

Zigbee Based Wireless Home Security System

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ABSTRACT

Article Info

Volume 8, Issue 3

Page Number: 491-497

Publication Issue :

May-June-2021

Article History

Accepted : 12 June 2021

Published: 21 June 2021

In recent years, the home environment has seen a rapid introduction of network enabled digital technology. This technology offers new and exciting opportunities to increase the connectivity of devices within the home for the purpose of home automation. Moreover, with the rapid expansion of the Internet, there is the added potential for the remote control and monitoring of such network enabled devices. However, the adoption of home automation systems has been slow. This paper identifies the reasons for this slow adoption and evaluates the potential of ZigBee for addressing these problems through the design and implementation of a flexible home automation architecture. A ZigBee based home automation system and Wi-Fi network are integrated through common home gateway. The home gateway provides network interoperability, a simple and flexible user interface, and remote access to the system. A dedicated virtual home is implemented to cater for the system's security and safety needs. To demonstrate the feasibility and effectiveness of the proposed system, four devices, a light switch, radiator valve, safety sensor and ZigBee remote control have been developed and evaluated with the home automation system

Keywords : ZigBee home automation, Security, Temperature detection, PIR detection, DPS sensor.

I. INTRODUCTION

The major problem that leads to develop such a project of smart home automation system is because of our humans' bad attitude itself. Humans' are lazy to turn OFF/ON home appliances which is common problem among us. As the percentage of wastage of high electricity is increasing year by year, a better home automation system is able to overcome such a

problem. And the older people are incapable to control home appliances by moving all over their house especially if double story house, they will suffer to control their home appliances if the control of the appliances are only by switches. The basic problem faced by any system through wired medium is that it can be achieved only in limited range and under certain specified constraint. To overcome these problems, we are using ZigBee module.

A phone based remote controller for home automation system. In this system all the communications occur by a fixed telephone line and the system can be controlled by using any telephone that supports the dual tone multiple frequency (DTMF). This system has some disadvantages: in the users are not provided with a graphical user interface (GUI), users have to especially remember an access code, and they also have to remember which buttons to press for the control of connected devices of the system. [B] A Bluetooth based home automation system, it consist of a primary controller and number of Bluetooth sub- controllers. Each single device is physically connected to the local Bluetooth sub-controller. The home devices can communicate with their sub-controller using wired.

2. Block Diagram

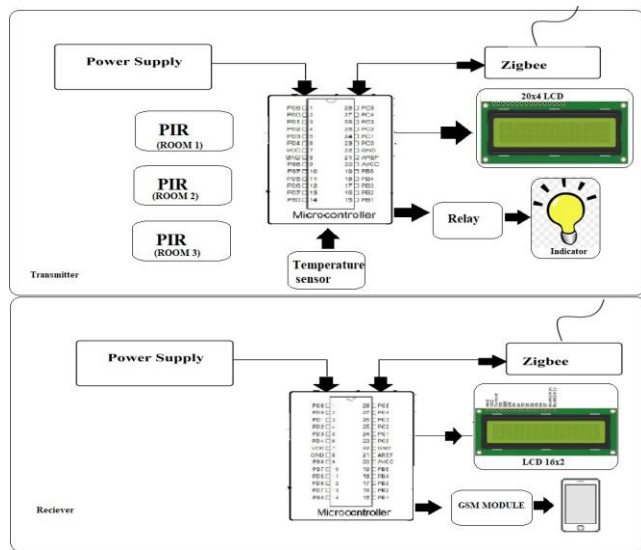


Fig 3. Block Diagram of System

3.1) BLOCK DIAGRAM DISCRIPTION:

The Zigbee based Home security system consists on two section namely transmitter and reciver, in transmitter side section used power supply, sensing unit,LCD display, Microcontroller and Reciver side

section used Zigbee, GSM module. The sensors sense parameter and give output to the controler and output given to the LED display.

3.2) HARDWARE REQUIRED

1. Atmega328P
2. Power Supply
3. Sensing Unit
4. Zigbee Module
5. Display
6. Connecting Wires
7. Switch & Toggle

4 HARDWARE DISCRIPTION

4.1) Atmega controller - The ATmega328 is a single-chip microcontroller created by Atmel in the megaAVR family (later Microchip Technology acquired Atmel in 2016). It has a modified Harvard architecture 8-bit RISC processor core. The ATmega328 is a single-chip microcontroller created by Atmel in the megaAVR family (later Microchip Technology acquired Atmel in 2016). It has a modified Harvard architecture 8-bit RISC processor core.



Features:

- High performance, low power AVR® 8-bit microcontroller
- Advanced RISC architecture
- 131 powerful instructions – most single clock cycle execution
- 32 8 general purpose working registers
- Fully static operation
- Up to 16MIPS throughput at 16MHz
- On-chip 2-cycle multiplier

- High endurance non-volatile memory segments
- 32K bytes of in-system self-programmable flash program memory
- 1Kbytes EEPROM
- 2Kbytes internal SRAM
- Write/erase cycles: 10,000 flash/100,000 EEPROM
- Active mode: 1.5mA at 3V - 4MHz
- Power-down mode: 1µA at 3V

II. SENSING UNIT

A) PIR Sensor.



Peripheral features

- Two 8-bit Timer/Counters with separate prescaler and compare mode
- One 16-bit Timer/Counter with separate prescaler, compare mode, and capture mode
- Real time counters with separate oscillator
- Temperature measurement
- Programmable serial USART
- Master/slave SPI serial interface
- Programmable watchdog timer with separate on-chip oscillator
- On-chip analog comparator
- Special microcontroller features
- External and internal interrupt sources
- Six sleep modes: Idle, ADC noise reduction, power-save, power-down, standby, and extended standby

I/O and packages:

- 23 programmable I/O lines
- 32-lead TQFP, and 32-pad QFN/MLF
- Operating voltage:
- 2.7V to 5.5V for ATmega328P

Temperature range:

Automotive temperature range: -40°C to $+125^{\circ}\text{C}$

Speed grade: 0 to 8MHz at 2.7 to 5.5V (automotive temperature range: -40°C to $+125^{\circ}\text{C}$)

0 to 16MHz at 4.5 to 5.5V (automotive temperature range: -40°C to $+125^{\circ}\text{C}$)

Low power consumption

REES52® HC-SR501 PIR Motion Sensor- Adjust Ir Pyroelectric Infrared (PIR) Motion Sensor Detector Module -PIR Sensor for Arduino uno.

PIR sensor detects a human being moving around within approximately 10m from the sensor. This is an average value, as the actual detection range is between 5m and 12m. PIR are fundamentally made of a pyro electric sensor, which can detect levels of infrared radiation. For numerous essential projects or items that need to discover when an individual has left or entered the area. PIR sensors are incredible, they are flat control and minimal effort, have a wide lens range, and are simple to interface with.

PIR sensor detect motion in 5 meters area

- Working voltage: 5V - 20V
- Power Consumption: 65 mA
- TTL Output: 3.3V
- Lock Time: 0.2 sec

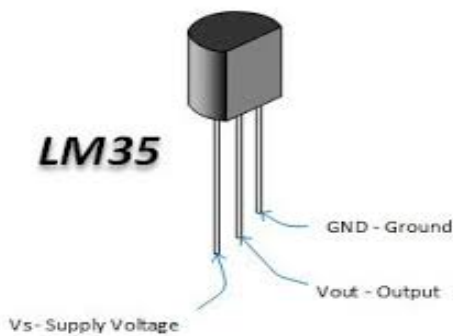
Applications:

- Wearable Devices
- Office Assistant Devices
- CCTV Monitoring Devices
- Home automation system.

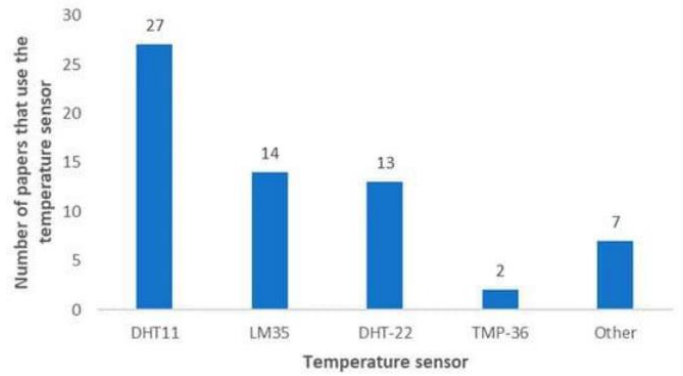
Benefits and Features:

1. Use PIR sensor and reduce the electricity units.
2. Ultra-Low-Power Operation Increases Battery Life for Wearable Devices
3. Programmable Sample Rate and LED Current for Power Savings
4. Ultra-Low Shutdown Current (0.7µA, typ)
Advanced Functionality Improves Measurement Performance
5. High SNR Provides Robust Motion Artifact Resilience
6. Integrated Ambient Light Cancellation
8. High Sample Rate Capability
9. Fast Data Output Capability

B) Temperature Sensor LM35



The LM35 is precision IC temperature sensor. Output voltage of LM35 is directly proportional to the centigrade/Celsius of temperature. The LM35 does not need external calibration or trimming to provide accurate temperature range. It is very low cost sensor. It has low output impedance and linear output. The operating temperature range for LM35 is -55°C to +150°C. With rise in temperature, the output voltage of the sensor increases linearly and the value of voltage is given to the microcontroller which is multiplied by the conversion factor in order to give the value of actual temperature.



LM35 Regulator Features:

- Minimum and Maximum Input Voltage is 35V and -2V respectively. Typically 5V.
can measure temperature ranging from -55°C to 150°C
- Output voltage is directly proportional (Linear) to temperature (i.e.) there will be a rise of 10mV (0.01V) for every 1°C rise in temperature.
- ±0.5°C Accuracy
- Drain current is less than 60uA
- Low cost temperature sensor
- Small and hence suitable for remote applications
- Available in TO-92, TO-220, TO-CAN and SOIC package

LM35 Temperature Sensor Applications:

1. Measuring temperature of a particular environment.
2. Providing thermal shutdown for a circuit.
3. Monitoring battery temperature.
4. Measuring temperature for HVAC application.

C) ZigBee Module:



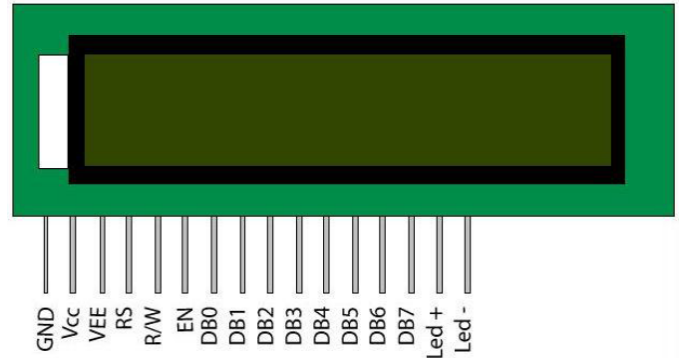
Fig : Zigbee Module.

ZigBee is a wireless communication technology developed by Zigbee Alliance as an open global standard to address the unique needs of low-cost, low-power, wireless sensor networks. ZigBee modules are a family of nice little radio devices that use the ZigBee or 802.15.4 protocol. Zigbee is the standard based technology designed to address the unique needs of low cost, low power wireless sensor. Zigbee can be used at almost anywhere and it is easier to implement and needs little power to operate. They send and receive the data via the 2.4GHz or 900 MHz band at a relatively low power and used to set up simple point-to-point links or complex self-healing networks spread over quite large areas. The higher power devices are used as telemetry solutions over the long ranges, but the applications are really extremely varied. Interfacing of a device with a ZigBee module is also easy. The technology defined by the Zigbee is intended to be simpler and less expensive than others such as a Bluetooth. Zigbee is targeted at radio frequency(RF) application that require a low data rate, long battery life and secure networking. Zigbee is basically a transceiver module.

Zigbee Features:

- ZigBee Module Support UART
- ZigBee Module Low power consumption design, support multi-sleep and trigger modes to reduce the power dissipation farthest
- ZigBee Module Supply 5 I/O channels,compatible 3 analog inputs and 2 pulse input counters
- ZigBee Module Support auto recovery mechanism, including online detect, auto redial when offline to make it always online
- ZigBee Module Support ZigBee wireless data transmission
- ZigBee Module Support Point-to-Point, Point-to-Multipoint, Peer-to-Peer and Mesh network

6 LCD DISPLAY



Here we used LCD 16x2 display for displaying status of motor whether it is ON or OFF. It also shows monitoring parameter. An LCD is an electronic display module which uses liquid crystal to produce a visible image. The 16x2 LCD display is a very basic module commonly used in DIYs and circuits. The 16x2 translates o a display 16 characters per line in 2 such lines. In this LCD each character is displayed in a 5x7 pixel matrix.

Features of 16x2 LCD module

- Operating Voltage is 4.7V to 5.3V
- Current consumption is 1mA without backlight
- Alphanumeric LCD display module, meaning can display alphabets and numbers
- Consists of two rows and each row can print 16 characters.
- Each character is build by a 5x8 pixel box
- Can work on both 8-bit and 4-bit mode
- It can also display any custom generated characters
- Available in Green and Blue Backlight

7 SOFTWARE REQUIREMENT

a) Arduino IDE

The Arduino integrated development environment (IDE) is a cross-platform application (for Windows, mac OS, Linux) that is written in the programming language Java. It is used to write and upload programs

to Arduino compatible boards, but also, with the help of 3rd party cores, other vendor development boards. The source code for the IDE is released under the GNU General Public License, version 2. The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub *main()* into an executable cyclic executive program with the GNU tool chain, also included with the IDE distribution. The Arduino IDE employs the program *argued* to convert the executable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware..

III. WORKING

This project is an affordable and smart home automation system is introduced because of our humans' bad attitude itself. Humans' are lazy to turn OFF/ON home appliances which is a common problem among us. As the percentage of wastage of high electricity is increasing year by year, a better home automation system is able to overcome such a problem.

IV. ADVANTAGES

Easy to Use
Automatic Operation

V. APPLICATION

a. Hospitals
b. Home Automation.
c. Offices.
d. School/Collage.

VI. FUTURE SCOPE

Now a days, Home Security threat is the most challenging task in our life. To overcome this threat, our houses must be Smart. This paper gives a solution to overcome the Home security threat. Using Zigbee network enabled digital technology, we can make our home Smart and secure. The technology gives us the opportunity to increase the connectivity of various devices hence we can get an overall security solution. Moreover, as the area of Internet is widening, we can remotely control and monitor the network enabled devices. The device can also send signal to the remote person whom we want to notify about the threat. Common gateway is used by both the Zigbee security system and Wi-Fi network for integration purpose.

Humans' are lazy to turn OFF/ON home appliances which is a common problem among us. As the percentage of wastage of high electricity is increasing year by year, a better home automation system is able to overcome such a problem. And the older people are incapable to control home appliances by moving all over their house especially if double story house, they will suffer to control their home appliances if the control of the appliances are only by switches.

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Cite this article as :

Kanhaiya C Jarad, Dipali B Gaikwad, Tanuja S Mulay, Prof. Satish Shelke, Prof. Sudhir N Divekar, "Zigbee Based Wireless Home Security System", International Journal of Scientific Research in Science, Engineering and Technology (IJSRSET), Online ISSN : 2394-4099, Print ISSN : 2395-1990, Volume 7 Issue 3, pp. 491-497, May-June 2020.
Journal URL : <https://ijsrset.com/IJSRSET2183206>