

Design of A Low Cost Extendable Embedded Smart Car Security System

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Abstract - The main aim of this proposed embedded car security system is, If the car is stolen, this system is designed to retrieve the position of the car and the car thief, and make an alarm loudly or soundlessly. The other modules transmit necessary information to users and help to keep eyes on cars all the time, even when the car is lost. Which consists of a face detection subsystem, a GPS module, a GSM module and a control platform? It captures the image using a camera which will be hidden in the dash board. Face Detection Algorithm is used to detect the face., In today's world, many new techniques such as biometric recognition technique, image processing technique, communication technique and so on, have been integrated into car security systems. At the same time, the amount of car lost is also increasing. The system is mainly used to identify the car and the thief who theft the car. This system prototype is built on the base of one embedded platform ARM7 which controls all the processes. Experimental results illuminate the validity of this car security system.

Keywords- Vehicle Security Camera; GPS; GPRS; embedded system, ARM7.

I. INTRODUCTION

This proposed embedded car security system, FDS (Face Detection System) is used to detect the face of the driver and compare it with the predefined faces. For example, in the night when the car's owner is sleeping and someone theft the car then FDS obtains images by one tiny web camera which can be hidden in the car. FDS compares the obtained image with the predefined images if the image doesn't match, then the information is sent to the owner through MMS. So now owner can obtain the image of the thief in his mobile as well as he can trace the location through GPS.

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.

II. SYSTEM COMPONENTS

As shown in the figure 1, this system builds a new intelligent vehicle checking system based on ARM7 embedded processing technology, processing technology of digital videos, vehicle identification technology, GSM wireless mobile telecommunication technology, GPS positioning technique, implements the security to vehicles. This system has the following features:

1) *Image Capture*: When the system works, the camera in the car capture the Image of driver automatically and saves it in the video buffer.

2) *ARM7-based embedded system (AES)*: The AES is termed to the heart of System. It is designed based on a low power 32-bit ARM7. It is a high performance and Low cost solution for network applications.

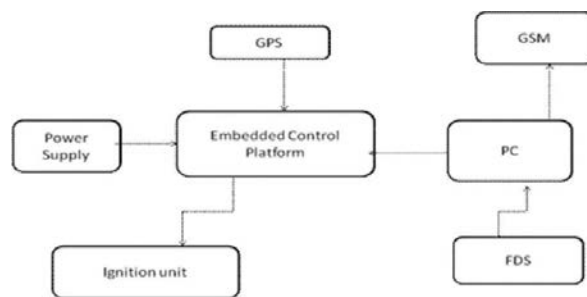


Fig.1 System components

3) *GPS module*: The system can correctly send the position of vehicle to the server center by GPS positioning. The GPS module obtains the precise locality by parsing received GPS signal.

4) *GSM module*: A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem sends and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves. 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”.

III. HARDWARE DESIGN

Smart vehicle Security system is composed of ARM7 microprocessor, peripheral equipment, and video capture, GPS positioning module, wireless telecommunication module and remote control receiver. The detailed hardware composition is shown in figure 2

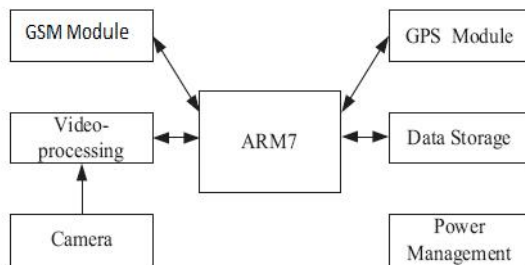


Fig.2 Hardware of Security System

A. ARM7 PROCESSOR

The circuit of ARM7 microprocessor and peripheral equipment includes a ARM7 chip, a clock circuit, a reset circuit, a 32MB flash memory, . All of these make up the control and process core of the system. The on chip features can significantly reduce the total system cost to design network devices. It has 8 kB to 40 kB of on-chip static RAM and 32 kB to 512 kB of on-chip flash memory, so it can execute longer programming code and has larger RAM to store more data.

B. IMAGE RECOGNITION AND PROCESSING

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 nobody should be in the car,. FDS obtains images by one tiny digital camera which can be hidden easily in somewhere in one car.

FDS is used to detect the face of the driver and compare it with the predefined face, whenever person enters in car FDS obtains images of that person by one web camera. FDS compares the obtained image with the predefined images if the image doesn’t match then the information is send to the owner through MMS.

C. GPS MODULE

The GPS module can receive the data by connected to ARM7 development-board URAT0 through RS232 port.

When the ARM7 chip sends the instruction AT to GPS module, the GPS module starts receiving the data and saves it into memory. This instruction sends the region information with the vehicle license information to the support-server center through GSM net. Because the system is based on GPS data which is sent through GPRS net, it must be initialled at first. Reset User settings initialized Following are the some instructions that are associated with GPS module and are useful in the system design. The default address is the SIM card mobile phone number which contains 11 numbers, the address can be changed as required.

D. GSM MODEM

A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem sends and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves.

A GSM modem can be an external device or a PC Card / PCMCIA Card. Typically, an external GSM modem is connected to a computer through a serial cable or a USB cable. A GSM modem in the form of a PC Card / PCMCIA Card is designed for use with a laptop computer. It should be inserted into one of the PC Card / PCMCIA Card slots of a laptop computer. Like a GSM mobile phone, a GSM modem requires a SIM card from a wireless carrier in order to operate.

As mentioned in earlier sections of this SMS tutorial, computers use AT commands to control modems. Both GSM modems and dial-up modems support a common set of standard AT commands. You can use a GSM modem just like a dial-up modem.

In addition to the standard AT commands, GSM modems support an extended set of AT commands. These extended AT commands are defined in the GSM standards. With the extended AT commands, you can do things like:

Reading, writing and deleting SMS messages. Sending SMS/MMS messages. Monitoring the signal strength. Monitoring the charging status and charge level of the battery.

IV. SOFTWARE DESIGN

Following are the different software’s used to design a smart car security system

A. KEIL C

Keil software is the leading vendor for 8/16-bit development tools. Keil software is represented worldwide in more than 40 countries, since the market introduction in 1988; the keil C51 compiler is the de facto industry standard and supports more than 500 current device variants. Now, keil software offers development tools for ARM. Keil software makes C compilers, macro assemblers, real-time kernels, debuggers, simulators, integrated environments, and evaluation boards for 8051, 251, ARM and XC16x/C16x/ST10 microcontroller families.

B. FLASH MAGIC

Flash magic can control the entry into ISP mode of some microcontroller devices by using the COM port handshaking signals to control the device. Typically the handshaking signals are used to control such pins as Reset, PSEN and VCC. The exact pins used depend on the specific device.

When this feature is supported, Flash Magic will automatically place the device into ISP mode at the beginning of an ISP operation. Flash Magic will then automatically cause the device to execute code at the end of the ISP operation.

C. MATLAB

This is the tool used for the image recognition and image processing. Using this code captured image is compared with the previously stored images and the result is given to processor whether person is authenticated or not.

V. CONCLUSION

From this we implement image-recognition 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. The System offers a widely communication bandwidth with the car control system to change data and information, and new functional modules can be easily added to the system to upgrade and enhance it.

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