Arm 7 Based Theft Control, Accident Detection & Vehicle Positioning System

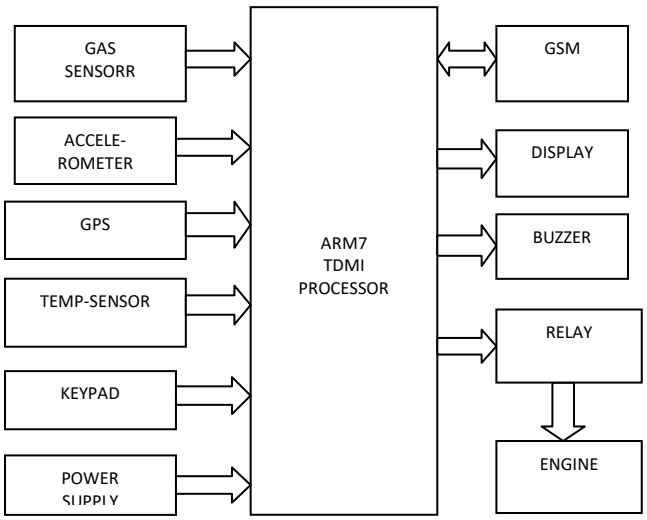
M.S. Joshi, Deepali V. Mahajan

Abstract*—This system makes use of an embedded chip that has an inductive proximity sensor, which senses the key during insertion. This is followed by the system present in the car asking the user to enter a unique password. The password consists of few characters and the car key number. The system sends a text message to the owner's mobile stating that the car is being accessed. If the user fails to enter the correct password in three trials, a text message is sent to the owner and police with the vehicle number about the unauthorized usage and the location tracked using a GPS ,GSM module and ARM7. Apart from this if your car is stolen, a password like SMS is sent by the owner, it automatically stops the car. One more application of this project is that it is use for early accident detection. It can automatically detect traffic accidents using accelerometers along with other sensors and immediately notify owner, police station & two more contacts saved in that along with vehicle number & location of that place.

Keywords*— Accident alert, accelerometer, GSM, GPS, i2c protocol, UART, vehicle tracking

I. INTRODUCTION

This project can be used to control the thefting of vehicles, track the thefted vehicles and finding the location of vehicle and also implement the scene of accident alarm system. In this we are trying to program a GPS/GSM module incorporating an accelerometer to report occurrences of accident automatically via the GSM communication platform (using SMS messaging) to the nearest agencies such as hospitals, police stations, fire services and so on, giving the exact position of the point where the crash had occurred.



Block Diagram of the System

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This can provide early response and rescue of accident victims; saving properties and lives. The whole paper is based on arm controller. This controller is used to coordinate all the activities in the system. The components details are ARM 7(LPC 2148), Accelerometer (MMA7660FC), GPS module (MR 87), and GSM module (SIM 300)

II. SYSTEM DESCRIPTION

In above paper heart of above system is ARM7LPC2148, GPS module and GSM module. Power supply require for GPS, GSM and ARM7LPC2148 is 3.3V &5V. Keypad is used to enter security code. Gas sensor, accelerometer & temperature controller is used for pre-accident detection system. GPS module is used to find the used to display the co-ordinates of any location with the help of GSM module. If any value of gas sensor, temp-controller & accelerometer is changed beyond limit then buzzer will on & if driver can't stop the buzzer than it will consider as a major accident then co-ordinators of the location along with vehicle no. is send to owner, police station and few more contacts.

III. HARDWARE COMPONENTS AND DESIGN

A. ARM7TDMI Processor

ARM7TDMI processor in our model due to its advanced features described below. 32-bit ARM processor is the contemporary general purpose microprocessor in the embedded market used in industrial level applications. ARM7 consists of a number of peripherals interfaced to it. We use keypad matrix, LCD display, UARTS, GPIO and I2C protocol. ARM7 processor is a link between GPS and GSM modules for communication. The description of ARM7 is discussed in further sections.

FEATURES:

- 16/32-bit ARM7TDMI-S microcontroller is a 64 or 144 pin package.
- 16 KB on-chip Static RAM.
- 128/256 KB on-chip Flash Program Memory. 128-bit wide interface/accelerator enables high speed 60 MHz operation.
- In-System Programming (ISP) and In-Application Programming via on-chip boot-loader software. Flash programming takes 1ms per 512 byte line. Single sector or full chip erase takes 400 ms.
- Two 32-bit timers (with 4 capture and 4 compare channels), PWM unit (6 outputs), Real Time Clock and Watchdog.

- Multiple serial interfaces including two UARTs (16C550), Fast I2C (400 Kbits/s) and two SPIs60 MHz maximum CPU clock available from programmable on-chip Phase-Locked Loop.
- On-chip crystal oscillator with an operating range of 1 MHz to 30 MHz

B. GPS Module

GPS Wireless communication module. This design adapts the current leading GPS technology and the integrated positioning chip LEADTEK LR9548S. Specifically Designed for OEM Applications, it is a GPS receiver module with high sensitivity, low power consumption, and 20 channels. Compared with other independent GPS solutions GPS9548 is able to help Users gain and continuously track GPS signals at a very low signal intensity, which means GPS9548 can be used in the environment where it has never been thought to be accessible, such as Buildings of the city building, dense forest, garage, and many indoor environment, with a positioning accuracy of less than 10 meters. With only an addition of relevant circuit at the periphery, positioning information including time, longitude, latitude, rate, moving direction, etc., can be output through the serial. The GPS module can receive the data by connected to ARM7development-boardURAT0through RS232port. WhentheARM7chip 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 initialed at first.

The initial instructions are following:

Reset
User settings initialized
Press ++++++ to enter the setup mode…Done
Initial command List:
AT+ID= X CR
AT+IP= X CR
AT+PORT= X CR
AT+HTH= X CR
AT+BAUD= X CR AT+APN= X CR
AT+AGREE= X CR AT+REST=X CR

AT+ID=X: this instruction is used to set the terminal address. Each device must be set the address which indicates its ID, the default ID is139XXXXXXXX. The default address is the SIM card mobile phone number which contains 11 numbers, the address can be changed as required. AT+ID=? This instruction is used to inquire the ID of the terminal. The instruction can be used to check whether the set of the device is correct. AT+IP=X this instruction is used to set the IP address of these in surveillance centre. The format of IP is X.X.X.X.AT+IP=? This instruction is used to inquire the IP address. address of these in surveillance centre. The format of IP is X.X.X.X.AT+IP=? This instruction is used to inquire the IP address. AT+PORT=X this instruction is used to set the port number of the application software in surveillance center server. AT+PORT=? This instruction is used to inquire the port number. . AT+HTH=X AT+HTH=? This instruction is used to set and inquire the time intervals of the GPS positioning information which the terminals send automatically. The unit of the time interval is second. AT+BAUD=X AT+BAUD=? This instruction is used to set and inquire the initial baud rate. The default is 4800 and does not need changing usually. AT+APN=X AT+APN=? This instruction is used to set and inquire the connect port of GPRS telecommunication. The default value is CMNET. AT+AGREE=X AT+AGREE=? This instruction is used to set and inquire the net communication protocol. The default value is TCP protocol. The terminal on car supports the UDP and the TCP protocol. Users can change the protocol as needs. Address of these in surveillance center. The format of IP is X.X.X.X.AT+IP=? This instruction is used to inquire the IP address.

C. GSM Module

Global system for mobile communication (GSM) is a globally accepted standard for digital cellular communication. GSM is the name of a standardization group established in 1982 to create a common European mobile telephone standard that would formulate specifications for a pan-European mobile cellular radio system operating at 900 MHz. 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 working of GSM modem is based on commands, the commands <CR> character. For example, the dialling command is ATD<number>; ATD3314629080; here the dialling command ends with semicolon. The AT commands are given to the GSM modem with the help of PC or controller. The GSM modem is serially interfaced with the controller with the help of MAX 232.

D. ACCELEROMETER

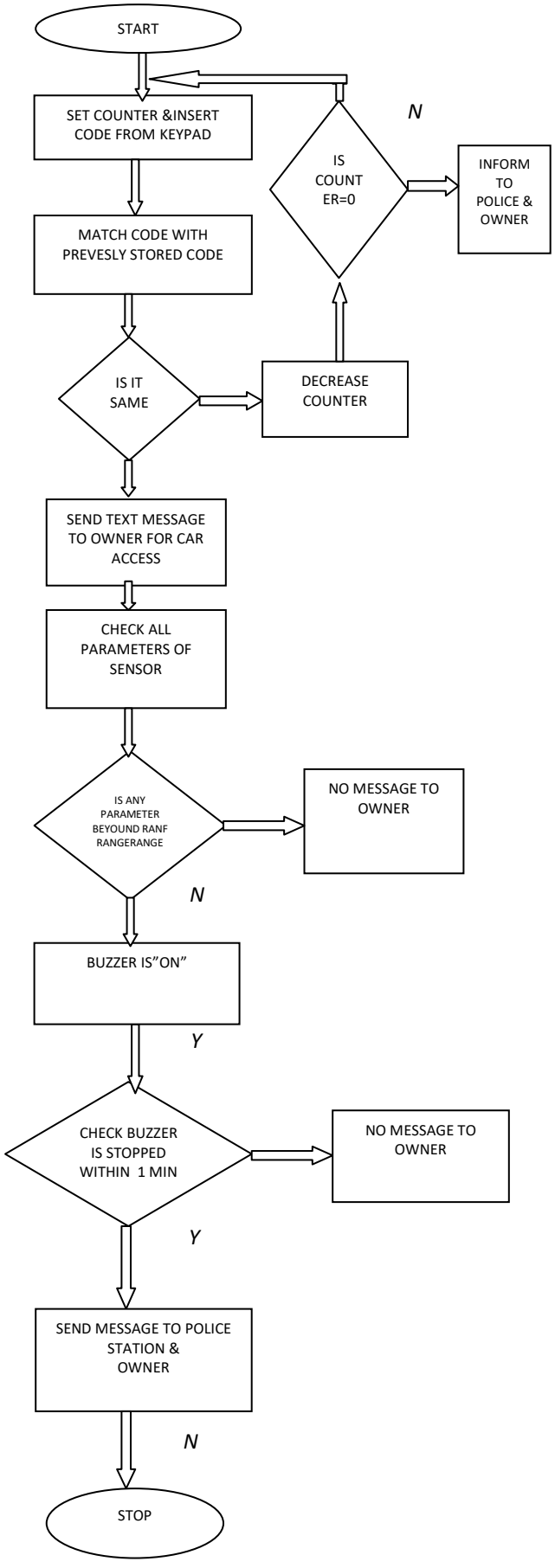
The MMA7660FC is a ±1.5 g 3-Axis Accelerometer with Digital Output (I2C). Low profile capacitive MEMS sensor featuring a low pass filter, compensation for 0g offset and has again errors. The device is used for product orientation, sensor data changes, and gesture detection through an interrupt pin (INT). The device is housed in a small 3mm x 3mm x 0.9mm DFN package. It can operate in different modes as follows. The sensor is having three power modes: first one is Off Mode, then Standby Mode, and finally Measurement Mode to offer the customer different power consumption choices. The sensor can only run in one of these modes at a time. Shake Detection, Orientation Detection, Tap Detection and/or Auto-Wake/Sleep Feature, Shake Detection and in this mode the digital analysis for any of these functions can beasily done

E. TEMPERATURE SENSOR (LM35)

In this project, in order to obtain the vehicle engine temperature, we use temperature sensor. Initially this temperature value has to be read and fed to the microcontroller. This temperature value has to be sensed. Thus a sensor has to be used and the sensor used in this project is LM35. It converts temperature value into electrical signals. LM35 series sensors are precision integrated-circuit temperature sensors whose output voltage is linearly proportional to the Celsius temperature. The LM35 requires no external calibration since it is internally calibrated. The LM35 does not require any external calibration or trimming to provide typical accuracies of ±1⁄4°C at room

temperature and ±¾°C over a full −55 to +150°C temperature range.

IV. FLOW CHART



V. ALGORITHM

Step 1: Start the process
Step 2: Set counter =3.
Step 3: Enter code from keypad.
Step 4: Check code with previously stored code.
Step 5: Is it same? If "YES" then goto step 8.If "NO" then goto step 6.
Step 6: Decrease counter.
Step 7: Is counter=0? If "YES "then inform to police And owner. If "NO" then goto Step 3.
Step 8: Send text message to owner for car access.
Step 9: Check all parameters of sensor.
Step 10: Is any parameter beyond range? If "YES" then goto Step 11. If "NO" the message will not be send to owner.
Step 11: Buzzer is "ON"
Step 12: Check the buzzer is stopped within 1 minute. If "YES" message will not be send to owner. If "NO" goto Step 13.
Step 13: Send message o police station & owner.
Step 14: Stop

VI. EXPECTED RESULT

In the above paper the system is used for theft control as well as accident detection and prevention system. Initially to on the car owner or driver must enter specific code. If code is correct then message is send to owner for accessing of car. If anybody enter wrong code for three times then a message is send to owner and police station along with co-ordinates of location about illegal access of car. So in this way security system is much better than other security systems. Another application is that in this various sensors are placed which indicates occurrence of an accident just like gas sensor, alcohol detector, accelerometer. If range of that sensor increases beyond specific range then buzzer will "on" for one minute and driver can't stop the buzzer within one minute then it will detect as a accident and a message will send to owner, police station & two previously stored numbers with co-ordinates of that location. And if unfortunately car is stolen at that time owner can stop the car by sending a message.

REFERENCES

1. Abid Khan, Ravi Mishra ―GPS – GSM Based Tracking System‖, International Journal of Engineering Trends and Technology, Volume3, Issue2, Pp: 161-169, 2012.
2. S.P. Bhumkar, V.V. Deotare, R.V.Babar ―Intelligent Car System for Accident Prevention Using ARM-7‖, International Journal of Emerging Technology and Advanced Engineering, Volume 2, Issue 4, Pp: 56-78, 2012.
3. B.G .Nagaraja, Ravi Rayappa, M.Mahesh, Chandrasekhar M Patil, Dr TC Manjunath:"Design and Development of GSM based vehicle theft control system" Advanced Computer Control ICACC "09 International conference.pp148.
4. Xu Li, Wei Shu, Minglu Li, Hong-Yu Huang, Pei-En Luo, and Min-You Wu, "Performance Evaluation of Vehicle-Based Mobile Sensor Networks for Traffic Monitoring" IEEE 2009.
5. Young, Kar-Keung D. "Automated navigation and mobile vehicle control using wireless sensor network technology," Proceedings of the IEEE International Conference on Industrial Technology, 2008.