REMOTE CONTROL HOME AUTOMATION AND SURVEILLANCE SYSTEM BASED ON ZIGBEE AND GSM TECHNOLOGY

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Abstract*: - In recent years, the home environment has seen a rapid development with wireless communication network and advanced computing technologies. In this paper we focus on monitoring a smart home and providing security when the user is away from home. In this proposed security algorithm it provides security against intrusion and only the authenticated person can monitor and control the home appliances through wireless network. Zigbee IEEE 802.15.4 based Sensor Network and GSM are embedded through a standard home gateway. The overall wireless communication of the smart home system is controlled by the home gateway.*

Keywords: - *GSM, ZigBee, ARM7, Smart Home System, MEMs Sensor, VB.*

I. INTRODUCTION

Advancements in science and technology lead to the development of applications in each and every field. In the communication field the technologies such as Bluetooth, GSM, and Zigbee were introduced which created the wireless communication system. The smart home application is also one of the important applications which led to luxury home environment and more to the pursuit of security which made the people living life style more comfort and improved the people living standard. Many smart home applications have come into existence which reduced the human task force. Wireless systems for smart home applications are developed to monitor and control the status of home equipments based on ZIGBEE and GSM technology. The sensors used are temperature sensor, gas sensor, infrared sensor, vibration sensor, and smoke sensor, these sensors are Micro Electro Mechanical System based components and these components are used for monitoring the smart home system. The relay is anchored with the bulb and motor which automatically turns off the ac load when threshold limit is exceeded. The main advantage of this system is that it can monitor and control the smart home efficiently. A buzzer is present which acts like an alarm when the threshold limit is exceeded. Zigbee is used for its power efficiency and long range (upto 75 m) when compared to Bluetooth which operates in a similar frequency to that of Zigbee.

II. OVERVIEW

The host sends the text message via mobile phone to the master slave or host control centre of the home appliance to control the smart home appliances. The control center detects for an external interrupt, when an external interrupt occurs, the buzzer will automatically alarm, the home control system sends text message to mobile phone. ZigBee module is responsible for receiving and sending data between the host control and sub function system. Data transmission is due to communication between the ZigBee and ZigBee modules GSM module is responsible for receiving the control system commands issued as the warning signals and re-transmits the control command to the host center.

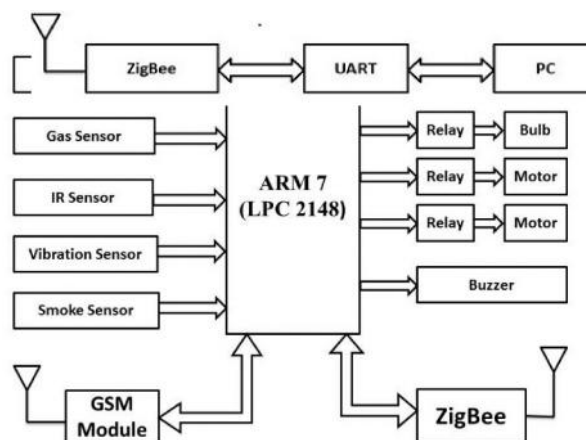### A. SYSTEM ARCHITECTURE:

Fig 1: Host controller and transmitter module

Fig 2: Receiver module

The host control center consists of five modules: The remote communication module GSM, ZigBee wireless communication module, control module, power module and IR sensor. The system ZigBee module features Chipcon's CC2430 radio transceiver chip. The remote communication

function is performed by SIMCOM GSM module to achieve control from the macro crystal technology. STC series single-chip controls the power module of GSM. The control unit MCU controls all the operations of the host system units which provides the communication to the host and the home equipments. The IR sensor is used to identify the home equipment disturbance when the host sets the absence of any one in home. The IR sensor gives the abnormal or error message to the host through the GSM module. The block diagram of the host control system is shown in the figure. The schematic representation of the host system is given below.
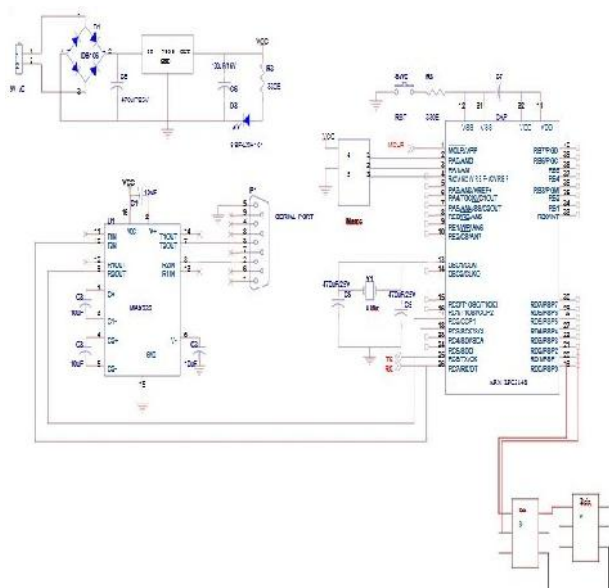

Fig 3: Schematic diagram

B. ZIGBEE MODULE:

ZigBee application is used to implement embedded system on a chip which is made by Chipcon Company. It supports 2.4GHz IEEE802.15.4 ZigBee agreement. According to the different chip flash memory capacity, it provides users with three versions, namely CC2430-F32/64/128, corresponding to the built-in flash memory 32KB/64KB, 128KB. CC2430 chip with a powerful integrated development environment as a support, the internal circuit interactive debugging of the IAR IDE to comply with industry standards support, embedded institutions received a high recognition. The previous chip architecture extension is CC2430 of CC2420 chip, integrated on a single chip with ZigBee radio frequency (RF) front end, memory and microcontroller. Make these devices very well suited for communication gateways and protocol converters, recognition of voice and

low end imaging, provide both large high processing power and buffer size.

C. GSM MODULE:

The system uses GSM module SIM900A which is provided by SIMCOM. This GSM module is used to provide the short messaging service to the user. This module supports dual band which are GSM900 and GSM1800. This module is used to implement long distance communication between the user and the system. This module is connected with the system through a serial port RS232. Max232 is used between SIM900A and host microcontroller to convert the CMOS and TTL level to RS232 voltage level which is -12v to +12v.

D. MICROCONTROLLER LPC2148:

The LPC2148 microcontroller is based on a 32 bit ARM7TDMI-S CPU which supports real-time emulation and embedded trace support, combining the microcontroller with embedded high speed flash memory ranging from 32 kB to 512 kB. The unique architecture of the accelerator enables execution of the 32-bit codes with the maximum clock frequency with a 128-bit of wide memory interface. For reducing the code by more than 30% with minimal performance penalty 16-bit Thumb mode is used as alternative for the critical code size applications. For application such as access control and point of sale, LPC2148 is ideal due to their tiny size and low power consumption where miniaturization is the key requirement. For providing both large buffer size and high processing power a blend of serial communication interfaces ranging from multiple UARTS, on chip SRAM of 8kB up to 40kB, USB 20.0 devices to I2Cs. This makes these devices well suited for soft modems, recognition of voice protocol converters and communication gateways and low end imaging. To make these microcontrollers suitable for industrial purposes in control and medical system operations a 32-bit timer with 10 bit ADC or DAC is used which is added with the 45 fast GPIO lines passing through the PWM channels comprising level sensitive external interrupt pins.

E. BUZZER:

An oscillating electronic circuit drives a piezoelectric element. The sound generated by the FDK piezo-ceramic buzzers is due to the bending vibrations of the thin metal plate adhered to a piezo-ceramic disc. The features of these buzzers include low-power consumption, non-contact structure, and small size, light weight, spark free. Theses buzzers include alarm devices and timers.

III. OPERATION FLOW

The system software includes the host control system and sub function system. The function of the host control system includes data processing and transmission. The main function of the sub function system is data collection and then sending the data to the host control centre and controlling the household appliance according to commands sending from the host control centre. The below is the flow chart of the host control system and sub function system.

A. SENDING SMS:

GSM short message service is used to send remote alarm SMS in this design. The local user interface will be available for the users to set the number of SMS center and destination phone number. After starting SMS sending program, it will read the configuration from the file and hence it will send commands to the SIM900A module to set the SMS server and the destination phone number. The sending SMS flow diagram is shown in figure.
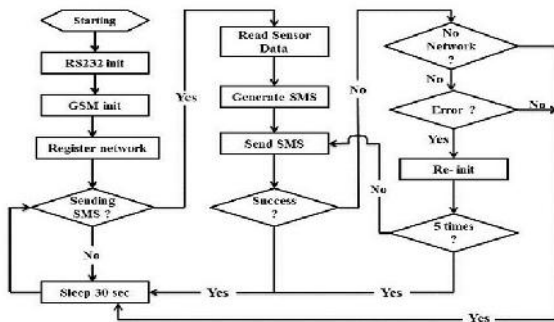

Fig 4: Sending flow diagram

B. RECEIVING SMS:

At the primary stage of receiving sms after initialization, GSM is activated and verified for new SMS, if there is no new sms this process is continued else the sms is read and scrutinized for authenticated number if yes then the sms is parsed and operated otherwise the process is aborted .The status information of SIM900A module is regularly queried by this process. If there is a new SMS, this process will read the SMS from SIM900A module and process it. The status information of each device, and timing are maintained by the subsequent device monitoring process, this process will just analysis the SMS and notify the device monitoring process to operate by IPC when a new legitimate SMS is received. Then the device monitoring process will send the result of implementation back to this process. The receiving SMS flow chart is shown in figure.
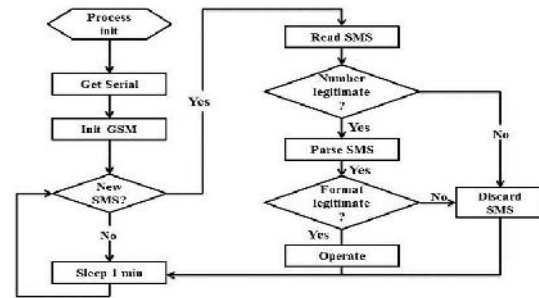

Fig 5: Receiving flow diagram

C. ALGORITHM OF HOST CONTROL SYSTEM:

STEP 1: Start the process.
STEP 2: Reset and initialization
STEP 3: The Routine Process will start
STEP 4: The Routine Process means all sensors sensing from that instance and the host control system accepts and stores the number of user for future acceptance.
STEP 5: The host controller checks the set value.
STEP 6: Host control system sends the status of wake up condition.
STEP 7: The information signal is sent to the serial communication port.
STEP 8: Host control system accepts the AT Commands for GSM, and also set the function for Zigbee Communication.

D. CODING SEGMENTATION:

```
#include <LPC21xx.H>        /* LPC21xx definitions */
#define CR    0x0D

int putchar (int ch)
{                          /* Write character to serial port */
 if (ch == '\n')
{
   while (!(U0LSR & 0x20));
   U0THR = CR;                    /* output CR */
 }
 while (!(U0LSR & 0x20));
 return (U0THR = ch);
}
int getchar (void)
{                   /* Read character from Serial Port */
 while (!(U0LSR & 0x01));
 return (U0RBR);

}
```

IV. SYSTEM IMPLIMENTATION & RESULT

The host sends text messages to GSM module, the module begin to interpret the command when it receives the command, and then send the command to the control center of the ZIGBEE co coordinator module. Finally the command is sent to the appropriate sub-control terminal equipment by the ZIGBEE module and the sub-control terminal takes the corresponding actions when it receives the command.

V. CONCLUSION

This design is based on ZigBee and GSM technology. The main purpose of the paper is to control the home appliance remotely from anywhere. The host controls the home from anywhere through mobile. Host sends an SMS through mobile phone to the host control system at the particular device. The host system controls the particular device according to the condition given by the host controller. The objective of this project is to detect any damage or abnormal condition of the home equipment when the host is away from home. Hence the remote control home automation and surveillance system based on zigbee and gsm technology is designed and implemented.

VI. ACKNOWLEDGMENT

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