Home Security with Beagle Bone

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ABSTRACT

Security is the main concern for every individual. Everyone wants to live securely in his/her house. Everybody wants them to keep safe or secure from various incidents like theft in their house or accidents caused due to LPG gas leakage or accidents due to fire in their house. So, with the rapid Increase in the technologies as well as in the Science, it has become a major concern for every individual to be updated in the latest inventions and the software's. This project deals with the smart security system to safeguard our houses using our cell phones. We have seen innumerous cases of theft as well as stolen things from the particular houses. Several researches are still undergoing but none of them proved to be beneficial as of now. So, the basic approach to implement this project is how we can simply make sure that our home will be safe with the use of just a single password. There are several appliances available in the market on which we have to manually press the keys to enter the password and get in. Hence, to make it more simple, I have used a simple smart phone to enter the password into the device remotely from anywhere in the world with the help of the DTMF technology.

Index Terms — *Intelligent Control, Smart Home, DTMF based security, Home Security.*

I. INTRODUCTION

The aim of the proposed system is to develop a cost effective solution that will provide controlling of home appliances remotely and enable home security against intrusion and theft in the absence of owner of the house. This project provides availability due to development of a low cost system. This project with the low cost was thought to be built that should be mobile providing remote access to allow home security. However, the devices connected as home and office appliances consumes electric power but it is definitely going to prove beneficial to every individual. In this project, we are going to make a cellular phone based security system to safeguard our houses. The system is designed for controlling arbitrary devices. It includes a cell phone, a GSM module based on DTMF technology and also several components as per the need. The user can insert the password in his cell phone which in turn will be sent to the electronic board connected at the main door of the house with the help of

Dual Tone Multiple Frequency. If the password matches with the particular password provided to the board initially then the door will automatically open whereas on the other hand, if the password does not match to the stored password then the development board will display an error on the screen and it will ask you to re-enter the password.

However, for additional security prospect, we can limit the number of times the password entered to our need (most probably 3 or 5 times).

II. BLOCK DIAGRAM
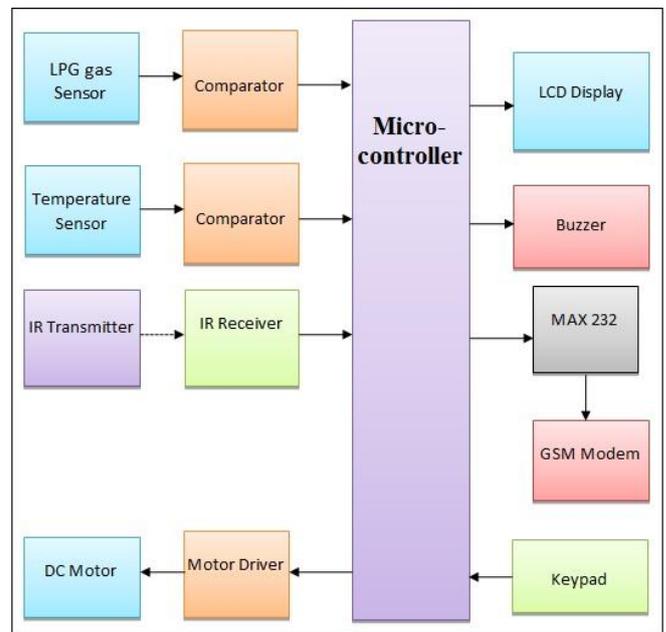
It mainly consists of the following blocks:

1. Infrared Transmitter: We are going to implement the Person detection module using single transmitter as well as a receiver. Moreover, we will be using Infrared transmitter as infrared beams are not visible to human eyes and are safe. The Transmitters used are IR LEDs.

2. Receiver: We have opted to use an Infrared receiver. It is basically an active low device which generally gives low output when it receives the Infrared rays.

3. Microcontroller: It is the main CPU of our project. We will be using a microcontroller of 8051 family. The several functions of microcontroller are as:

I. It reads the digital input from infrared receiver to find whether person is entered inside house. II. It then sends this data to LCD so that the person operating this project should read the exact number of persons present. III. Accepting the password using keypad and to check if it is a correct password or a wrong and rotate the stepper motor if the password entered is a genuine password. IV. Lastly, it sends the data to the GSM modem using serial port. The data consist of number of persons inside the room and the status of entered password.

4. LCD: We are going to deal with 16×2 alphanumeric Liquid Crystal Display (LCD) which generally means it can display alphabets along with particular numbers on 2 lines containing 16 characters each.

5. GSM Modem: We have used Sim300 as a GSM modem. The presence of persons inside the room, the status of the gas Leakage and the status of entered password will be sent to the desired GSM modem.

6. CM8870PI IC: This is the general IC used in the DTMF circuit for encoding as well as decoding process.

AT89S52 is an ATMEL microcontroller with the core of Intel MCS51. This micro controller is a low-power, good performance CMOS 8-bit micro computer with 8K bytes of Downloadable Flash programmable and reusable read only memory as well as 2K bytes of EEPROM. This device is manufactured using Atmel's high density non-volatile memory technology and it is as similar as the industry standard 80C51 instruction set.

The Downloadable Flash allows the program memory to be reprogrammed in-system through an SPI serial interface or by a conventional non volatile memory programmer. This device is a powerful microcomputer by combining a versatile 8-bit CPU with Downloadable Flash on a monolithic chip, that often provides a highly flexible and cost effective solution to many embedded control applications and products.

The AT89S52 provides the standard features as shown:

It has 8K bytes of Downloadable Flash, 2K bytes of EEPROM, 256 bytes of RAM, 32 I/O lines, programmable watchdog timer, two Data Pointers, three 16-bit timer/counters, a six-vector two-level interrupt, a full duplex serial port, on-chip oscillator and clock circuitry paradigm.

In addition to these features, the AT89S52 is designed with static logic for operation down to zero frequency and supports three software selectable power saving modes. The Idle Mode normally resists the CPU while allowing the timer/counters, RAM, serial port as well as interrupt system to continue functioning. The Power down option

saves the RAM contents but freezes the oscillator, sometimes disabling all other chip functions until the next interrupt or hardware reset has occured.

The Flash which is downloadable can be changed into a single byte at a time and is accessible through the SPI serial port interface. Holding RESET active for along time forces the SPI bus into a serial programming interface and allows the program memory to be written to or read from, unless the Lock Bit two has been activated.

III. SYSTEM DESCRIPTION

The general description of the overall project can be glimpsed in the figure shown below:
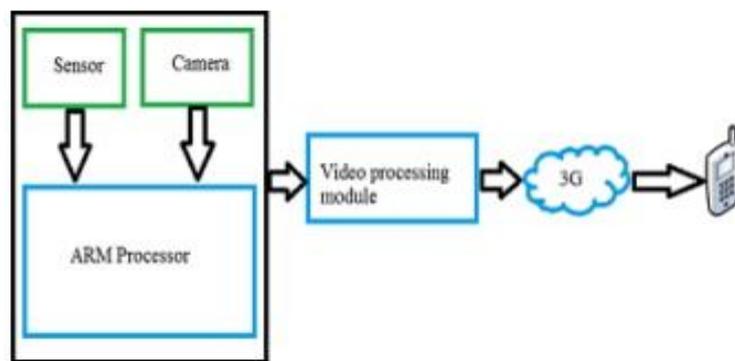

Fig. System Block Diagram

It can be easily seen in the above diagram that how the whole system is going to work. There would be appropriate sensors as well as cameras placed at the main entrance of the house which are connected to the ARM Processor. Here, it is not a compulsion that we have to use only the ARM processor. For the cost effective purpose, we can use Beagle bone board, Raspberry PI or any other development board which will contribute less in the cost factor.

One of the very key aspect that is to be considered is that the cell phone should have a GSM connection established with it such that while sending an SMS or while setting up a security code, the user need a secure connection to communicate with the board.

If any unknown person has intruded into the house then the board will immediately issue a warning signal to the CPU. The CPU will look which and where the alarm is situated, the scene is immediately preceded by a sound and light alarm and takes emergency treatment by controlling the CMOS device to capture video frames and images and then put stored video image data into buffer, and finally run the image display program which is transplanted to embedded target platform just for processing & displaying the buffer zone of the image data acquired. Furthermore, the images which can be saved into a data file format and labelled as UDP packets, through the 3G network sends it to the remote user mobile phone. In contrast, even if the host is far away, he may

have glance at the situation at home through the 3G network, and can set defending or attacking mode to achieve remote monitoring function.

IV. SPECIFICATION OF THE BOARD

1. Processor TI DM3730 Processor -1 GHZ ARM Cortex
2. Package on Package POP CPU/MEMORY Chip
3. 512 MB LPDDR RAM
4. 'HD' Capable TMS320C64X + core (800 MHZ up to 720px @30 fps).
5. 4 GB Micro SD card connection for Data storage
6. RS 232 Port for serial communication
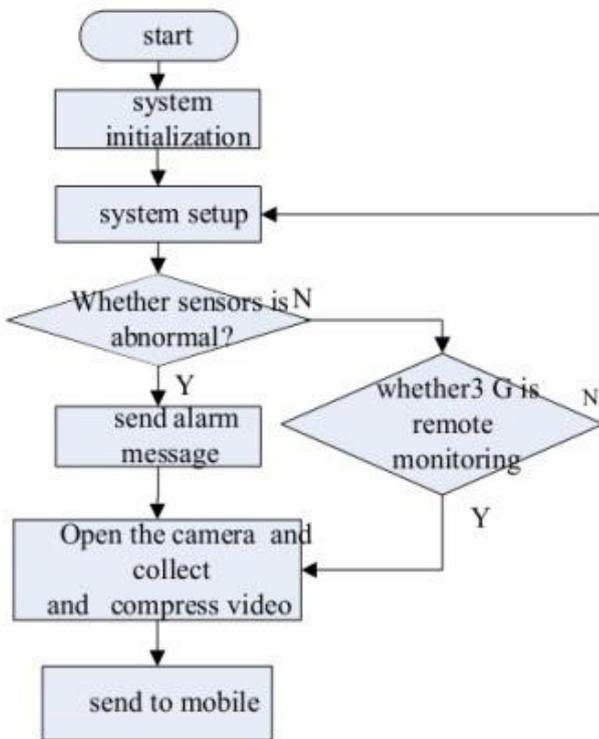7. Camera Port

V. SYSTEM SOFTWARE DESIGN

Fig. Generic Algorithm for System Program Flow

The development board uses Linux2.4 core with powerful network and excellent transplant & a powerful processing memory and equipment Penny rationale to support a variety of file system, Built a complete TCP / IP protocol and the system needed for a variety of devices such as the driver which is used to manage a wide aspect of applications software to achieve real-time systems and multi-tasking. The File system used is EXT3 file system, that system all the files and directory tree structure to the formation of the overall directory hierarchy in order to facilitate system management of documents and almost 300 equipments. The User applications needs to be completed by a series of a function of the respective functional components such as including alarm monitoring process, image acquisition compression procedures, 3G technology communication procedures, video monitoring etc.

System software is mainly consists of boot loader, respective operating system, the file system and all the user applications. Moreover, the boot loader using the boot files is mainly used to initialize the processor and hardware equipments, downloadable system images and initializes the operating system to be ready to implement. Hence, to all the devices on the system which needs to prepare the driver and the corresponding user applications in order to achieve the required system functions of the system, the main important algorithm is shown in Figure above.

For the CMOS USB camera itself, the driver program need to provide basic I/O interface functions including the achievement of open, read, write, close and several features.

The disturbance or interfering of processing, memory mapping function, as well as the control interface of the function to achieve for I/O channel and so on.

VI. SOURCE CODE OF THE PROJECT

```
#include<avr/io.h>
void disp_cmd(unsigned int cmd);
void disp_data(unsigned int cmd);

void disp_cmd(unsigned int cmd)
{
  int cmd1=(cmd & 0xF0);
  PORTD=cmd1 + 0x0F;
  _delay_ms(1);
  PORTD=PORTD - 0x01;
  cmd1=((cmd<<6) & 0xFF);
  PORTD=cmd1 + 0x03;
  _delay_ms(1);
  PORTD=PORTD - 0x04;
}

void disp_data(unsigned int cmd)
{
  int cmd1=(cmd & 0xFF);
  PORTA=cmd1 + 0x01;
  _delay_ms(1);
  PORTA=PORTA - 0x02;
  cmd1=((cmd<<6) & 0xF9);
  PORTA=cmd1 + 0xAB;
  _delay_ms(1);
  PORTA=PORTA - 0x0C;
}

void main ()
{
int pass, a=0,b=0;
 while (1)
 {
```

```
  disp_cmd (0x01);
  _delay_ms (10);

  disp_string ("Please Enter the Password");

  while(a!=12)
  {
   a=Pressed_key();
   if(a==12)
    {
     break;
    }
   else
    {
     b=b*10+a;
     disp_cmd (0xc4);
     disp_number (b);
     _delay_ms (100);
    }
  }
clrscr ();
getch ();

}
```

VII. CONCLUSION

The GSM based home security system has been designed and tested with the mobile network. The user can get alerts anywhere through the GSM technology thus making the system location independent. An easy and flexible approach to control and explore the services of the cell phone, the important commands is used in the system. The communication of the mobile owner with his home is only through the SMS which has been tested with the mobile networks and is working on any mobile network.

The web camera based security system is very easy, user friendly and software has many features. It will be more easy to use IP camera instead of web camera. However, the cost of IP camera is more. Similar software's are available on internet which will perform the same task. This type of system is useful when the owner is out of station and the home is locked. The system has tested on the model of smart home and further it will be tested in actual home. The more accurate result as well as the complexity of the algorithm of the system can be raised by introducing and allowing an ample number of sensors to make the energy efficient home.

*Advantages:

1. Remote indication: With the use of GSM technology in the device, the owner of the house or industry gets remote indication through messages. Hence, even if the user is not present at his home or industry, he will get to know and intimated about the hazardous or undesirable conditions / situations inside the house.

2. This system is a fully automated system. So once this system is installed at a particular place inside our home or industry, then it does not allow any human involvement to operate it which means it is self operable and easy to handle. With the use of this system we can save the life of person inside home / industry. Since the accidents caused due to fire and LPG gas leakage can cause life threat.

3. Also the property inside house and various materials inside the house and industry are saved from to theft and from fire detection.

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