International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 02 | Feb 2020 www.irjet.net p-ISSN: 2395-0072

Low Powered Radio Frequency and PIR Sensor Based Security Device

Lavkush Gupta[1], Sanket Kupate[2], Pushkaraj Gharat[3]

[1]Student MSc Final Year, NES Ratnam College of Arts, Science and Commerce. Bhandup Mumbai 42 India
[2]Student MSc Final Year, NES Ratnam College of Arts, Science and Commerce. Bhandup Mumbai 42 India
[3]Project Guide, NES Ratnam College of Arts, Science and Commerce. Bhandup Mumbai 42 India

---

Abstract – *In this study, the design of a microcontroller based wireless security device using Radio Frequency and Passive infrared Sensor is described. The system detects unwanted intruders and sends the warning to alert systems based on buzzer alarm. Security Device is divided into two Hardware units. First Sensor unit, based on the networks of PIR sensors interfaced with RF Transmitter Module. Second Computational Unit based on Microcontroller AT89s52 interfaced to RF Receiver module and Alarm system. The communication between this two units is established with RF Transmitter/Receiver Module. The designed system specifically makes use of microcontroller which can operate with use of minimal power, with such low power current consumption, it should be possible for system to work longer before needing to change batteries. Most Wireless Security Device rely on Bluetooth, WIFI, Zigbee which practically use more power and are costly.*

Key Words: Wireless Security Device, Microcontroller application, PIR sensor, RF Module, Warning system

1. INTRODUCTION

Since the beginning of civilization, feeling safe is one of the need for human settlement. More and more people migrating to urban had led us to settle in more congested settlements. Consequences are feeling less secure inside of one owned home. With the daily increasing crime involving intruders and trespassers risking humans need of privacy, there is a need for system, capable of detecting it and warn us to take needed actions.

The most efficient and effective way to detect such unwanted trespassers is to installed a system at desired location which are vulnerable.

Microcontroller and RF based low powered devices are much favored as compared to other wireless devices which required FTP servers to communicate required separate power sources which are much easier to tamper or hijack.

This system is designed specifically with the view that make use of minimal power and can work on small size batteries, the compact size of our system xis easier to install and required very less physical space. And much easier to maintain.

Overall function of the devices can be increased with distributed array of sensor network unit.

2. Components used for Making of Security Device. The project consists of following important parts:

2.1 Microcontroller (AT89S52)

AT89s52: The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry-standard 80C51 instruction set and pinout. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with in-system programmable. The AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry.

2.2 RF Transmitter/Receiver Module

The RF modules are 433 MHz RF transmitter and receiver modules. The transmitter draws no power when transmitting logic zero while fully suppressing the carrier frequency thus consume significantly low power in battery operation. When logic one is sent carrier is fully on to about 4.5mA with a 3volts power supply. The data is sent serially from the transmitter which is received by the tuned receiver.

The **HT12D** and **HT12E** are 4-data bit encoder and decoder modules. This means that we can make (2^4 = 16) 16 different combinations of inputs and outputs. These are 18 pin IC's which can operate between 3V to 12V input power supply. As said, they have 4-data bit and 8-addresss bit, these 8 address bits has to be set same on both the encoder and decoder to make them work as a pair.

2.3 PIR Sensor

A passive infrared sensor (PIR sensor) is an electronic sensor that measures infrared (IR) light radiating from objects in its field of view. They are most often used in PIR-based motion detectors. PIR sensors are commonly used in security alarms and automatic lighting applications. PIR sensors detect general movement. PIR sensors are more complicated than many of the other sensors explained in these tutorials (like photocells, FSRs and tilt switches) because there are multiple variables that affect the sensors

input and output. To begin explaining how a basic sensor works, we'll use this rather nice diagram The PIR sensor itself has two slots in it, each slot is made of a special material that is sensitive to IR. The lens used here is not really doing much and so we see that the two slots can 'see' out past some distance (basically the sensitivity of the sensor). When the sensor is idle, both slots detect the same amount of IR, the ambient amount radiated from the room or walls or outdoors. When a warm body like a human or animal passes by, it first intercepts one half of the PIR sensor, which causes a positive differential change between the two halves. When the warm body leaves the sensing area, the reverse happens, whereby the sensor generates a negative differential change. These change pulses are what is detected.

2.4 Buzzers (5 Volt DC)

Buzzer is a device used for beep signal. This will help us to make understand information or message. A buzzer is usually electronic device used in automobiles, household applications etc. It mostly consists of switches or sensors connected to a control unit that determines if and which button was pushed or a preset time has lapsed, and usually illuminates a light on appropriate button or control panel, and sounds a warning in the form of a continuous or intermittent buzzing or beeping sound.

3. Architectural Design and Working of Security Device

The system consists of two functional Hardware modules and One Software program written in C language. These are Sensing Unit, Computational Unit and also Wireless communication channel.

A) *Sensing Unit*.

The PIR sensors, Encoder IC and RF Transmitter are fixed on this board. PIR Sensors responsible for Detection gives TTL output to the Encoder IC. The signal is encoded and is transmitted over the Radio Channel.

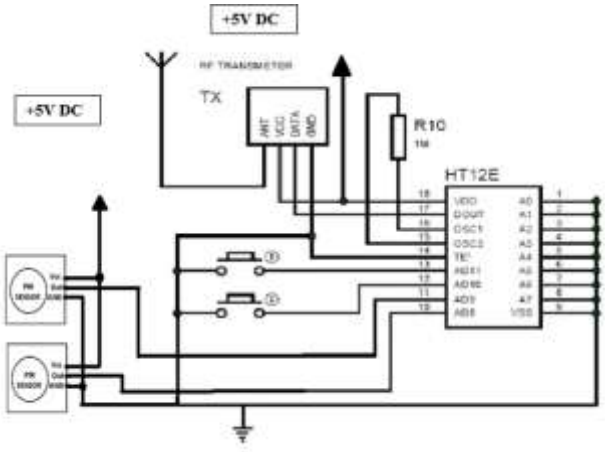

Fig -1: Circuit Diagram of Sensing Unit.

B) Computational Unit.

The Microcontroller, Decoder IC, RF Receiver and Buzzer/Alarm is fixed on this board.

Microcontroller is responsible for processing for signal received by the Decoder IC received by RF Receiver End. The signal received is processed by the CPU on board, based on the embedded program, microcontrollers drive the buzzer on board. It also has a RESET button to reset the device.

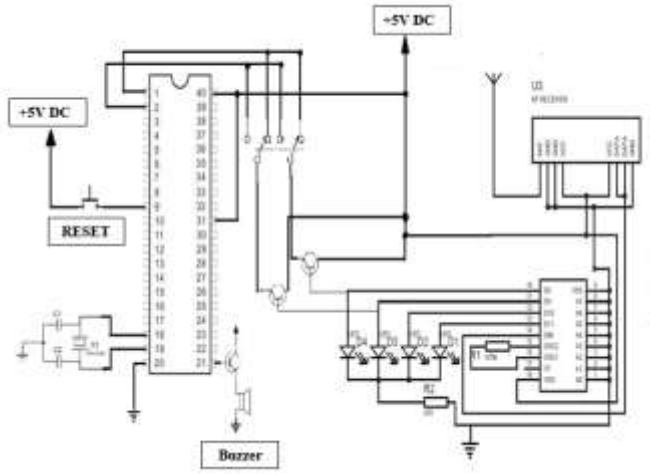

Fig -2: Circuit Diagram of Processing Unit.

C) Software Program

The program written in C Language drives the microcontroller. The program is configured to drives Two Modes of alarm. The modes can be selected with a simple push of DPDT push button fixed on the board.

MODE 1: Alarm/Buzzer goes continuously ON unless the reset button is pushed.

MODE 2: Alarm/Buzzer Turns OFF after completing certain interval of time set in the program.

3. Result

Low powered wireless security device based on Microprocessor using PIR Sensor and RF Transmitter/Receiver application has been developed and build.

3.1 Overview of designed Security Device

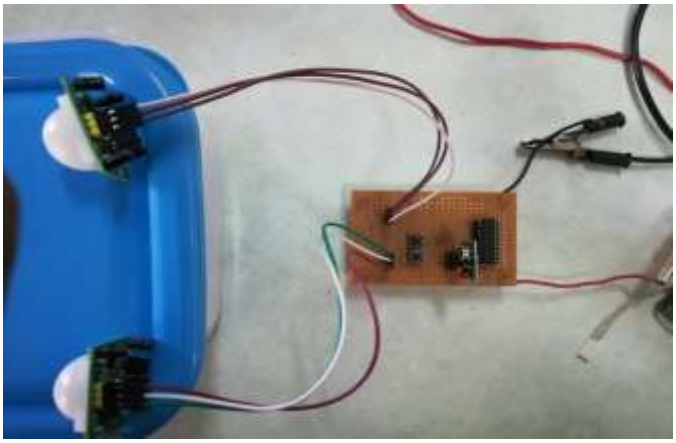

Fig -3: Top View of Sensing Unit.

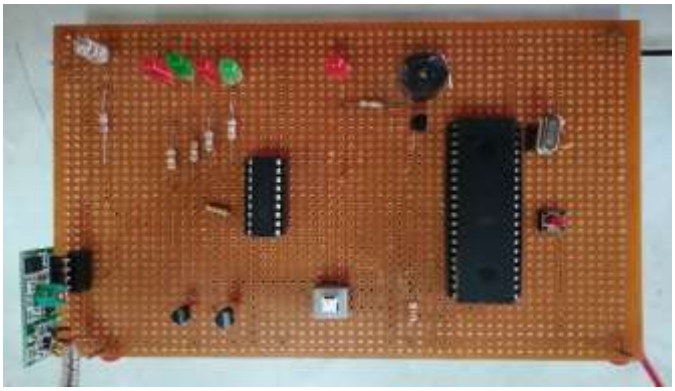

Fig -4: Top View of Processing Unit.

After all the testing is conducted, the tabulated result shows that the Device is able to deliver a desired result at a temperature of 28□ in static condition.

Table -3: Power Consumption of components Used

Devices	Parameter	Operating voltage			Unit
		Min	Operation On	Max	
PIR Sensor	VCC	4.0	4.81	12.0	V
	Range	--	Up to 7 Meters	--	Meter
	Temperature	-20	+30	+80	Celsius
RF Transmitter	Supply Voltage	3	4.82	12	V
	Frequency Range	---	433.92	--	MHZ
	Data Output	--	1.29-1.33	--	V
RF Receiver	VCC	--	4.84	--	V
	Frequency Range		433.92		MHZ
	Data Output	--	1.09-1.14	--	V
AT89S52	VCC	4.5	4.85	5.5	V
	Input Pin: OFF State	--	0.13	--	V
	Input Pin: ON State	1.5		2.4	V

4. CONCLUSION

Working model of the said security device has been build. Sensitivity of the PIR sensors can be achieved by adjusting the on-chip screw, by adding more arrays of PIR sensors, the area covered can be increased.

ACKNOWLEDGEMENT

I am thankful to our colleagues of Department of Physics, NES Ratnam college of Arts, Sceince and Commerce for providing us appropriate environment required for the paper to complete

REFERENCES

[1] "THE 8051 MICROCONTROLLER AND EMBEDDED SYSTEM" by Muhammad Ali Mazidi , Janice Gillispie Mazidi, Rolin D. Mckinlay

[2] "Let Us C" by Yashwant Kanitkar.

[3] How Does PIR Work - https://learn.adafruit.com/pir-passive-infrared-proximity-motion-sensor/how-pirs-work

[4] RF Module - https://en.wikipedia.org/wiki/RF_module

[5] AT89S52 Datasheet - http://ww1.microchip.com/downloads/en/DeviceDoc/doc1919.pdf

[6] Puskaraj Gharat https://www.ijresm.com/Vol.2_2019/Vol2_Iss12_December19/IJRESM_V2_I12_52.pdf

[7] Buzzer : https://en.wikipedia.org/wiki/Buzzer

BIOGRAPHIES

Lavkush Gupta
Pursuing M.Sc. in Physics and M.Sc. in Data Science from University of Mumbai.

Sanket Kupate
Pursuing M.Sc. in Physics from University of Mumbai.

Pushkaraj Gharat
received the B.S. and M.S. degrees in Physics from University of Mumbai in 2017 and 2019, respectively. He now with Ratnam College, Mumbai as Demonstrator.