A Novel Method For Vehicle Authentication And Theft Control System Based On Voice Recognisation

Venkaiah. J
M-Tech Student
Department of ECM
K L University, Guntur,
Andhra Pradesh, India

Narendra Babu. T
Asst professor
Department of ECM
K L University, Guntur
Andhra Pradesh, India

Kondalrao. Punati
Research Scholar
Department of ECM
K L University, Guntur,
Andhra Pradesh, India

ABSTRACT
The main objective of this paper is to develop an embedded system, which is used to authenticate the engine status by voice recognition and password authentication. It also includes MEMS sensor which provides details regarding accident, when accident occurs to the engine, here the entire communication between system and authorization persons by using GSM. We present a novel anti-theft control system for automobiles that tries to prevent the theft of a vehicle using the voice authentication, whenever voice is not matched with the reference, automatically sends data in form of message i.e. position values using GPS and vehicle number i.e. (provided the number is to be registered to the authentication novel control system) to the police and owner. Otherwise if voice matches, the system present in the car asks for the user to enter a unique password. If the user fails to enter the correct password in three trials, a text message is sent to the police and owner with the vehicle number and the location tracked using a GPS module about unauthorized usage using GSM.

General Terms
Voice-recognisation-techniques,
GPS-positioning,
GSM-communication-methodologies,
Sensor-interfacing and
Authentication techniques

Key Words
GSM, GPS, MEMS sensor, SMS, ARM7TDMI, Voice recognizer

1. INTRODUCTION
Embedded system is defined as, a particular/specific application implemented with the software code to interact with hardware. Software is used for providing features and flexibility, Hardware {Processors, ASICs, Memory} is used for Performance (& sometimes security). There are many definitions of embedded system but all of these can be combined into a single concept. An embedded system is a special purpose computer system that is used for particular task. In recent years, vehicle thefts are increasing at an alarming rate around the world. People have started to use the theft control systems installed in their vehicles

that are commercially available. Anti-theft vehicular systems are very expensive. General it's scheme involved a microcontroller, GSM modules [1], GPS with most popular standard.

GSM is used both in signaling and speech channels which is digital, i.e. that it is of a second generation (2G) mobile phone system. Communication can also used as a mode of security, with which various anti-theft control systems have developed over the past few years. An integrated Info-Security Circuit Board [3] & [7] that uses ECUs and sensors inside a vehicle using CAN bus, LIN bus, Flex Ray and MOST Bus to communicate with other vehicles, road-side infrastructure and mobile phones using wireless interfaces. The main drawback within these systems is data timeliness and network delays that is used to realize the reliable security methods involves within modules used in car communications. Systems varies from each other based on components used ie usage of arm ,microcontrollers and other processors and GSM/CDMA for communication and others [4], considering design, computing methods of device [6] with reference to statistical analysis of anti-theft control system as mentioned in [7]. The limitation in existing systems is most, requires a secure processor and smart card chips to store in the Group Identification Number. With remote controlled security systems that disable an automobile and its key automatically when it is stolen added secure vehicle-communications. In this paper we are presenting low cost embedded system i.e.. a novel anti-theft control system for automobiles that tries to prevent the theft of a vehicle using the voice authentication, whenever voice is not matched with the reference, automatically sends data as a message i.e. position values obtained using GPS and vehicle number i.e. (provided the no is to be registered to the authentication novel control system) to the police and owner. If voice matches, the system present in the car asks for the user to enter a unique password (consists of few characters and the car key number). If the user fails to enter the correct password in three trials, a text message is sent to the police and owner with the vehicle number and the location tracked using a GPS module about unauthorized usage using GSM. Here in this embedded system we are also using MEMS sensor for detecting accidents. Whenever accident happens large vibrations will be resulted which was detected MEMS sensor and give the signals to the arm processor, with respect to MEMS signals the control system sends position values using GSM to the authorized third party registered person and police regarding status of car i.e. accidents etc...

.

2. BLOCK DIAGRAM

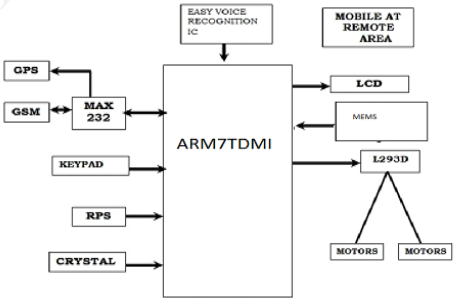

Fig 1: Block diagram

An embedded system is developed; this is used to authenticate the engine by voice recognition and password authentication, also includes MEMS sensor which provides details regarding accident i.e. when accident occurs to the engine, entire communication between system and authorization persons done by using GSM. Using this novel anti theft control system with automobiles prevents the theft and accidents controlling , this design includes ARM 7TDMI

operated at voltage(+3v) as a processor which is connected with voice recognizing ic (ICHM2007) having memory and ability to accept the data, compare with reference provided and providing results to processor, GSM module used in communication & GPS modules to track the position which are interconnected via MAX232, KEYPAD to provide input, RPS,CRYSTAL,LCD (to display output),MEMS sensor for detecting accidents, L293D for controlling engine as per results i.e. preventing un-authorization usage, we had in detail discussed about the components and there usage ,and the way they overcome the limitations in previous systems

3. HARDWARE

3.1 ARM 7 TDMI

ARM core and is widely used across a range of applications, most notably in many digital mobile telephones. The ARM7 is a 3 volt compatible rework of the ARM6 32-bit integer core, the Thumb 16-bit compressed instruction set, on-chip Debug support, enabling the processor to halt in response to a debug request and an enhanced Multiplier, with higher performance than its predecessors and yielding a full 64-bit result and Embedded ICE hardware to give on-chip breakpoint and watch point support. The ARM7TDMI has been fabricated on a large number of different CMOS process technologies, some supporting clock rates over 100 MHz and others enabling operation at 0.9 V (thereby allowing a single-cell battery to be used as the source of power). Typical applications in production at the time of writing use a 3.3 V supply on a 0.35 um process yielding a clock rate of up to 66 MHz, but the trend is, of course, towards smaller transistors, lower supply voltages and higher clock frequencies**.** The ARM7TDMI [5] core is a basic ARM integer core using a 3-stage pipeline with a number of important features and extensions

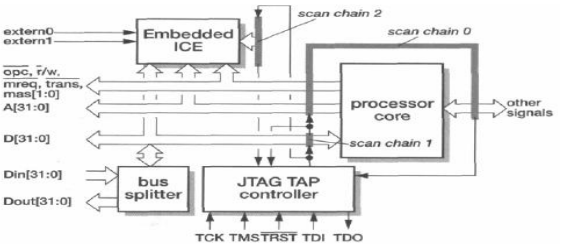

Fig 2: ARM 7 TDMI Organization

It implements ARM architecture version 4T, with support for 64-bit result multiplies, half-word, signed byte loads and stores with the thumb instruction set .It includes the embedded ICE module to support embedded system debugging. As the debug hardware is accessed via the JTAG test access port, the JTAG control logic is considered part of the processor microcell. The ARM7TDMI hardware interface signals are shown in Figure 2**.** The apparently bewildering number of signals is rather misleading as it suggests a complexity of behavior that believes the intrinsic simplicity of the basic ARM interface. Numerically the interface signals are dominated by the principal 32-bit address and data buses, and a simple memory interface will use these and a few control signals as described below.
The other signals are dedicated to more **esoteric** functions such as on-chip debug, JTAG boundary scan extensions, and so on.

3.2 Voice Recognizer

Speech recognition technology the application can be divided into two directions: one is the large vocabulary continuous speech recognition

system, generally implemented in computer dictation machine, telephone network or Internet; second based on direction it is a small, portable voice applications like wireless mobile phone dialing, automotive equipment for voice control, intelligent toys, remote control of home appliances and other applications, these application systems mostly demand specialized hardware, rapid development in Speech signal processing chip (Application Specific Integrated Circuit, ASIC) and speech recognition System on chip (System on Chip, SOC) appear. Computer speech recognition system by AT&T Baer developed in the laboratory of Audrey, which is able to identify the 10 English figures.

Fig 3: Automobile intelligent voice recognition system

The identification method is tracking the voice of Resonance peak. The system got the correct rate ie ranges b/w 98 To 1950 time end, London (College of London) Denes have joined the speech recognition grammar probability. 1960 time, artificial neural network was introduced into the speech recognition resulted Linear Predictive Coding (LPC), and the Dynamic Time Warp technology. Speech recognition technology the most major breakthrough was the Hidden Markov Model application, offers from Baum related mathematical reasoning, Labiner with Carnegie Mellon University finally achieved the first Hidden Markov model for large vocabulary speech recognition system .Thereafter, strictly speaking voice recognition technology is not separated from the HMM framework. After many researches on speech recognition technology resulted an voice recognition& dictation machine design i.e. IC-HM2007

3.3 GSM

GSM modem is a specialized type of modem which accepts a SIM card, and operates on subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone. When a GSM modem is connected to a computer, this allows the computer to use the GSM modem to communicate over the mobile network. While these GSM modems are most frequently used to provide mobile internet connectivity, many of them can also be used for sending and receiving SMS and MMS messages.

Fig 4: GSM Module

3.4 Keyboard

Keypad used here for inputting the data is of the form (4 × 3) matrix board, which is used to connect to the ARM microcontroller. It is used to input the password for validation purposes. The Fig. 5 shows a (4 × 3) matrix connected to two ports. The rows are connected to an output port and the columns are connected to an input port. If no key has been pressed, reading the

input port will yield 1's for all columns since they are all connected to high (Vcc). If all the rows are grounded and a key is pressed, one of the columns will have 0 since the key pressed provides the path to ground. It is the function of the ARM7TDMI LPC 2148 microcontroller to scan the keyboard continuously to detect and identify the key pressed.

Fig 5: Keyboard

3.5 LCD

The LCD is connected to Port 0 of the ARM7 LPC2148 microcontroller. It is used to display messages (either error or accepted). Variable resistor connected to Pin3 of LCD, is used to control the brightness of LCD. A liquid crystal display is a low cost, low power device capable of displaying text and images. LCD's are extremely common in embedded system. An LCD or a liquid crystal display consists of liquid crystals between electrodes. The arrangement consists of polarization filters which are aligned perpendicular to each other. This arrangement doesn't allow any visible light if there was no liquid crystal between the filters. This arrangement is aligned in between transparent conductors. When sufficient voltage is applied to a certain pixel, the crystal at that pixel aligns such that no light passes through it. Therefore that particular pixel appears dark. If such an electric field is applied for a longer period, the alignment of the crystal change and the quality of LCD degrades. In a bigger LCD display, to provide voltage sources to each pixel, the rows and column lines are multiplexed.

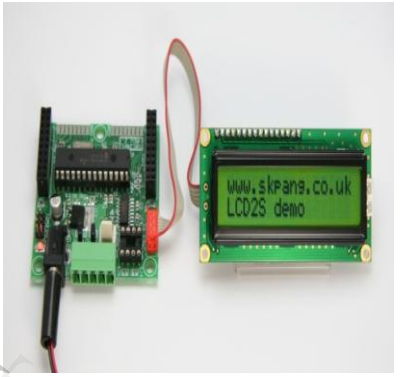

Fig 6: LCD

3.6 Global Positioning System

Global Positioning System (GPS) technology is changing the way we work and play. You can use GPS technology when you are driving, flying, fishing, sailing, hiking, running, biking, working, or exploring. With a GPS receiver, you have an amazing amount of information at your fingertips. Here are just a few examples of how you can use GPS technology. Know precisely how far you have run and at what pace while tracking your path so you can find your way home, Pinpoint the perfect fishing spot on the water and easily relocate it, Get the closest location of your favorite restaurant when you are out-of-town and Find the nearest airport or identify the type of airspace in which you are flying.

3.7 MEMS

Micro electromechanical systems (MEMS) are the technology of the very small and miniature systems and merges at the nano-scale into Nano Electromechanical Systems (NEMS) and nanotechnology. MEMS are made up of components between 1 to 100 micrometers in size (i.e. 0.001 to 0.1 mm) and MEMS devices generally range in size from 20 micrometers (20 millionths of a meter) to a millimeter. They usually consist of a central unit that processes data, the microprocessor and several components that interact with the outside such as micro sensors. At these size scales, the standard constructs of classical physics are not always useful. Due to MEMS' large surface area to volume ratio, surface effects such as electrostatics and wetting dominate volume effects such as inertia or thermal mass. Micro-Electro-Mechanical Systems (MEMS) is the integration of mechanical elements, sensors, actuators, and electronics on a common silicon substrate through micro fabrication technology. While the electronics are fabricated using integrated circuit (IC) process sequences (e.g., CMOS, Bipolar, or BICMOS processes), the micromechanical components are fabricated using compatible "micromachining" processes that selectively etch away parts of the silicon wafer or add new structural layers to form the mechanical and electromechanical devices.

3.8 Engine Control Unit

An Engine control unit (ECU), most commonly called the power train control module (PCM), is a type of electronic control unit that controls a series of actuators on an internal combustion engine to ensure the optimum running. It does this by reading values from a multitude of sensors within the engine bay, interpreting the data using multidimensional performance maps (called Look-up tables), and adjusting the engine actuators accordingly. Before ECUs, air/fuel mixture, ignition timing, and idle speed were mechanically set and dynamically controlled by mechanical and pneumatic means. However its major advantage that where in some aircraft of the time it took the manipulation of 6 different controls to initiate hard acceleration, in the 801 series equipped aircraft there was just one

Fig 7: ECU used for Voice Recognition

4. WORKING OF ANTI THEFT CONTROL SYSTEM

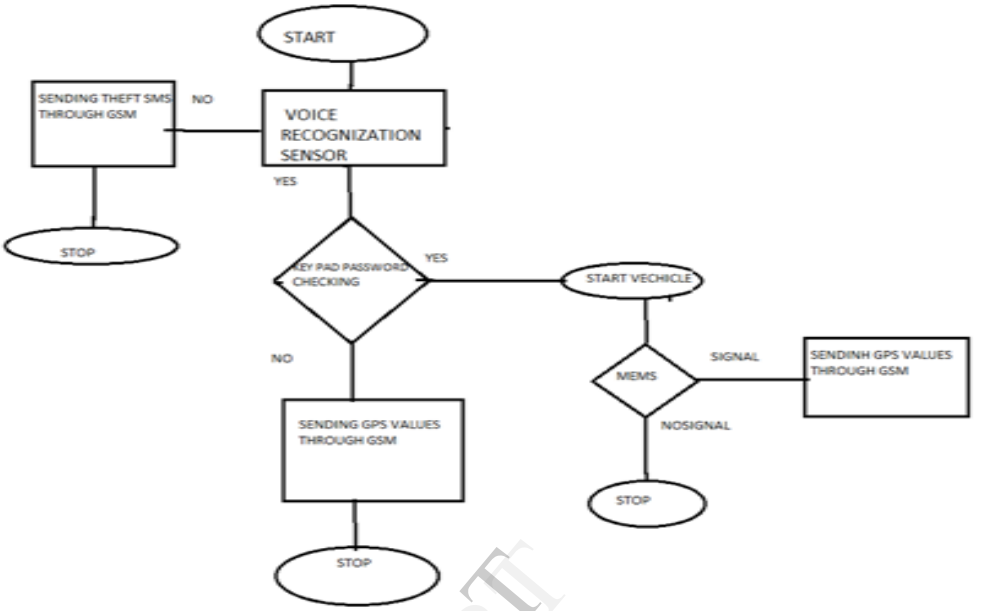

Fig 8: Flow chart

Complete description which explains how the system works, when the engine was ready to start i.e. to which the novel system is connected, It will verify for matched voice using voice recognizer and compare with reference voice provided i.e. which is recorded initially ,if verified logic is true, asks for authentication I.e. username and password if valid proceed the action and MEMS sensor come into picture which is actually for sensing the accident activity, provide position of accident using GPS module and effected machine identity no which was registered with GSM used, to the registered police no, owner no and third party ph no registered with GSM using GSM module in form of SMS or alert, and here voice recognizer and authentication validate also having connection with GSM module so to send SMS or alert to phone no's of police and owner registered with this GSM when mismatches takes place at voice recognition levels and authentication levels,

5. CONCLUSION AND FUTURE SCOPE

Conclusion

In this paper we mainly focused on the security criteria which minimum requirement for present day applications at low cost for vehicles, It is best of its natured applications as there is two level authentications and even with extra application i.e. avoiding accidents and making us available to third party whenever we are in problems majorly due to accidents. Finally we conclude that it validated at all levels of security after its final analysis with test machine, it is

built at low cost, most effective ,more easier to implement on any type of automobiles in controlling the theft,

Future scope

But during deep level analysis we found the limitation, it will not even validate the owner when his or her vocal card is in problem as it is the machine we can overcome this by interfacing artificial intelligence with above mentioned embedded system, which is done in future

.

6. References

[1] Design and implementation of GSM based vehicle theft control system, by M. Patil International Conference on Advanced Computer Control, ICACC'09, and PP-148

[2]Secure end _to_end communication using GSM in PSTN network by S. Ajmal at IEEE'2009 Asia-Pacific International conference, PP-243

[3] Rajkamal ARM Processor and its Architecture, version 2009

[4] Anti theft control system using embedded system by Albert Joe Francies, published on IEEE Asia-Pacific., 2011

[5] Jung-hsuan Wu Chien-Chuan Kung Jhan. .'Design of an In-Vehicle Anti –Theft Components' International Conference on Intelligent System Design and Application IDSA 2008,pp-556

[6] Huaqun Guo Lek Heng Ngoh Young Dong Wu Teo Secure Wireless Vehicle Monitoring and Control' IEEE Asia-Pacific conference on Device Computing, APSCC 2009,pp-81

[7]Cyber Reference:
http://www.nationmaster.com/red/pie/cri_car_the-crime-car-thefts for statistical analysis
http://www.unitracking.com/howitworks.html
for the product available in the present market
http://cars.about.com/od/toppicks/ss/Least-Expensive-Cars.html
for car design analysis
http://www.colorado.edu/geography/gcraft/notes/gps/gps_f.html
for detail description regarding GPS

[8] Key book of ARM controller by
www.embeddedcraft.org/**armbasics**.