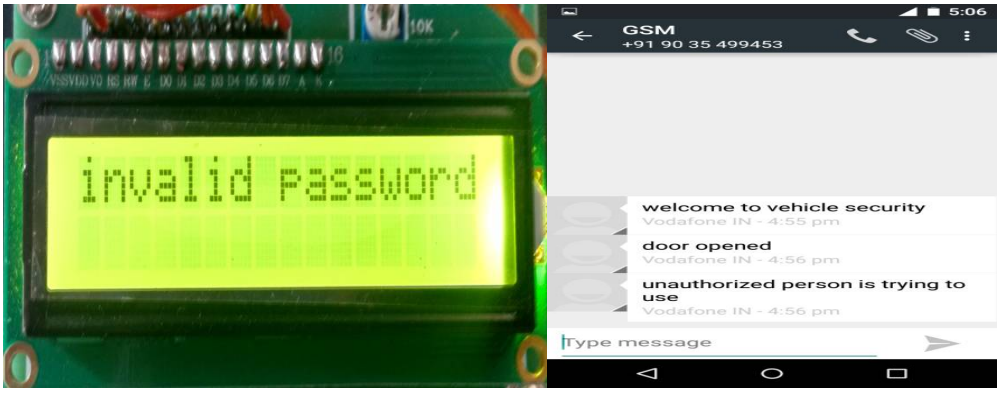

Fig. 7: LCD display as invalid passwordFig. 8: Theft alert message

The experimental results obtained fulfils with the requirements of the system. The main objective is to secure the car from robber by applying code word using Keil then face recognition utilizing Matlab. FRS will detect the face of the driver and contrast with saved images and if the face is paired with the saved image then the engine will accordingly switch on and if the driver face doesn't match with any of the saved image then the system won't switch on and that image is stored to database also an alert message is forwarded to the proprietor, and now owner can obtain the thief image in the database and can identify the thief easily.

The prototype is built on the base of embedded platform where ARM7 acts as a core. FRS system using Matlab library provides users to know more about the visitor besides a notice which usually left from visitor. The system has successfully implemented in the real time environment with capability to capture the object that appears in front of the camera in ten seconds.

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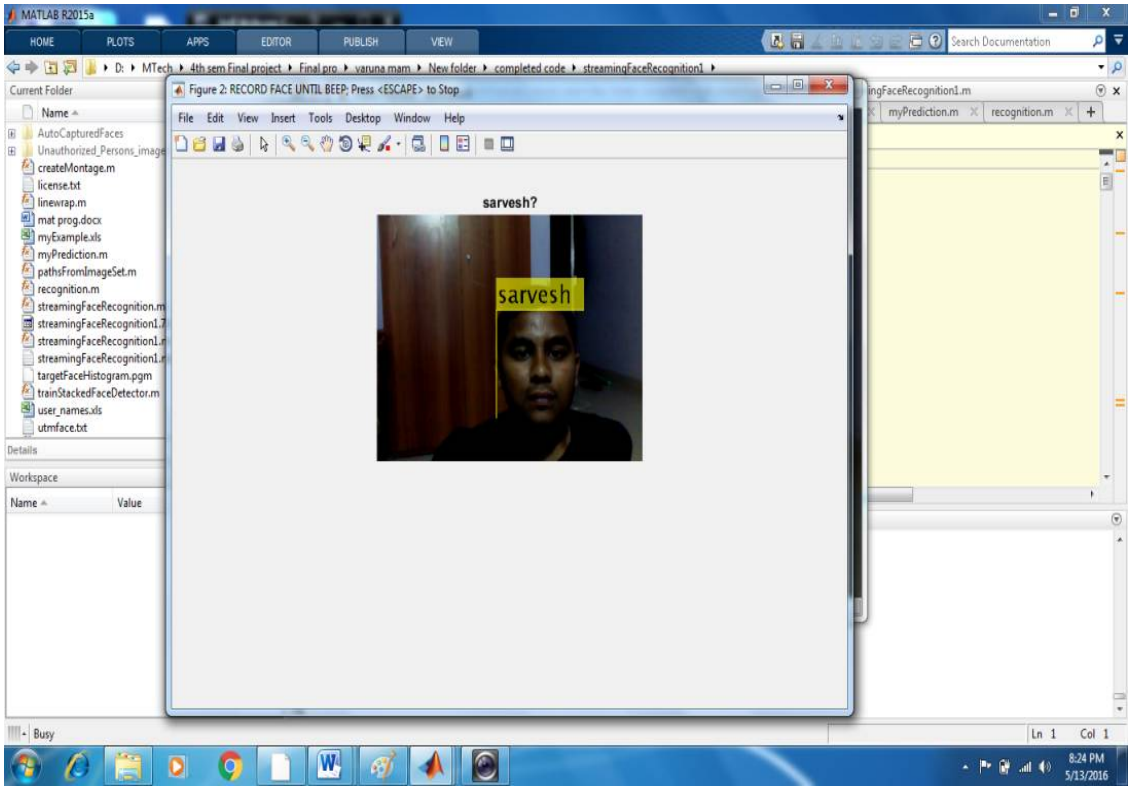

Fig. 9: Face Recognition output when paired.

Outputs of face recognition when paired is shown in the fig. 9and when not paired can be seen in fig. 10.

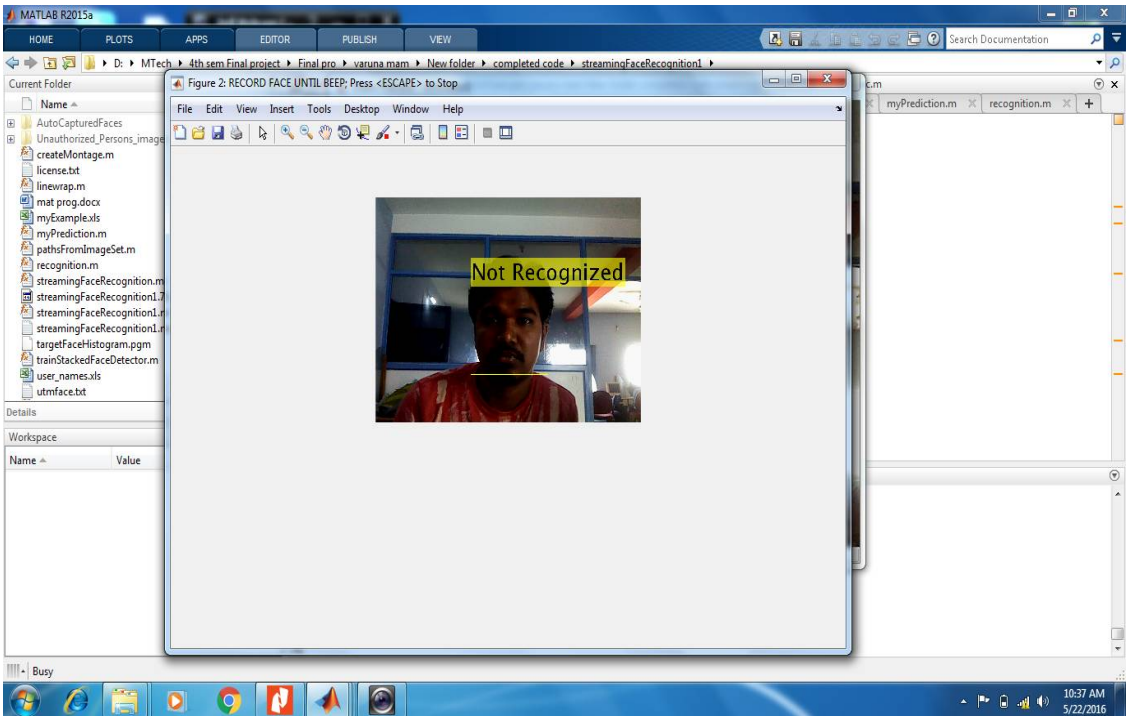

Fig. 10: Face Recognition output when not paired.

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ISSN (Online): 2278 – 8875

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VI. CONCLUSION

Generally this face recognition is a big challenge as there is a chance of high uncertainty due to the external lighting conditions, so we are taking the advantage of histograms and LBP (Local Binary Pattern), which are less effected to the external environment. An intelligent portable human recognition and identification system is proposed in this project using an ARM 7 based microcontroller and Matlab based machine. The proposed face detection method is based on a cascade of simple classifiers to handle each part of the integral image. The design of whole system consisted of two part which are hardware and software.

The system contained the second verifying methods which were inputting owner's password in order to make the other people gain the permission of owner's to use the vehicle. The security features were enhanced largely for the stability and liability of human-face recognition. This technology FRS using Matlab provides user to know more about the visitor besides a notice which usually left from visitor. The system has successfully implemented in the real time environment with capability to capture the object that appears in front of the camera. If another GPRS module is added in, the image data could also sent to an information server and sends the image through MMS.

VII. FUTURE WORK

The proposed framework will be more efficient by implementing the GSM of high baud rate and also including GPS module for the co-ordinates and it is obvious that the result of this face recognition system is good but there is scope for future improvement. Because of time limitations we were not ready to execute a few goals that ought to have improved the exploration work a suggestion. The principle change will seek after the exhibitions, perceives the ongoing face acknowledgment. I might want to enhance my code for face picture acknowledgment and also tidy up the code keeping in mind the end goal to enhance execution. Numerous challenges has been confronted when perceived face pictures from database, for example, lighting varieties, expression varieties, age varieties, and facial impediments. In future to enhance the posture remedy, quality based edge determination, maturing correction, and stamp based coordinating procedures can be joined to manufacture a unified framework for video based face acknowledgment.

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