Asian Journal of Electrical Sciences (AJES)
Vol.2.No.1 2014 pp 1-6.
available at: www.goniv.com
Paper Received :08-03-2014
Paper Accepted:22-03-2013
Paper Reviewed by: 1. R. Venkatakrishnan 2. R. Marimuthu
Editor : Prof. P.Muthukumar

SUPER LOCKING TECHNIQUE FOR AUTO THEFT PREVENTION SYSTEM

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ABSTRACT

This paper introduces a design of next generation auto theft prevention system as vehicle becomes more sophisticated, must be stronger than ever before. A modern vehicle utilizes remote keyless entry system and immobilizer system as the main weaponry against the vehicle theft. Project proposed aims to design to the next generation auto theft prevention system by adding enhancement and modernizing the existing system and try to overcome the drawbacks. There is a long list of features implemented in this project using gesture based smart gravitational lock, cryptographic keyless entry, touch screen ignition system, GPS fencing, car finder, remote fuel cut off, adjustable motion alarm sensitivity and a ubiquitous vehicle tracking with the help of inertial navigation sensors that consists of 3-axis MEMS accelerometer and 3-axis MEMS magnetometer.

***IndexTerms*—**Cryptographic keyless entry, MEMS accelerometer, MEMS magnetometer, Gravitational lock, IEEE802.15.4.

1. INTRODUCTION

As vehicles becomes more sophisticated, vehicle security system must be stronger than ever before. To increase in human machine interactions in our daily leaves had made user technology progressively more important, Physical gestures as intuitive expressions will greatly ease the interaction process and enable humans to more naturally command machines.

In this project, a miniature MEMS accelerometer based recognition system which can recognize various hand gestures like up, down, etc., in 3-D space is built. The recognition system consists of sensor data collection, segmentation and recognition.

The importance of accuracy in a positioning system has increasingly been stress for intelligent transport system applications based on position information, including advanced driver-assistance systems, electronic toll intersection collision warnings, and traffic control. Today, the satellite-based Global Positioning System (GPS) is widely used for such applications because the GPS receiver provides vehicle position and velocity data in global coordinates.

However, a standalone GPS receiver cannot fulfill the positioning requirements of ITS applications due to the occasional temporary loss of satellite connection and signal errors. To provide continuous, accurate, and high integrity position data, the positioning system should be aided by additional sensors such as an inertial navigation system, vehicle motion sensors, digital road maps, cameras, radar.

The interruptions and degradations in Global Navigation Satellite Systems-based vehicular navigation solutions in dense urban scenarios such as urban canyons and tunnels lead to the fact that these solutions have to be augmented with other systems to achieve continuous and accurate navigation. Some of the major problems with existing auto theft prevention system are:

It offers no protection when the key fob is stolen. So a smart key fob sold in the market is not actually smart.

Vehicle tracking devices will not be able to locate a vehicle in GPS denied environments such as within the buildings, underground and dense city regions, resulting in the loss of vehicle. A low cost navigation device for land vehicles involving a reduced number of MEMS-based inertial sensors augmented with the measurements of the vehicle odometer and integrated with GPS and map data. This solution can be used in all environments including degraded GPS environments which routinely occur in urban and rural canyons.

2. PROPOSED SYSTEM

The project proposed here aims to design a next generation auto theft prevention system by adding significant enhancements and modernizing the existing system and thus try to overcome the above drawbacks.

It consists of two units namely,

1. Smart key fob unit
2. Vehicle unit

These units consists of the following feature,

A. Smart Gravitational Lock

The system is armed automatically when the driver moves away from the vehicle. It is disarmed only when a specific gesture is made in the hand-held wireless key fob. The 3D gesture is made in mid-air and can be reprogrammed by the user on the fly. The air gesture is recognized using a 3-axis MEMS Accelerometer that senses the gravitational force exerted upon it, as in [1]. A stolen key fob thus cannot be used to enter into the vehicle without performing the secret gesture. The password is stored in an external non-volatile serial EEPROM memory.

B. Cryptographic keyless entry

If the gesture is valid, the key fob transmits a unique encrypted code that changes every time when this gesture is made. RC4 Stream Cipher Cryptographic algorithensures the safety of the data transmitted. The key fob communicates with automotive vehicle unit using IEEE 802.15.4 wireless networking protocol. This prevents thieves from detecting the static codes, which were used in older keyless entry systems. The wireless packets are also used to measure the proximity of the key fob to the vehicle.

Figure. 1. Cryptographic keyless entry

C. Touch screen Ignition

A dual layer keying approach is followed during vehicle ignition process. This consists of software and hardware keys. A unique touch gesture is made on the 65K Color Touch screen TFT Display 320*240 resolution in 16-bit RGB format with an 8-bit parallel interface which acts as the software key. The system verifies this and then accepts the hardware key which is the actual key fob normally used. This feature can be temporarily disabled and enabled via SMS sent by the owner. This is useful in situations such as, when someone (like a mechanic) other than the owner wants to handle the vehicle and the owner does not want the other person to know the secret onscreen password. A serial EEPROM memory is used to store the password. The touch screen used is a digital resistive touch screen that senses stylus or finger touch.

Figure.2.Touchscreen ignition system

Figure 3.Touchscreen display

D. Adjustable Motion Alarm Sensitivity

The vehicle unit constantly monitors the vehicle motion after being armed (locked). The integrated motion sensing subsystem measures the vehicles three-dimensional position and detects any unauthorized motion if the vehicle is moved or tilted that exceeds a threshold level. The sensitivity of this function can be adjusted on the touch screen display GUI to effectively avoid any false warnings that are common with existing vehicle security systems. When someone tries to break into the vehicle

forcibly, the alarm triggers the siren and headlamps and sends an SMS to the owner.

E. Ubiquitous Vehicle Tracking

GPS and GSM technologies enable the vehicle owners to track and monitor the vehicle with cell phone at anytime from anywhere. The important enhancement in this feature is its ability to inform the vehicle position even during a GPS outage using dead reckoning method, as in [2]. This is achieved with the help of Inertial Navigation Sensors that consists of a 3-axis MEMS Magnetometer and a 3-axis MEMS Accelerometer that will act as a tilt compensated compass module. The 3-axis digital MEMS accelerometer detects 3- axis acceleration and acts as a vibration sensor to find the accident scenario

Figure 4. MEMS Accelerometer

GPS Modem

A GPS modem is a space based radio navigation system consisting of a constellation of satellite and networks of ground station used for monitoring and control.GPS is operated and maintained by the Department of defense (DOD). The GPS is a constellation of satellites in orbit around the Earth which transmit their positions in space as well as the precise time. It is the receiver that collects data from the satellites and computes its location anywhere in the world based on information it gets from the satellites.

GSM Modem

A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a sub - scriptions to a mobile operator, just like a mobile phone. From the mobile operator perspective, GSM modem looks just like a mobile phone. A GSM modem can be a dedicated modem device with a serial, USB or Bluetooth connection, or it may be a mobile phone that provides GSM modem capabilities. A GSM modem could also be a standard GSM mobile phone with the appropriate cable and software driver to connect to a serial port or USB port on your computer

F. Car Finder

When the owner approaches the vehicle, the system automatically verifies the code from remote key and the vehicle emits a head light flash and horn beep to show its presence. This feature is known as car finder and it assists the owner to locate the vehicle in a parking lot where several vehicles are parked.

G. GPS Fencing

This feature restricts the vehicle movement within a particular area. For example, if the owner wants the car to move only within a particular city, once it moves out of city border, the owner would immediately receive an SMS alert as to the current location of the vehicle. The interesting feature here is the fence radius can be programmed in the touch screen display by the user. This flexibility allows the user to set a virtual fence that can be at building level, street level, city level, or state level.

H. Remote Fuel Cut-off

This is very useful especially in case of auto theft. If the vehicle is somehow hacked into and taken, you can send message that will slowly cut-off the fuel supply, thereby disabling the vehicle. A Servo Motor controlled valve is used to cut the fuel supply. The DC Servo motor used for position and speed control is operated at 50Hz. This operates at low current and is ideal for battery-powered applications.

Figure. 5. DC Servomotor

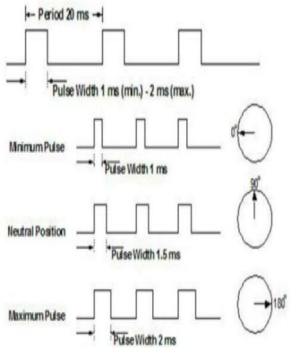

Figure.6. pulse width of servomotor

Both the vehicle unit and the smart key fob unit use LPC1313, a 32-bit ARM Cortex-M3 microcontroller from NxP Semiconductors. The

following to block diagram shows the smart keyFob unit and vehicle unit.

3. SYSTEM ARCHITECTURE
BLOCK DIAGRAM

1. Smart Key fob Unit

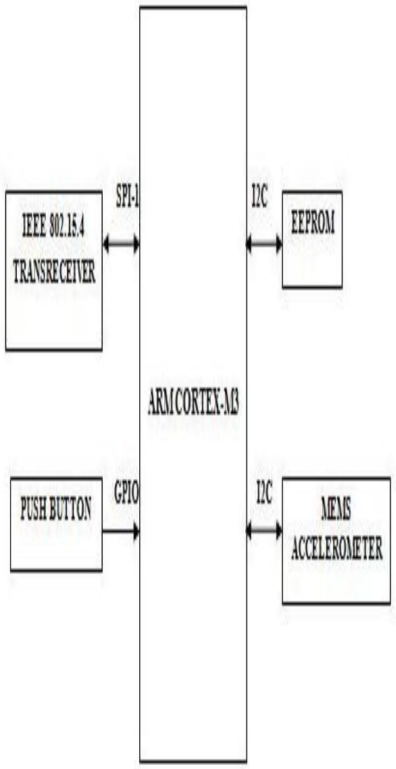

Figure 7. Key fob unit block diagram

IEEE 802.15.4

The demand is growing for more and more applications to move to wireless communication. The benefits are reduced costs and ease of implementation.

Wireless communication does not require cabling and other hardware, and the associated installation costs. It also can be implemented in locations where cabling would be hard, if not impossible, to install.

The Microchip MiWi P2P Wireless Protocol is a variation of IEEE 802.15.4, using Microchip's MRF24J40 2.4 GHz transceiver and any Microchip 8, 16 or 32-bit microcontroller with a Serial Peripheral Interface (SPI).

The protocol provides reliable direct wireless communication via an easy-to-use programming interface.

2. Vehicle Unit

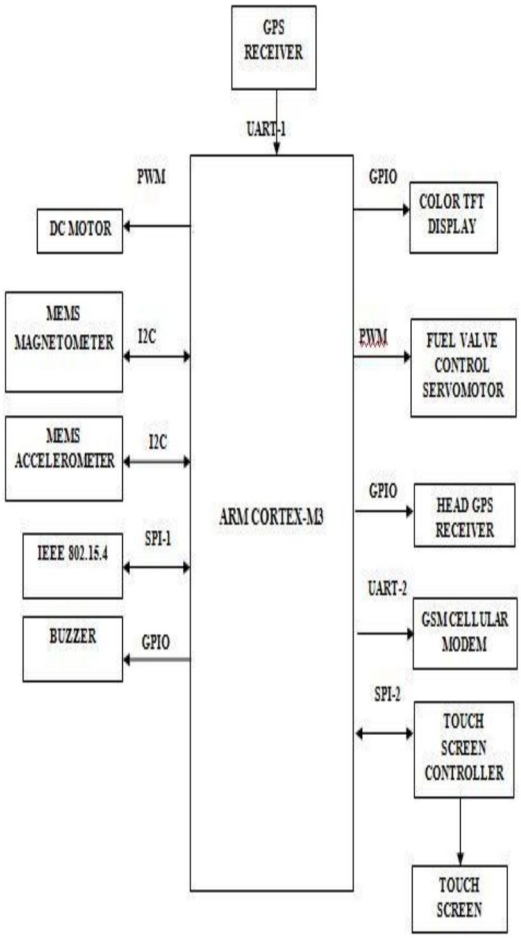

Figure 8.vehicle unit

ARM Cortex

The ARM Cortex-M3 processor is the industry-leading 32-bit processor for highly deterministic real-time applications and has been specifically developed to enable partners to develop high-performance low-cost platforms for finally,completecontentandorganizationaleditingbefor eformatting.

Pleasetakenoteofthefollowingitemswhenproo freadingspellingandgrammar.a broad range of devices including microcontrollers, automotive body systems, industrial control systems and wireless networking and sensors. The processor delivers outstanding computational performance and exceptional system response to events while meeting the challenges of low dynamic and static power constraints.

LPC1313

The LPC1313 are ARM Cortex-M3 based microcontrollers for embedded applications featuring a high level of integration and low power consumption. The ARM Cortex-M3 is a next generation core that offers system enhancements such as enhanced debug features and a higher level of support block integration. The LPC1313 operate at

CPU frequencies of up to 72 MHz. The ARM Cortex-M3 CPU incorporates a 3-stage pipeline and uses Harvard architecture with separate local instruction and data buses as well as a third bus for peripherals. The ARM Cortex-M3 CPU also includes an internal prefetch unit that supports speculative branching. The peripheral complement of the LPC1313 includes up to 32 kB of flash memory, up to 8 kB of data memory, USB Device (LPC1342/43 only), one Fast-mode Plus I2C-bus interface, one UART, four general purpose timers, and up to 42 general purpose I/O pins.

4. SOFTWARE DESCRIPTION

Proteus 8

Proteus 8.0 represents over three years continuous development and includes improvements to every area of the software suite. Major work on the application framework together with the introduction of a common database provides a much smoother workflow for users while the rich new feature set saves time and effort in the design lifecycle. A demonstration version can be downloaded directly from the Lab center website and you can then either watch getting started movies from the application home page or access the tutorial documentation for evaluation.

5. EXPERIMENTAL RESULT

It is used to check the UART terminal using proteus software. Main operation of this output is how the message is transferred the GSM mobile through the microcontroller. A specific gesture is made in the hand-held wireless key fob. The 3D gesture is made in mid-air and can be reprogrammed by the user on the fly. The air gesture is recognized using a 3-axis MEMS Accelerometer that senses the gravitational force exerted upon it.

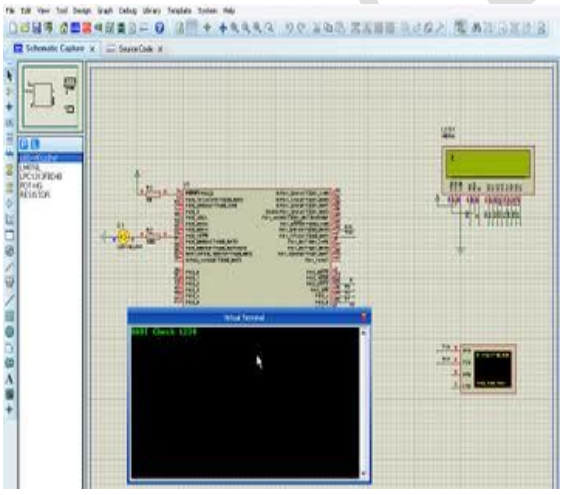

Figure.9. Screen sort for simulation

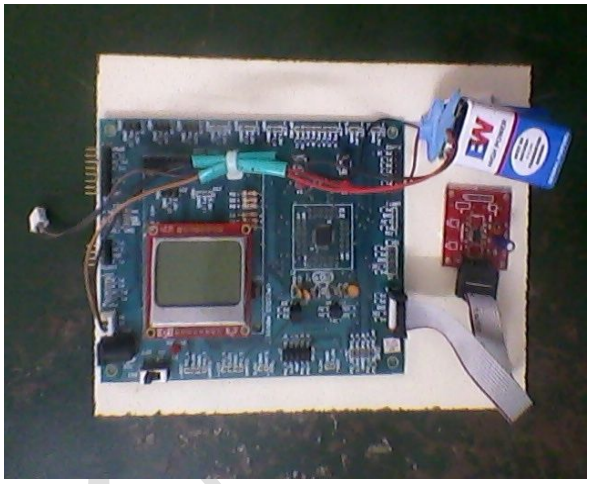

Figure.10 Hardware setup

6. CONCLUSION

The proposed solution describes a nonspecific person gesture recognition system by using MEMS accelerometers. The recognition system consists of sensor data collection, segmentation and recognition. Since the standard gesture patterns are generated by motion analysis and are simple features represented by 8 numbers for each gesture, the recognition system does not require a big data base and need not collect many gestures made by different people. This improves the recognition accuracy. The concept of Cryptographic keyless entry and Touch screen ignition system gives a secured and an authenticated control over the automotives. The integrated navigation solution is very competitive for vehicle navigation with low-cost sensors. This solution can be used in all environments including degraded GPS environments which routinely occur in urban and rural canyons.

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