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A PROJECT REPORT ON SMS BASED HOME SECURITY SYSTEM BY USING GSM AND GPS

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ABSTRACT: GSM – Global System for Mobile Communication is used as a media which is used to monitor and control the function load from anywhere by sending a message. It has its own deterministic character. Thereby, here GSM is used to monitor and control the functionality of Project. Hence no need to waste time by manual operation and transportation. Hence it is considered as highly efficient communication through the mobile which will be useful in Home security which would be controlled from anywhere else. It is also highly economic and less expensive; hence GSM is preferred most for this mode of controlling.

In this application we are maintaining a switch. In the worst situation when we press switch at that time with location place will be sent to the android mobile which is enrolled in the memory IC should get a message like help needed. We are using LCD to display on the screen while sending message like (message sending to cell *********).

GPS gives only the longitude and latitude values but by using Android application in the mobile we can easily get the location name from where the message has been sent. The controller takes the switch as its input i.e when some threat has occurred one need to press that switch and the controller makes the GSM module to message to the pre-stored number. In this way the concerned person will know the location and they will be able to save the candidate. With a wide range of serial communications interfaces, they are also very well suited for communication gateways, protocol converters and embedded soft modems as well as many other general-purpose applications.

This project uses regulated 5V, 500mA power supply. Unregulated 12V DC is used for relay. 7805 three terminal voltage regulator is used for voltage regulation. Bridge type full wave rectifier is used to rectify the ac out put of secondary of 230/12V step down transformer.

Keywords: Atmegal6, GSM SIM900A, Microcontroller, Android, GPS, Security.

I. INTRODUCTION

Smart Home can be also known as Automated Home or intelligent home which indicates the automation of daily tasks with electrical appliances used in homes. This could be the control of lights, fans, viewing of the house interiors for surveillance purposes or giving the alarm alteration or indication in case of gas leakage. Home security has changed a lot from the last century and will be changing in coming years. Security is an important aspect or feature in the smart home applications. The new and emerging concept of smart homes offers a comfortable, convenient, and safe environment for occupants. Conventional security systems keep homeowners, and their property, safe from intruders by giving the indication in terms of alarm. However, a smart home security system offers many more benefits. This paper mainly focuses on the security of a home when the user is away from the place. Two systems are proposed, one is based on GSM technology and other uses web camera to detect the intruder. The first security system uses a web camera, installed in house premises, which is operated by software installed on the PC and it uses Internet for communication. The camera detects motion of any intruder in front of the camera dimensions or camera range. The software communicates to the intended user via Internet network and at the same time it gives sound alert. The second security system is SMS based and uses GSM technology to send the SMS to the owner. The proposed system is aimed at the security of Home against Intruders and Fire. In any of the above cases happens while the owners are out of their home then the device sends SMS to the emergency number which is provided to the system. The system is made up of three components: sensors, GSM-GPS Module (sim548c), Atmega644p microcontroller, relays to control the device and buzzers to give security alert signal in terms of sound.

II. BLOCK DIAGRAM AND MODULES DESCRIPTION

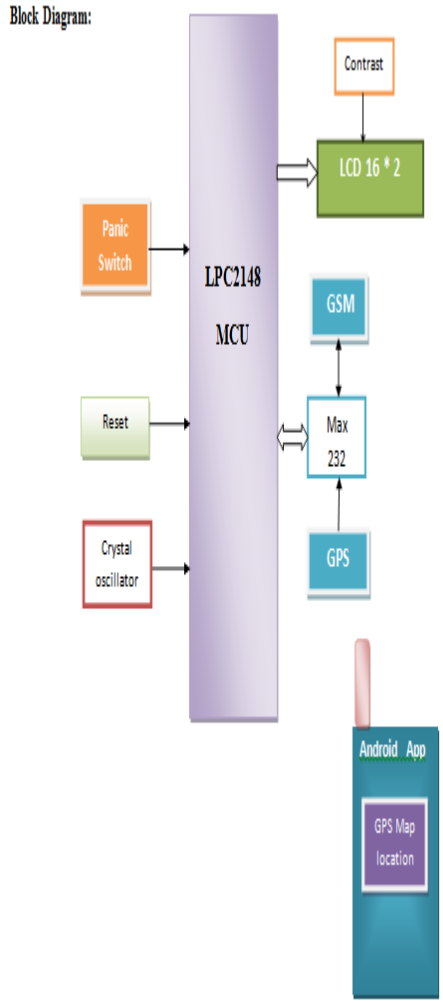

Fig.1. Block Diagram

A. Modules and Description

1. LPC2148 Microcontroller

LPC2148 microcontroller board is based on a 16-bit/32-bit ARM7TDMI-S CPU with real-time emulation and embedded trace support, that combine microcontrollers with embedded high-speed flash memory ranging from 32 KB to 512 KB. A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at the maximum clock rate. For critical code size applications, the alternative 16-bit Thumb mode reduces code by more than 30% with minimal performance penalty. The meaning of LPC is Low Power Low Cost microcontroller. This is 32-bit microcontroller manufactured by Philips semiconductors (NXP). Due to their tiny size and low power consumption, LPC2148 is ideal for applications where miniaturization is a key requirement, such as access control and point-of-sale.

2. Features of LPC2148 Microcontroller

- 16-bit/32-bit ARM7TDMI-S microcontroller in a tinyLQFP64 package.
- 8 KB to 40 KB of on-chip static RAM and 32 KB to 512 KB of on-chip flash memory; 128-bit wide interface/accelerator enables high-speed 60 MHz operation. USB 2.0 Full-speed compliant device controller with 2 KB of endpoint RAM. In addition, the LPC2148 provides 8 KB of on-chip RAM accessible to USB by DMA. One or two (LPC2141/42 Vs, LPC2144/46/48) 10-bit
- ADCs provide a total of 6/14 analog inputs, with conversion times as low as 2.44 ms per channel. Single 10-bit DAC provides variable analog output
- (LPC2148 only) Two 32-bit timers/external event counters (with four
- capture and four compare channels each), PWM unit (six outputs) and watchdog. Low power Real-Time Clock (RTC) with independent
- power and 32 kHz clock input

3. Power Supply

All electronic circuits works only in low DC voltage, so we need a power supply unit to provide the appropriate voltage supply for their proper functioning .This unit consists of transformer, rectifier, filter & regulator. AC voltage of typically 230volts rms is connected to a transformer voltage down to the level to the desired ac voltage. A diode rectifier that provides the full wave rectified voltage that is initially filtered by a simple capacitor filter to produce a dc voltage. This resulting dc voltage usually has some ripple or ac voltage variation. A regulator circuit can use this dc input to provide dc voltage that not only has much less ripple voltage but also remains the same dc value even the dc voltage varies somewhat, or the load connected to the output dc voltages changes.

4. Transformer

A transformer is a static piece of which electric power in one circuit is transformed into electric power of same frequency in another circuit. It can raise or lower the voltage in the circuit, but with a corresponding decrease or increase in current. It works with the principle of mutual induction. In our project we are using a step down transformer to providing a necessary supply for the electronic circuits. Here we step down a 230volts ac into 12volts ac.

5. Rectifier

A dc level obtained from a sinusoidal input can be improved 100% using a process called full

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wave rectification. Here in our project for full wave rectification we use bridge rectifier. From the basic bridge configuration we see that two diodes(say D2 & D3) are conducting while the other two diodes (D1 & D4) are in off state during the period t = 0 to T/2.Accordingly for the negative cycle of the input the conducting diodes are D1 & D4 .Thus the polarity across the load is the same. In the bridge rectifier the diodes may be of variable types like 1N4001, 1N4003, 1N4004, 1N4005, IN4007 etc… can be used. But here we use 1N4007, because it can withstand up to 1000v.

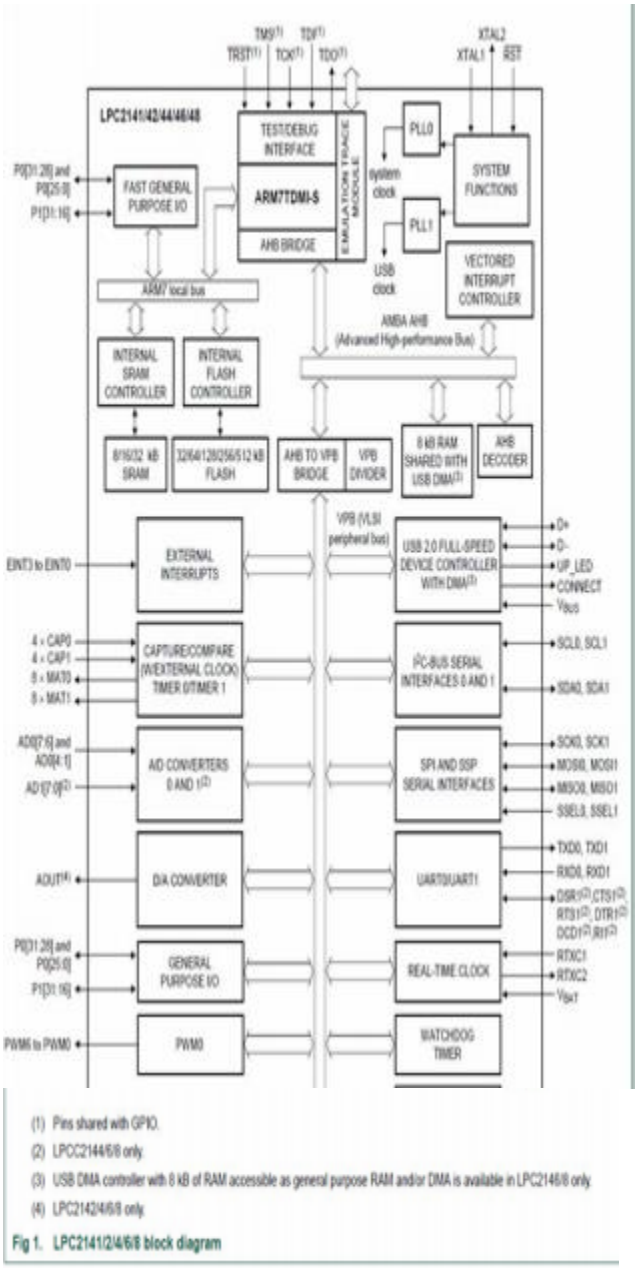

Fig.2. Block Diagram

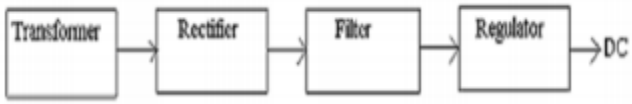

Fig.3. General Block of Power Supply Unit

6. Filters In order to obtain a dc voltage of 0 Hz, we have to use a low pass filter. So that a capacitive filter circuit is used where a capacitor is connected at the rectifier output& a dc is obtained across it. The filtered waveform is essentially a dc voltage with negligible ripples & it is ultimately fed to the load.

7. Regulators The output voltage from the capacitor is more filtered & finally regulated. The voltage regulator is a device, which maintains the output voltage constant irrespective of the change in supply variations, load variations & temperature changes. Here we use fixed voltage regulator namely LM7805.The IC LM7805 is a +5v regulator which is used for microcontroller.

D. Voltage Sensor

1. Description

This module is based on resistance point‟s pressure principle, and it can make the input voltage of red terminal reduce 5 times of original voltage. The max Arduino analog input voltage is 5V, so the input voltage of this module should be not more than 5Vx5 = 25V (if for 3.3V system, the input voltage should be not more than 3.3Vx5 = 16.5V). Because the Arduino AVR chip have 10 bit AD, so this module simulation resolution is 0.00489 V (5V/1023), and the input voltage of this module should be more than 0.00489 Vx5 = 0.02445V.

2. Gas Leakage Sensor MQ-6

Sensitive material of MQ-6 gas sensor is SnO2, which with lower conductivity in clean air. When the target combustible gas exist, the sensor‟s conductivity is higher along with the gas concentration rising. Please use simple electro circuit, Convert change of conductivity to correspond output signal of gas concentration. MQ-6 gas sensor has high senility to Propane, Butane and LPG, also response to Natural gas. The sensor could be used to detect different combustible gas; it is with low cost and suitable for different application.

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Fig.6. Voltage Sensor

3. Electronic Buzzer

Fig.7. Electronic Buzzer

4. Features

- The PS series are high-performance buzzers that employ uni morph piezoelectric elements and are designed for easy incorporation into various circuits.
- They feature extremely low power consumption in comparison to electromagnetic units.
- Because these buzzers are designed for external excitation, the same part can serve as both a musical tone oscillator and a buzzer.
- They can be used with automated inserters. Moistureresistant models are also available.
- The lead wire type (PS1550L40N) with both-sided adhesive tape installed easily is prepared.

5. Application

Electric ranges, washing machines, computer terminals, various devices that require speech synthesis output.

6. Light-emitting diode (LED)

Fig.8. Red, Pure Green and Blue Leds of the 5mm Diffused Type

7. LCD Display

Liquid crystal displays (LCDs) have materials which combine the properties of both liquids and crystals. Rather than having a melting point, they have a temperature range within which the molecules are almost as mobile as they would be in a liquid, but are grouped together in an ordered form similar to a crystal. An LCD consists of two glass panels, with the liquid crystal material sand witched in between them. The inner surface of the glass plates are coated with transparent electrodes which define the character, symbols or patterns to be displayed polymeric layers are present in between the electrodes and the liquid crystal, which makes the liquid crystal molecules to maintain a defined orientation angle. One each polarisers are pasted outside the two glass panels. This polarizer‟s would rotate the light rays passing through them to a definite angle, in a particular direction. When the LCD is in the off state, light rays are rotated by the two polarisers and the liquid crystal, such that the light rays come out of the LCD without any orientation, and hence the LCD appears transparent. When sufficient voltage is applied to the electrodes, the liquid crystal molecules would be aligned in a specific direction.

The light rays passing through the LCD would be rotated by the polarisers, which would result in activating / highlighting the desired characters. The LCD‟s are lightweight with only a few millimeters thickness. Since the LCD‟s consume less power, they are compatible with low power electronic circuits, and can be powered for long durations. The LCD does don‟t generate light and so light is needed to read the display. By using backlighting, reading is possible in the dark. The LCD‟s have long life and a wide operating temperature range. Changing the display size or the layout size is relatively simple which makes the LCD‟s more customer friendly. The LCDs used exclusively in watches, calculators and measuring instruments are the simple sevensegment displays, having a limited amount of numeric data. The recent advances in technology have resulted in better legibility, more information displaying capability and a wider temperature range. These have resulted in the LCDs being extensively used in telecommunications and entertainment electronics. The LCDs have even started replacing the cathode ray tubes (CRTs) used for the display of text and graphics, and also in small TV applications.

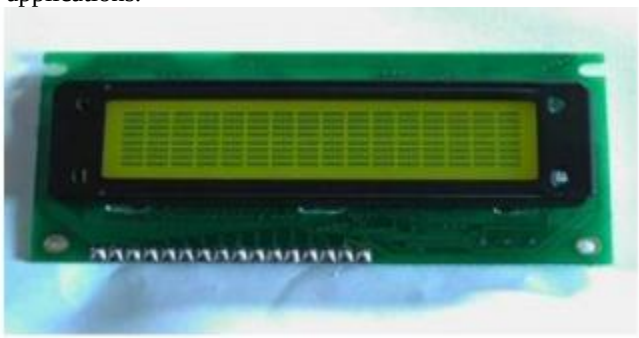

Fig.9.LCD Display

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8. GSM (Global System for Mobile Communication)

GSM, reigns as the world‟s most widely used cell phone technology. Cell phones use a cell phone service carrier‟s GSM network by searching for cell phone towers in the nearby area. 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. It is estimated that many countries outside of Europe will join the GSM partnership.

Fig.10. GSM Unit

9. General Features

- Tri-band GSM/GPRS900/1800/1900Mhz
- GPRS multi-slot class 10
- GPRS mobile station class –B
- Complaint to GSM phase 2/2+
- -class 4(2W @900MHz)
- -class 1(1W @/18001900MHz)
- Dimensions: 40x33x2.85 mm
- Weight: 8gm
- 7. Control via AT commands
- (GSM 07.07, 07.05 and SIMCOM enhanced ATcommands) SIM application tool kit
- supply voltage range from 3.5 to 4.5 v
- Low power consumption
- Normal operation temperature: -20 ‟C to +55 „C
- Restricted operation temperature : -20 ‟C to -25 „C and +55 ‟C to +70 „C
- storage temperature: -40 „C to +80 „C

III. DESIGN PROCEDURE

A. Microcontroller and GSM Module Interfacing

The microcontroller Atmega16 and the GSM Module SIM900A are connected to intercommunicate via the USART device present in the Atmega16 chip. The Rx (PD0) and Tx (PD1) pins of Atmega16 are connected to the Tx and Rx of the GSM Module respectively.

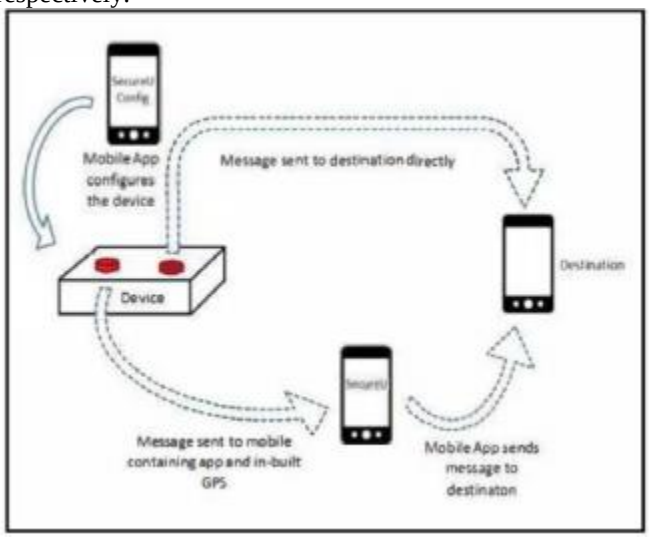

Fig.11. Working of the System

The GSM Module SIM900A can accept power supply in the range 9 to 15 volts. It is powered with a 12 volt dc adapter. The Atmega16 is powered with a 5V supply from the 5V power output pin in the GSM Module. The two buttons in our device are connected to the Atmega16 External Interrupt pins: INT0 and INT1 on one end, and the other end is grounded. The pull-up resistors in the interrupt pins are enabled in the coding. So, pins INT0 and INT1 are at 5 volt by default. When a button is pressed, the corresponding pin is grounded (0 volt).In addition two LEDs are connected to pins PORTB2 and PORTB6 of the Atmega16 for status indication. The USART has to be initialized before any communication can take place. The initialization process normally consists of setting the baud rate, setting frame format and enabling the Transmitter or the Receiver. Baud rate is set by writing the value of in the Baud Rate Registers: UBRRH and UBRRL.

$$[C\ PUjr\ eq \div (16 \times baudrate)]-1 \qquad (1)$$

The USART Transmitter and Receiver are enabled by setting the Transmit Enable (TXEN) bit and setting the Receive Enable (RXEN) bit in the UCSRB Register to one. A frame format of 8 data bits and 1 stop bit is selected by setting the UCSZ1 and UCSZ0 flags to one and the USBS flag to zero in the UCSRC register.

B. Sending SMS via GSM Module

The microcontroller sends an SMS in the following two events:

1. When a Button is Pressed: The buttons are connected to the INT0 (PD2) and INT1 (PD3) pins of Atmegal6. When pressed, Interrupt Service Routines of external interrupts INT0 and INT1 are triggered. The initialization of interrupt is done as follows:

- The pins PD2 and PD3 are configured as input ports by appropriately setting the DDRD register
- The pull up resistors for pins PD2 and PD3 are enabled by appropriately setting the PORTD register.
- The INT0 and INT1 interrupts are enabled by setting them INT0 and INT1 flags of GICR register to one.
- The interrupts are configured to be triggered at the rising edge by setting the ISC00, ISC0l, ISC10 and ISC11I flags in MCUCR register to one
- The Global Interrupt flag in the SREG is set by calling the sei() function.

2. Saving New Settings: When a user sends a message to save new settings in the device, the microcontroller is required to send an SMS to the user notifying that the new settings have been saved or that the pin in the message is incorrect Receiving SMS from GSM Module and saving new settings in EEPROM' In order to receive any data from the GSM Module, the RXC interrupt of the Atmega16 is used. The RXC flag in UCSRA register is set when the USART has already received a byte from the GSM Module. As soon as the RXC flag is set, the RXC interrupt is triggered and its ISR is executed. In the ISR, the received byte is read from the UDR and written to a character array named URBuff. The RXC interrupt is enabled by setting the RXCIE flag in the UCSRB register. When a new SMS is received by GSM Module, it sends a new message indication to Atmegal6. This message indication starts with +CMTI. In order to detect new SMS arrival, Atmega16 keeps on checking the URBuff length continually in an infinite while loop. If the length found to be non-zero, the array URBuff is checked for +CMTI. If found, it implies that a new message has arrived. Now the Atmega16 sends the AT +CMGR command to the GSM Modem. GSM Modem then sends a string of data to Atmega16 which contains the sender' s number and the message body which are retrieved by Atmega16 by reading the buffer URBuff. The number and message body is then passed onto a C function: void SetConfig (char *number, char *message) Functional Algorithm of SetConfig function: Steps of the algorithm are given below:

Step 1: Wait until a new message arrives.
Step 2: When a new message arrives, retrieve the sender' s number and message body.
Step 3: Look for the sequence 'double-hash ABC' at the start of the message body. If found, go to Step 4 If not found, go to Step 1
Step 4: Check the 4 digit pin enclosed within < and > in the message body. If pin received is incorrect, notify the sender. If pin received is correct, go to Step 5.
Step 5: Check for occurrence of tags and in the message body. If found, save the destination number setting enclosed within these tags in EEPROM. Then go to Step 6. If not found, go to Step 6
Step 6: Check for occurrence of tags and in the message body. If found, save the message setting enclosed within these tags in EEPROM. Then go to Step 7. If not found, go to Step 7
Step 7: Check for occurrence of tags and in the message body. If found, save the GPS Location number setting enclosed within these tags in EEPROM. Then go to Step 8. If not found, go to Step 8
Step 8: Check for occurrence of tags and
in the message body. If found, save the new pin setting enclosed within these tags in EEPROM then go to Step 9. If not found, go to Step 9
Step 9: If any of the above tags were found in the message body, notify the sender that new configurations have been saved. Then return to Step 1.
C. Android Application 1 (SecureU)
The android application designed for the project application acts as a communication interface between the sender‟s side and the receiver‟s side. It provides a very user friendly interface for all its controls and actions. Working Principle:

- It senses every incoming SMS and check if it is from the desired sender number.
- On sensing a SMS from the desired sender it comes into action.
- It accesses the built-in GPS system of the mobile and collects the current location details (current latitude and longitude).

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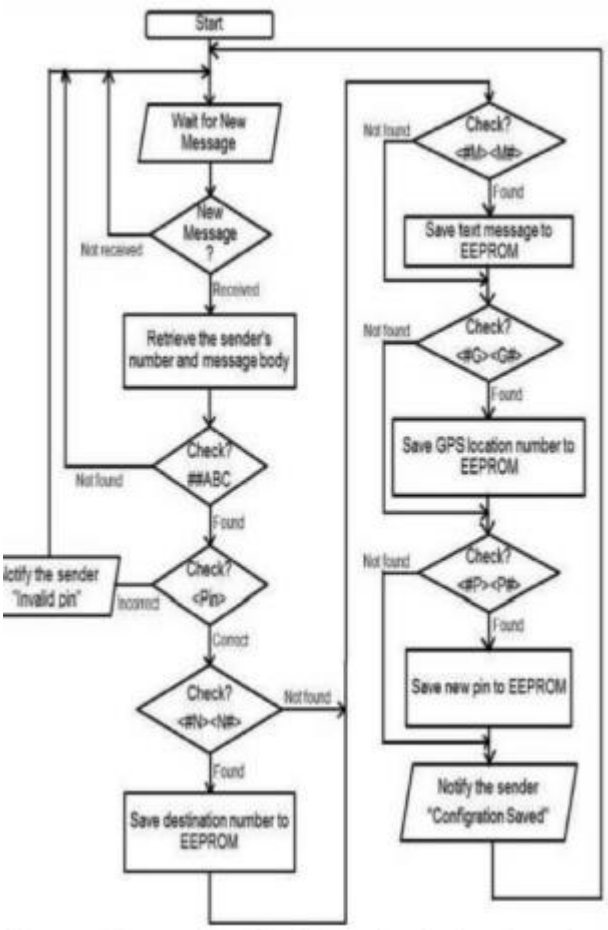

Fig.12. Flow Chart of the Configuration Saving Algorithm

Fig.13. Home Screen of SecureU

Fig.14. Settings Configuration Screen

Fig.15. SecureU Config Home Screen

D. Application Description

The application basically consists of two screens for user interaction. The first screen, for SecureU, consists of three buttons namely START, STOP and CONFIGURE.

- START: Pressing of this button initiates the application by starting its services. It allows the application to run in background.
- STOP: This button tenninates the application. It closes all the background activities of the application.
- CONFIGURE: This button leads the user to another screen consisting of three text fields where the user needs to feed the Device number (GSM module phone number), Destination number and a text message. The Save button keeps these feeds saved until it is changed again.

- On incomplete filling of the details, the application notifies the user at the start up to avoid malfunction

E. Android Application 2 (SecureU Con fig)

SecureU Config is an android application designed to give the users a very simple-to-use experience in configuring the device.

1. Working Principle: The application allows the user to configure the following parameters: Destination Nwnber SIM number of the mobile containing the SecureU application and in-built GPS A text message to be sent to destination and an authentication 4-digit PIN

2. On clicking the Configure Button

- The received entries from the user input are logged and special prefixes and suffixes are added to all the fed details and are arranged in a format understandable by the microcontroller to be configured.
- The formatted string of text is sent to the SIM number of the Microcontroller device.
- When the PIN is to be replaced, a new PIN is entered in the NEW PIN field and the old PIN is filled as usual in the PIN box. The old PIN is then replaced by the new PIN inside the device and remains saved.

3. Application Description: The application displays a single screen consisting four text fields namely Destination Number, GPS Location Nwnber, Message, 4 Digit PIN, Secure device number, PIN.

- Destination Number: The 10 Digit receivers contact number is fed into this field. Country code (0 or +91) may be entered as prefix.
- GPS Location Number: This field is to be filled with the mobile number where the SECUREU application is installed. This field is only use when GPS location is needed. Otherwise this is left blank.
- Message: This contains all the information in a simple text fondant that is sent to destination mobile number.

4. Digit Secure PIN: This field is filled only when the current authentication PIN needs to be changed with a new PIN. The new 4 digit PIN is entered here

- SecureU Device Number: The SIM number of device to be configured is entered in this field.
- PIN: Current authentication 4 digit PIN is entered here.

TABLE 1. Cost

Sl. No.	Components	Quantity	Cost per	Total
1	ATmega16	1	175	175
2	GSM	1	900	900
3	Push Button	2	25	50
4	Breadboard	1	100	100
5	Miscellaneou			50
Total Cost: 1275				

Configure: Button to save the entered PIN and send the message with the filled entry details.

Results:

IV. CONCLUSION

This security home feature become draws much attention in the future. People getting more concerned to protect their house from unauthorized people. This system can monitor a house by use of sensors that integrated with a microcontroller and a GSM unit. SMS use to alert users via mobile phone when a possible intrusion occurs. Today almost everyone using mobile phone so by use this system user will not have to carry additional device to monitor their house this system is design using modularity to become a flexible system that can be add more sensors without change the whole system, only add some sensors to increase systems functionality. So this system is a modular home security system by using SMS function to communicate between system and user.

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