

FACE IDENTIFICATION IN SMART CAR SECURITY SYSTEM IN REAL TIME

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Abstract-The main aim of this project is to offer advance security system in car, which consist of a face detection system, a GPS module, a GSM module and a control platform. The system is mainly used to identify the car and the thief who theft the car. FDS (Face Detection System) is used to detect the face of the driver and compare it with the port folio. The GSM plays an important role in this system. When the owner detects that his car was lost. Then immediately he can transfer the message from his mobile with the specified SIM which is predefined in the car module. The control depends upon the message received. The owner can able to perform door locking, car stopping, and alarm generation through his message from his mobile. The GPS module in the car detects the location of the car when the stop comment is passed from the owner and transfers location as longitude and latitude information along with the operation performance acknowledgment. For each message the reply is transferred after completion of specified control operation, for example if the GPS in car receives the message as !STOP then it stops the car and transfers the message to the owner as the stop is succeeded along with longitude and latitude information. So by this system the detection of thief image and the location of the car are simply smart and cheaper than traditional one.

Keywords –Vehicle Security video Camera; GPS; GSM; embedded system.

I.INTRODUCTION

Objective of the system:

The proposed system is used to detect the image of the thief and it controls the operation that is start and stop operation. Thus the control is performed with the help of GSM. In the car one GSM module is placed where one SIM inserted into that module. This module is performing the control over the car only with the owners SIM number. When the owner recognizes that the car was lost. Then he can able to lock the door, capture the image of the driver and stop the car. The location of the car is detected by the GPS module and transfers the location to the owner's mobile with the latitude and longitude specification. So that the car theft is controlled easily.

With ARM7 as the core, the new intelligent vehicle security system integrated a lot of hardware modules such as video capture, GPS positioning and wireless transmission, the design of the system software used the embedded software developing platform on. By the hardware/software co-design, the new intelligent vehicle security system implemented the functions of video capturing, GPS positioning and wireless transmission, met the needs of vehicle owners about Vehicle Security.

A. Overview:

In the car the system includes with GSM module, door lock system, start and stop controller, buffer, and camera. In this section, the GSM plays vital role. Because the components above said are controlled with the received messages. The system performs the control operation only for the messages which are transferred from specified owners SIM. Traditional car security systems rely on many sensors and cost a lot. When one car is really lost, no more feedback could be valid to help people to find it back. We put forward this technique to be applied in car security system because this kind of technique is effective and fast, and one alarm signal could be given to make an alarm or “call” the police and the host soundlessly with the help of other modules in the system prototype.

Many new face detection techniques have been developed to achieve higher detection rate and faster. In this embedded smart car security system, FDS (face detection subsystem) aims at detect somebody's face in the car during the time in which owner sent a message to on camera. FDS obtains images by one tiny digital camera which can be hidden easily in somewhere in one car. When FDS detects one face in alarm period, one alarm signal will be sent to the control central of the system.

An alarm or a “silent” alarm will be triggered according to the use's settings. In silent alarm pattern, no direct alarm will be made, but several modules are working at inform owner and the police several important data, for example, the precise location of the

car. The GPS module obtains the precise locality by parsing received GPS signal. The GSM module can send the information out by SMS (Short Message Service) message, including real-time position of the “lost” car and even the images of “the driver”.

B. Biometric recognition:

Biometrics (or biometric authentication) refers to the identification of humans by their characteristics or traits. Biometrics is used in computer science as a form of identification and access control. It is also used to identify individuals in groups that are under surveillance. Biometric identifiers are the distinctive, measurable characteristics used to label and describe individuals. Biometric identifiers are often categorized as physiological versus behavioral characteristics. Physiological characteristics are related to the shape of the body. Examples include, but are not limited to fingerprint, face recognition, DNA, palm print, hand geometry, iris recognition, retina and odour/scent. Behavioral characteristics are related to the pattern of behavior of a person, including but not limited to typing rhythm, gait, and voice..

More traditional means of access control include token-based identification systems, such as a driver's license or passport, and knowledge-based identification systems, such as a password or personal identification number. Since biometric identifiers are unique to individuals, they are more reliable in verifying identity than token and knowledge-based methods.

C. Digital image processing:

Digital image processing is the use of computer algorithms to perform image processing on digital images. As a subcategory or field of digital signal processing, digital image processing has many advantages over analog image processing. It allows a much wider range of algorithms to be applied to the input data and can avoid problems such as the build-up of noise and signal distortion during processing.

II. SYSTEM IMPLEMENTATION

A. The control 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 8051 microcontroller and operated

using 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 900 MHz frequency. Over billion people use GSM service across the world. The utility of the GSM standard makes international roaming very common between mobile phone operators, enabling subscribers to use their phones in many parts of the world. GSM differs significantly from its predecessors in both signalling and speech clarity, as its channels is digitized. It means that the GSM system is now considered as a third generation (3G) mobile communication system.

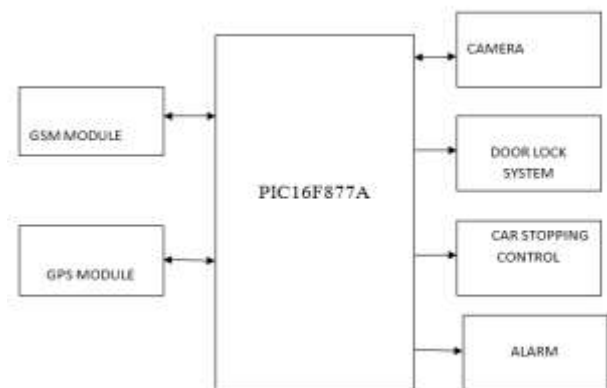


Fig -Block diagram of the system

B. Face detection:

Face detection is a computer technology that determines the locations and sizes of human faces in arbitrary (digital) images. It detects facial features and ignores anything else, such as buildings, trees and bodies. Face detection can be regarded as a more general case of face localization. In face localization, the task is to find the locations and sizes of a known number of faces (usually one). In face detection, one does not have this additional information.

In this paper, we will implement a face recognition system using the Principal Component Analysis (PCA) algorithm. The face recognition systems tries to find the identity of a given face image according to their memory (training set).

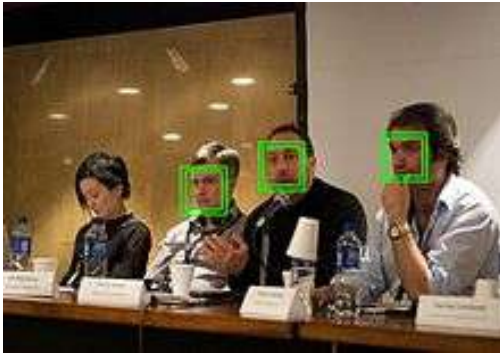


Fig Automatic face detection

B. Face recognition:

The memory of FDS consists of Training Set. In this paper, our training set consists of known face images of different persons. Thus, the function of the face recognizer is to find the most similar average face vector among the training set to the average face vector of a given test image. Here, we want to identify the person entering the car by comparing with the person (test image) given to the system.

Face recognition algorithm:

Face recognition algorithms are used in a wide range of applications viz., security control, crime investigation, and entrance control in buildings, access control at automatic teller machines, passport verification, identifying the faces in a given databases.

The Principal Component Analysis (PCA) approach is also known as Eigen faces. PCA is a useful statistical technique that has found application in fields such as face recognition and image compression, and is a common technique for finding patterns in data of high dimension. The basic goal is to implement a simple face recognition system, based on well-studied and well-understood methods. One can choose to go into depth of one and only one of those methods. The method to be implemented is PCA (Principle Component Analysis). It is one of the most successful techniques of face recognition and easy to understand and describe using mathematics. This method involves the Eigen faces.

In PCA the first step is to produce a feature detector (dimension reduction). Principal Components Analysis (PCA) was chosen because it is the most efficient technique, of dimension reduction, in terms of data compression. This allows the high dimension data, the images, to be represented by lower dimension data and so hopefully reducing the complexity of grouping the images.

C. Video security:

Webcams are also used as security cameras. Software is available to allow PC-connected cameras to watch for movement and sound, recording both when they are detected. These recordings can then be saved to the computer, e-mailed, or uploaded to the Internet. In one well-publicized case, a computer e-mailed image of the burglar during the theft of the computer, enabling the owner to give police a clear picture of the burglar's face even after the computer had been stolen.

D. Embedded control platform

The embedded control platform is built on one SoC (SEP4020), SEP4020 works at 100MHz, and there are one 8KB data/instruction cache, one MMU, 64KB ESRAM and many functional modules in it. SEP4020 is one low-power SoC, suitable for industry control systems especially with TFT displays. All face detection codes are realized by standard C language for achieving better portability to be ported from one chip to another without any change. Since the face detection process is also done in the chip by pure software method without any other hardware accelerator, we need some ways to optimize the process because low-end ARM chip is not good enough at computing

E. Input control devices:

Special software can use the video stream from a webcam to assist or enhance a user's control of applications and games. Video features, including faces, shapes, models and colors can be observed and tracked to produce a corresponding form of control. For example, the position of a single light source can be tracked and used to emulate a mouse pointer; a head mounted light would enable hands-free computing and would greatly improve computer accessibility. This can be applied to games, providing additional control, improved interactivity and immersiveness. Free Track is a free webcam motion tracking application for Microsoft Windows that can track a special head mounted model in up to six degrees of freedom and output data to mouse, keyboard. By removing the IR filter. The webcam, IR LEDs can be used, which has the advantage of being invisible to the naked eye, removing a distraction from the user. Track IR is a commercial version of this technology.

F. Technology:

Webcams typically include a lens, an image sensor, support electronics, and may also include a microphone for sound. Various lenses are available, the most common in consumer-grade webcams being a plastic lens that can be screwed in and out to focus the camera. Fixed focus lenses, which have no provision for adjustment, are also available. As a camera system's depth of field is greater for small image formats and is greater for lenses with a large f-number (small aperture), the systems used in webcams have a sufficiently large depth of field that the use of a fixed focus lens does not impact image sharpness to a great extent. Image sensors can be CMOS or CCD, the former being dominant for low-cost cameras, but CCD cameras do not necessarily outperform CMOS-based cameras in the low cost price range. Most consumer webcams are capable of providing VGA resolution video at a frame rate of 30 frames per second.

Support electronics read the image from the sensor and transmit it to the host computer. The camera pictured to the right, for example, uses a Sonix SN9C101 to transmit its image over USB. Typically, each frame is transmitted uncompressed in RGB or YUV or compressed as JPEG. Some cameras, such as mobile phone cameras, use a CMOS sensor with supporting electronics "on die",

G. Images from the Camera

In the system prototype, one USB camera is used to catch images in car, and the data are transmitted to FDS module by USB channel, and the data are transferred into jpeg format files by the chip embedded camera before the transmission. Every image is set to be 320*240 pixels in resolution ratio to remain small in size and could be detected fast. To reduce the hardware cost of the car security system, we realize the face detection process in pure software method. All calculations are done on one ARM7 SoC named "SEP4020", with cache and MMU, and its main frequency is 100MHz. To make the detection process more a few optimization ways have been tried.

H. MMS Module:

In case if the face of the person does not match with the training set, System will send a bit suggesting entry of unauthorized person in the car and thus it will activate the MMS module present in that system. The role of MMS module is to send the image of that unauthorized person on the owners Mobile. Owner will response to this MMS

through text, suggesting whether to stop the car or continue it.

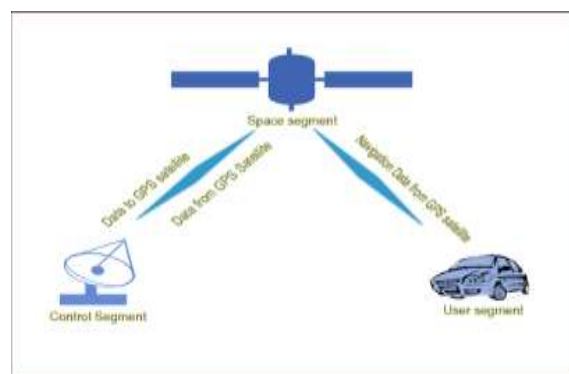
III GSM MODULE

To achieve important information of cars, one GSM module is added into the car security system. Siemens TC35I GSM modem can quickly send SMS messages to appointed mobile phone or SMS server. So the owner and the police can be informed at the first time. If another GPRS module is added in, the image data could also sent to an information server, and the real-time circumstance in the car could be seen.

IV. GPS MODULE

GSM (Global System for Mobile Communications, originally *Group Spécial Mobile*), is a standard developed by the European Telecommunication Standards Institute (ETSI) to describe protocols for second generation (2G) digital cellular network used by mobile phones. It became the de facto global standard for mobile communications with over 80% market share.

The GSM standard was developed as a replacement for first generation (1G) analog cellular networks, and originally described a digital, circuit-switched network optimized for full duplex voice telephony. This was expanded over time to include data communications, first by circuit-switched transport, then packet data transport via GPRS(General Packet Radio Services) and EDGE(Enhanced Data rates for GSM Evolution or EGPRS)



GPS technique has been widely used both in military equipments and civil devices in recent years. We choose Jupiter TU30 GPS module to offer the location of the car in time. TU30 has a UART (Universal Asynchronous Receiver/Transmitter), which can be used to communicate with many other embedded devices. It is easy to get a serial of char from TU30 at 9600 bps speed

from the UART interface, and the string accords with NMEA-0183(The National Marine Electronics Association) standard. After parsing the string, longitude, latitude, speed and so on of the car can be obtained to judge the precise location of the car now.

GSM/ GPRS Features:

- High Quality Product (Not hobby grade).
- Dual-Band GSM/GPRS 900/ 1800MHZ.
- RS232 interface for direct communication with computer or MCU kit.
- Configurable baud rate.
- Wire Antenna (SMA connector with GSM Antenna Optional).
- SIM Card holder.
- Built in Network Status LED.
- Inbuilt Powerful TCP/IP protocol stack for internet data transfer over GPRS.
- Normal operation temperature: -20 °C to +55 °C.
- Input Voltage: 12V DC.

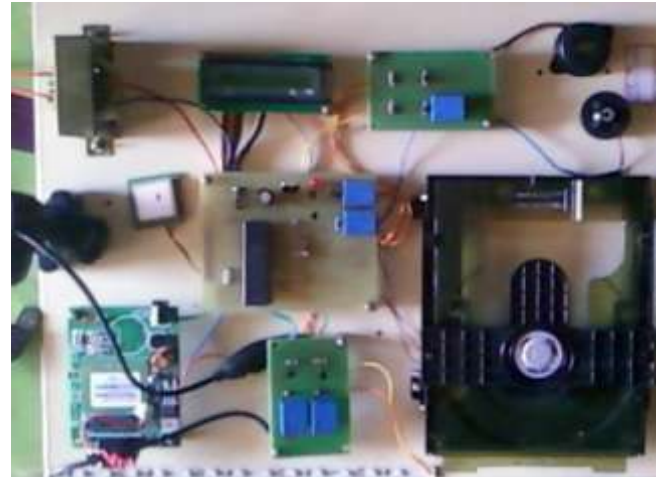
V. FEATURES

- Enhanced Wireless Control System
- Availability: wide range of monitoring as based on mobile GSM network.
- Reliability: Two tier securities are highly reliable.
- Portability: This system can be easily implemented in different cars.
- Scalability: The system can be easily transformed to three-tier security system.
- Less cost and compact.

V. RESULT ANALYSIS

Result:

The system lock the door, generates a buffer sound, detect thief image by camera and stop the car.



After completion of each of this controlling operation a message is transferred to the owner as an acknowledgment. The door system will get locked. If the system is unlocked then the system locks door else if the system is already locked it keeps the lock. And the message is transferred “the door locked successfully” is transferred as acknowledgement.

It stops the motor and detects longitude and latitude information. The alarm sound is produced. It transfers the message as “the car stopped successfully” and latitude and longitude information are transferred. And the camera detects the image of the driver seat the detected image is transferred to owner’s PC. It helps to track the hijacker

VI. CONCLUSION

From this we implement theft control techniques that can provide the important functions required by advanced intelligent Car Security, to avoid vehicle theft and protect the usage of unauthenticated users. Secured and safety environment system for automobile users and also key points for the investigators can easily find out the hijackers image. We can predict the theft by using this system in our day to day life. This project will help to reduce the complexity and improve security, also much cheaper and ‘smarter’ than traditional ones.

Because of the flexibility of embedded system, the embedded smart car security system is extendable for special purposes, We use timer control module, one functional module of SEP4020 which is precise in microsecond order, to test the face detection speed. Experiment results show that it takes about 6 seconds to detect one 320*240 colour jpeg image by software which is running on SEP4020. It seems to be too long to be used in “real-time” detection, but as

discussed in previous chapter, the driver could not leave the seat very soon, so it is also “fast” enough and valuable for a low-cost, low-power and smart car security system without additional hardware modules.

During the experiments, we find out that the face detection module cannot detect those faces not in front of camera, for example, when there is a big angle between face and the camera. It proves to us that the detection algorithm cannot detect all kinds of faces, and the camera need to be fixed toward the face of the driver if possible.

From this we can identify the thefts by using the face detection. By using GSM we can automatically lock the door through the message from the owner’s mobile stop message will be send from the owner’s mobile to the car system manual after the completion of the work acknowledgement will be received like car is stopped

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