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FACE RECOGNITION SYSTEM FOR UNLOCKING AUTOMOBILE USING GSM AND EMBEDDED TECHNOLOGY

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Abstract - *In this modern age there is rapid increase in number of vehicles and so is the number of vehicles theft attempts, locally and internationally. With the invention of strong stealing techniques, owners are in fear of having their vehicles being stolen from common parking lot or from outside their home. Thus the protection of vehicles from theft becomes important due to insecure environment. The proposed vehicle security system performs image processing based real time user authentication using face detection and recognition techniques and microprocessor based control system fixed on board with the vehicle. When the unknown person enters the parked car overcoming the existing security system, the infrared sensor attached to the driver's seat of the vehicle activates the hidden camera fixed in appropriate position inside the vehicle. As soon as face of the person is detected using that hidden camera. The extracted face is recognized proposed which by comparing the principal components of the current face to those of the known user in a facial database built in advance. When the person is not authenticated, the face of the person which is classified as unknown is sent to the email of the owner as a MMS through the software. This would be effective to authenticate the person under different environment and to have an efficient way of vehicle security. In case of accident happened the vibration sensor provides signal to the microcontroller. The microcontroller receives the location from the GPS and sent to the mobile of the owner as a SMS through operating GSM modem.*

KEYWORDS: Arduino Processor, GSM Module, GPS Module, Camera, Vibration Sensor.

1. INTRODUCTION

The use of vehicle becomes essential everywhere in the world and also preventing it from theft is required. Vehicle manufacturers are attaining the security features of their products by introducing advanced automated technologies to avoid the thefts particularly in case of cars. Biometric and non-biometric methods usually provide such security features. Sometimes these systems fail due to hacked password and encryption of decrypted data, but it is almost impossible to make replica of distinctive characteristics. Biometric systems are modern and use techniques like fingerprint recognition and face recognition. Of these face recognition and detection systems are more sophisticated, easy to deploy and people can be identified without their knowledge. Some advantages of facial recognition method for vehicle security application are:-

1. More convenient, sensed as soon as one is seated in position.
2. Low cost and a better approach to be used with existing methods.
3. Requires no active part of the user.

In this security system, the objective is to prevent the theft of vehicle and ensure safety of vehicle by avoiding the means of theft. One level of ensuring authentication of driving is through face recognition system that authenticates a user being an authorized person to have access to the ignition system. The microcontroller based control system fixed inside the vehicle uses GPS receiver, GSM modem and captures image from the camera on detection of person in the parked vehicle. Face is detected and recognized using algorithm overcoming the pose and illumination constraints. The recognized image is compared with the authorized image of users in the database. If matched, the system allows operating the vehicle. If not matched, it sends email of face and GPS values to the owner. This helps the owner in making decision about the control of vehicle. The owner decides and commands the system to prevent the access of the vehicle or to allow the person to operate the vehicle. The system is also designed to provide alert in case of accident or collision in case of the car.

2. METHODOLOGY

The block diagram and circuit diagram for that system is as follow

2.1 BLOCK-DIAGRAM

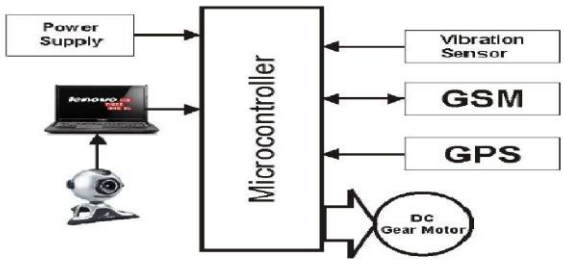

Fig.1: Block diagram of Face Recognition System for Unlocking Automobile Using GSM & Embedded Technology

The above diagram represents the complete architecture of the proposed system. In these days, automobile thefts are increasing at an alarming rate all over the world. So to escape from these thieves most of the vehicle owners have started using the theft control systems. The commercially available anti-theft vehicular systems are very expensive. Here, we make an attempt to develop an instrument based on arduino microcontroller and operated using email, GPS and GSM technology. The instrument is a simple and low cost vehicle theft control embedded system. The Global System for Mobile communications (GSM) is the most popular and accepted standard for mobile phones in the world established in 1982 and it operates in 800 MHz frequency.

2.1.1Microcontroller

Micro controller Based Circuitry is the BRAIN in our system. The microcontroller we have implied here is atmega16. The ATmega328 is a low power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. AVR is modified Harvard architecture 8 bit RISC single chip microcontroller which was developed by Atmel in1996. ATmega328 is high performance low power Atmel AVR 8 bit microcontroller. The controlling unit of the system consists of a microcontroller Atmega328. This microcontroller is used to control the system as per the output of the software of the designed system. This microcontroller receives data from the computer and accordingly allows or denies the access of the vehicle.

2.1.2 GSM module

Global System for Mobile communication (GSM) is a wireless modem that works with a GSM wireless network for mobile communication. GSM module in our proposed system is used for establishing the communication between the vehicle and the us The system consists of a GSM modem which is used to send alert message to the owner's vehicle in case of accident or collision happened in case of the vehicle. This GSM modem is interfaced with the microcontroller as shown in the architecture of the system.

2.1.3 GPS Receiver:

The Global Positioning System (GPS) is a space-based satellite route framework that gives area and time data in all climate conditions, anyplace on or close to the Earth where there is an unhampered observable pathway to four or more GPS satellites. In this system we have interfaced a GPS receiver to obtain the exact location of the vehicle for the owner's information. This GPS receiver is interfaced with the microcontroller and provides the longitude and latitude coordinates to the microcontroller.

2.1.4 Camera Module:

In this system a camera is interfaced with the computer/laptop as shown in the above diagram. This camera is used to capture the face image of the driver of the vehicle or one who is trying to access that vehicle. This camera captures the images of the driver and sends to the computer through USB connection. The computer has installed MATLAB software which is used to process and match the image with the database images for the access control of the vehicle camera module is used to capture the image of the user who is trying to access the vehicle in which the proposed system is implemented for security system. In this system a.

2.1.5 Vibration Sensor:

This sensor is used to detect the accident or collision in case of that vehicle in which the system is implemented for security and protection.

2.1.6 DC Motor:

The system has a DC motor interfaced with the microcontroller which will start rotating in case of access allowed by the system after verification. This is used for the demo purpose as a vehicle.

2.1.7 LCD:

This is a 16x2 LCD display interfaced with the microcontroller for the above mentioned function

2.2 CIRCUIT DIAGRAM

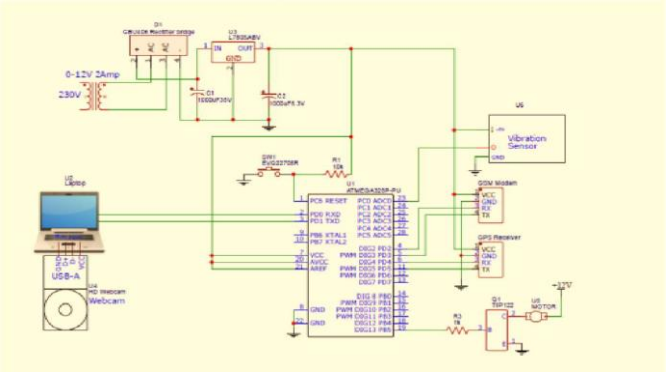

Fig. 2: Circuit diagram of Face Recognition System for Unlocking Automobile Using GSM & Embedded Technology

Above figure shows the Face Recognition Based Vehicle Access by using ATmega328 microcontroller. This system is accomplished to use various electronic components. This system can be simply divided into three main categories: the input, the processing and the output units. The detail circuit

diagram of the system is shown. This system composed of sensor circuits, microcontroller, motor, recognition system, and power supply.

The circuit diagram of the system is as shown in the figure above. The circuit starts with the power supply. The supply is provided through mains i.e., 230v. The supply is stepped down to 12v from 230v through transformer. Hence at the secondary terminal of the transformer we get 12v AC. This ac output of the transformer is converted into DC with the help of the full bridge rectifier. The output of the rectifier is 12v DC. This 12v is provided to the regulator IC. This regulator IC used is LM7805. The input to the regulator is provided at pin no 1 of the regulator and the output is taken out at pin no 3 of the regulator IC. The ground is provided at pin no 2 of the regulator. The 5v from one IC is provided to the controller. An LED is connected in between the regulator and the controller to indicate whether the power is on or off. The capacitor at the input and the output of the regulator is used to remove the ripples in the signal i.e., this are filter capacitor.

The power supply is provided to the pin number 7 which is VCC pin of the microcontroller also to the pin number 20 and 21 as shown in circuit diagram. A reset switch is connected to the RESET pin number 1 of the controller. This switch is used to reset the microcontroller if required.

In this system the output of the face recognition system developed in the MATLAB software is provided to the microcontroller through computer serially as shown in the circuit diagram. This output from the computer is provided to the RX and TX terminals of the controller as shown.

The vibration sensor used to detect accident or collision is interfaced with the microcontroller and is connected to the pin number 23 of the microcontroller. The required power supply for this sensor is provided to the VCC terminal of the sensor and remaining terminal is connected to the ground for completing the circuit.

GSM and GPS modem are also interfaced with the microcontroller and are connected to the pin number 4, 5 and 6, 11 respectively. These modems are used to receive the location of the vehicle from the satellite and to send alert SMS to the owner of the vehicle.

To show the starting of the ignition system of the vehicle we have used a DC motor connected with the microcontroller through a transistor as shown in the circuit diagram of the system. This DC starts rotating if the face recognition of the person is verified and system allows access to the person.

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