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Human Motion Detection Using Passive Infra Red Sensor

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ABSTRACT

The objective of this project is to develop a motion sensor alarm based on a Passive Infra-Red (PIR) sensor module. There are many vendors that manufacture the PIR sensor modules and almost all of them are pretty much the same in function. PIR sensor detects the changes in the IR levels emitted by humans. PIR sensors can detect levels of infrared radiation. In this project, microcontroller continuously monitors the output from the sensor module and turns a buzzer on when it goes active. The application areas of this project are: All outdoor lights, Lift lobby, Multi apartment complexes, common staircases, for basement or covered parking area, shopping malls, for garden lights. Certain crystalline materials have the property to generate a surface electric charge when exposed to thermal infrared radiation. This phenomenon is known as pyroelectricity. The presence of human body creates a sudden change in the IR profile of the surrounding that is sensed by the pyroelectric sensor. When the microcontroller detects the sensor is triggered, it drives the buzzer. The sensor is in retriggering mode, the buzzer remains on as long as the motion is continuously sensed.

Keywords: *AT89S51 Microcontroller, Buzzer, KEIL µ Vision, MAX232 IC, PIR Sensor.*

1. INTRODUCTION

Human motion detection using a PIR sensor[1] circuit can be used for providing security to home, shopping malls etc, as the PIR sensor used in this system detects the motion of human around this circuit. With the help of buzzer, we can identify the motion of human which was detected by the sensor. At the same time microcontroller sends a signal to computer through serial communication port to display a message saying "Motion Detected". This system can be used at any place where security is needed. Security is needed by everyone in the society now-a-days to protect their property or confidential information from others. There are many ways to provide security. We are using one of it. That is, providing security manually. This is the most common way used by the people for providing security to them.

2. PROPOSED SYSTEM

Alarm based human motion detection is an embedded system which we are used to provide security. This is our proposed system. Instead of manual security if we use alarm based detection system for detecting human motions to provide security which reduces man power and is very cheap. As we know human body radiates heat in the form of Infrared radiations. When a person moving around this circuit, PIR sensor[2] detects the change in the IR levels of surroundings and sends a signal to the microcontroller.

Features of proposed system are:

- It is very cheap and affordable.
- It is efficient and portable that means we can place this circuit at any place easily.
- Very easy to use.
- Maintenance cost is low.

3. DOMAIN ANALYSIS

3.1 Introduction

The domain is "Human motion detection using PIR sensor" for any place where security is needed. The main aim is to develop an alarm based security system which takes power supply as input and the sensor which we used will detect the motion and gives a message saying "motion detected" on PC and also sound which will be produced by the buzzer.

3.2 Functional Requirements

Functional Requirements are

- Power supply (+5v) to the hardware circuit.
- An interrupt is given to microcontroller by PIR sensor when it detects the motion.
- A buzzer which is used to produce sound.
- A PC is also needed where we can display a message showing "Motion Detected".

3.3 Non Functional Requirements

Hardware Requirements of the project are

- Printed Circuit Boards
- Micro Controller[3] (AT89S51)
- Adapters (230 V AC to 12 V DC)
- Passive infrared Sensor
- Buzzer
- Connecting wires
- Crystal Oscillator
- Capacitors and Resistors (with required values)
- Diodes (IN4007)
- Serial Communication (MAX232, RS232, DB-9)

Software Requirements of the project

- KEIL[4] (µ vision IDE)
- Micro Flash

4. SYSTEM DESIGN

4.1 Circuit[5] Description

In our project, we used AT89S51 microcontroller from ATMEL which plays an important role having configured to work with a crystal oscillator of 11.0952 MHz. A Passive Infrared Sensor (PIR sensor) is used in this project to detect the human presence, which is connected to port 2.0 of the microcontroller. It gives an interrupt to the microcontroller when it detects the human presence at its field of view. To indicate this, a buzzer is connected to same port 2.0 pin of the microcontroller.

- At 21st pin of AT89S51, buzzer and PIR sensor are connected which will interrupt the microcontroller when motion detected.
- At 10, 11 pins of microcontroller 12, 11 pins of MAX232 IC are connected to interface the serial communication.
- At 13, 14 pins of MAX232 IC 2, 3 pins of DB-9 connector is connected to communicate serially with the personal computer.

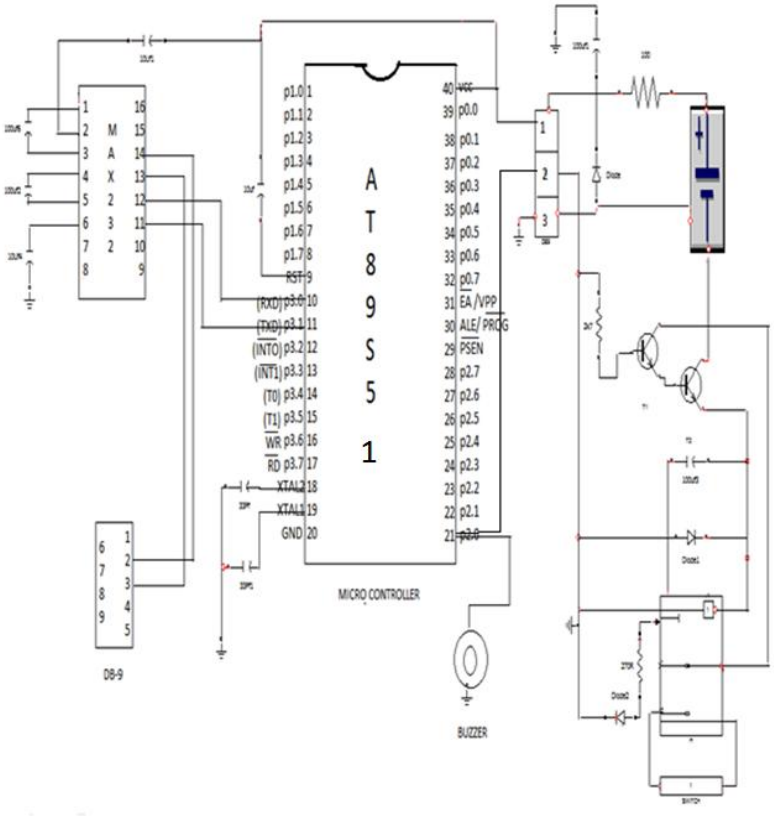

Fig 1: System Design of Our Proposed System

4.2 User Interface Design

This diagram mainly represents the interaction between the user and the system. The process of how system is responding to the user activities and the whole functionality of the system is represented in the following diagram. This diagram also shows the flow of activities done by the system and the user.

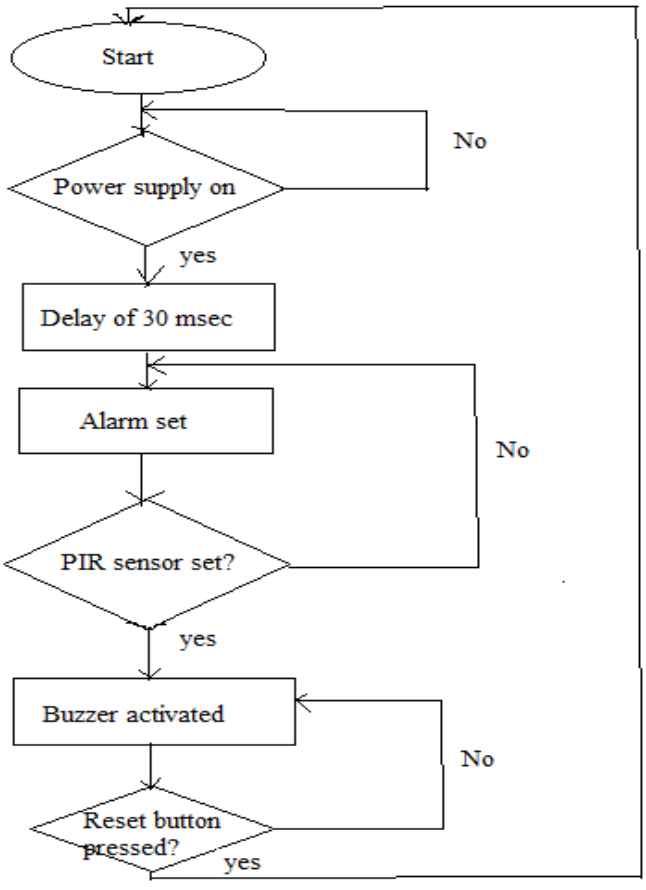

Fig 2: User Interface Design of Proposed System

5. OUTPUTS/ RESULTS

5.1 Result 1

The first result shows the final hardware design of the proposed system. This result clearly shows how all the components required for our system is connected.

5.2 Result 2

The second result shows how to open the Hyper Terminal where we can see the final output of the system in the PC. After opening it, we need to set the ASCII properties as well as restoring the default values.

5.3 Result 3

Whenever sensor detects the motion, a message showing “motion detected” will be displayed on PC.

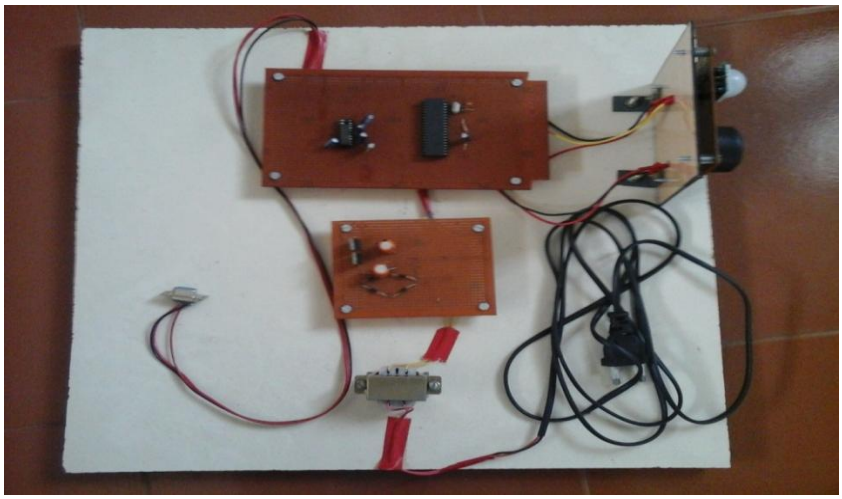

Fig 3: Final Hardware Design Module

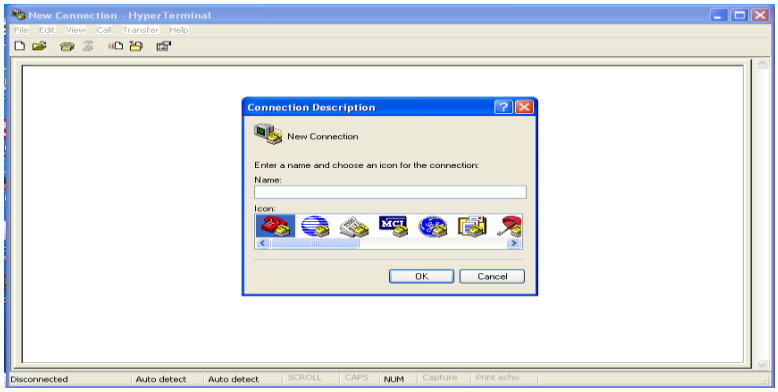

Fig 4: Open Hyper Terminal

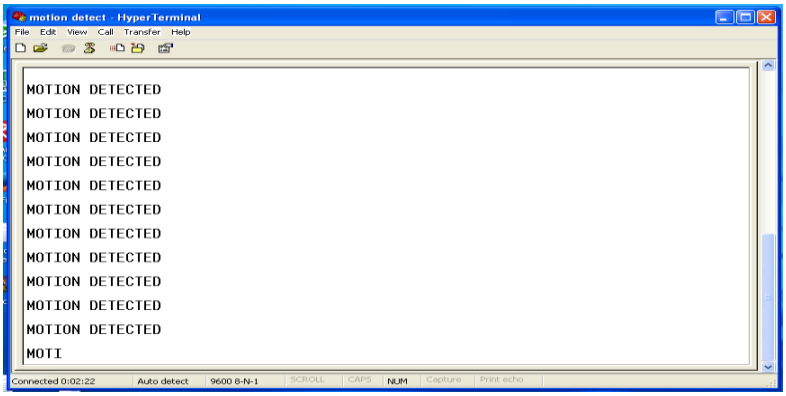

Fig 5: When the Sensor Detects Motion

6. CONCLUSION

The detection of human motion is done by developing an embedded system. This embedded system can be used for various applications like the home security system and home automations with slight modifications in software coding according to the requirements. As this system is software driven, no hardware modifications are required. This concept not only ensures for this project work but will be suitable to cater for future requirements with flexibility to adapt and extend, as it needs change. This project is developed around AT89S51 microcontroller. The data acquisition from sensor and processing is implemented in software. This system can also be applicable to various loads like pressure, force etc, by increasing the number of ports of the microcontroller. This can be developed without wires such that we can place different sensors in different places. This work can also be used to reduce electricity power consumption.

7. ACKNOWLEDGEMENTS

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APPENDIX

User Manual

The project **"Human Motion Detection Using Passive Infra Red Sensor"** is a security based embedded system developed KEIL µ vision software.

The following are the requirements for successful deployment.

1. KEIL µvision IDE
2. Micro Flash
3. Windows XP