

Home Security System Using Pyro Electric Infrared Sensors

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Abstract

This research assesses the creation of a low-cost security system based on a microcontroller and a tiny PIR (Pyroelectric Infrared) sensor. Because of the frequent and widespread incidents of burglary, the requirement for effective and accurate intrusion detection with an alarm system has become a critical necessity. Attacks on home offices, factories, banks, and other institutions are on the rise. Motion can now be detected by measuring the change in speed or vector of an object in the field of view, thanks to technological improvements. The motion detector is utilised in a variety of applications, including home automation systems, energy efficiency systems, and more. This project is made with an embedded microcontroller system capable of detecting intruder motion in a restricted area and then triggering an alarm system, motion detector system. However, pyroelectric infrared sensor identified the person's motion using the person's body heat. The motion detector in this project is a pyroelectric infrared (pir) sensor that is connected to a microcontroller that activates the alarm system and any other attached output device to warn the house owner. The concept passed the initial testing with flying colours.

Keywords:- Embedded Microcontroller, Passive infrared sensor, Buzzer /Siren, DC motor and Motion Detector.

INTRODUCTION

Security and safety is a hot concern in practically every aspect of smart environments, including surveillance,

industrial applications, offices, and in general. To protect it against theft, crime, fire, and other threats, a robust security system is needed that can not only detect

but also prevent threats. Traditional security systems rely on cameras and vast volumes of data to extract features at a great cost, necessitating large infrastructures.

A home security system based on Wi-Fi and GSM was presented to combat the rising rate of crime in most private homes and offices. The software, output part, and micro secure digital (SD) data storage card are the three essential components of the design. It works on the basis of infrared radiation produced by human body heat. The signal is processed by an embedded microcontroller and then forwarded to the user's mobile phone via SMS. This paper proposes a microcontroller-based real-time home security system with a password protection strategy. The main purpose of this security system is to identify the presence of a human being and notify the user whenever necessary by sending a text message to the user's registered mobile phone number. The presence of any human being will be detected by a Pyroelectric (PIR) motion sensor in the first stage, and the person will then be required to input the correct password using a keypad.

The password protection benefits this system in two ways: any unknown person will have to confirm his or her identity by

inputting the correct password to the security system, and every entrance will be notified to the owner through sms alert.

A GSM TTL module was used to perform real-time protection by sending and receiving text messages between the user's mobile phone and the microcontroller. By detecting any unlawful entry to our home or any other area that needs to be secured, our security system has given a low-cost and less difficult home security protection method. Over the last few years, motion detection surveillance technology has attracted a lot of attention. Based on a review and assessment of currently available methodologies. The proposed solution is both efficient and practical for usage at home and in offices.

METHOD & MATERIAL

Existing system

Human motion detection with alarms is an embedded technology that we employ to provide security. This is the system we suggest. Instead of manual security, we could employ an alarm-based detection system to identify human motions, which would save manpower and money. The human body emits heat in the form of infrared radiations, as we all know. When a human walks around this circuit, the PIR sensor detects changes in the ambient IR

levels and sends a signal to the microcontroller.

Proposed system

PIR sensors detect obstacles, and a GSM module allows the system to connect with a GSM phone. An open-source microcontroller controls the entire system. Using a GSM modem, the system takes all data from PIR sensors, processes it, and calls the relevant GSM mobile phone number. If the PIR sensors detect an obstruction in the covered area, a signal is sent to the microcontroller, the controller activates GSM, and the GSM Module sends an SMS to the house owner's mobile phone.

Block diagram description

In this system, a PIR sensor is utilised for sensing, followed by a microcontroller for

controlling, and finally a GSM module for phoning. When someone enters the range of the PIR sensor, the sensor sends a logic signal to the microcontroller, which then takes the appropriate steps to assume control and complete the task. The microcontroller is assigned a calling and SMS task using GSM. The block diagram of the suggested system is shown below.

Pir sensor

PIR sensors are used to detect the movement of live things. Passive Infrared (PIR) sensors detect infrared light. All living things emit heat energy in the form of radiation when their temperature rises above absolute zero. Infrared rays are responsible for these radiations. Because these photons have an infrared wavelength, they are invisible to the human eye.

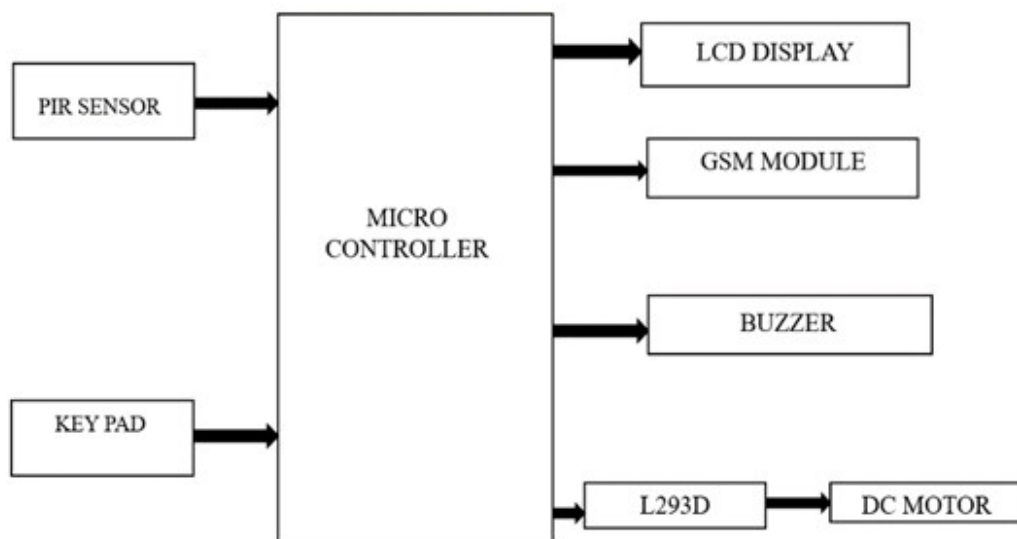


Fig 2.1: block diagram

When a living thing enters within range of a PIR sensor, the sensor senses heat and generates an output. The PIR sensor module does not emit any rays and only senses heat (Infrared). The term "passive" refers to elements that do not produce their own voltages or energy. They merely take measurements. As a result, we can call this sensor a passive infrared sensor because it does not generate any heat. It can only measure the radiations released by other objects in its vicinity. It measures those rays and does the necessary calculations.

Microcontroller

A microcontroller is a general-purpose device that combines a variety of microprocessor system components into a single chip. It features an integrated CPU, memory, and peripherals, allowing it to function as a tiny computer. The AT89C52

is a 40-pin, 8-bit microcontroller from the Atmel group.

It is a reprogrammable memory of the flash type. The benefit of this flash memory is that we can erase the software in a matter of minutes. It contains a 4kb on-chip ROM, 128 bytes internal RAM, and 32 I/O pins grouped as port 0 through port 3 with each port having an 8 bit bin. Port 0 has eight data lines (D0-D7) and one low-order address line (AO-A7). Higher order address lines are found on port 2. (A8-A15). Special purpose registers on Port 3 include the serial input receiver register SBUF, interrupt INT0,INT1, and timers T0, T1. Many of the pins have many functionalities and can be used as I/O pins in general (or) The programmer can decide on a special purpose function.

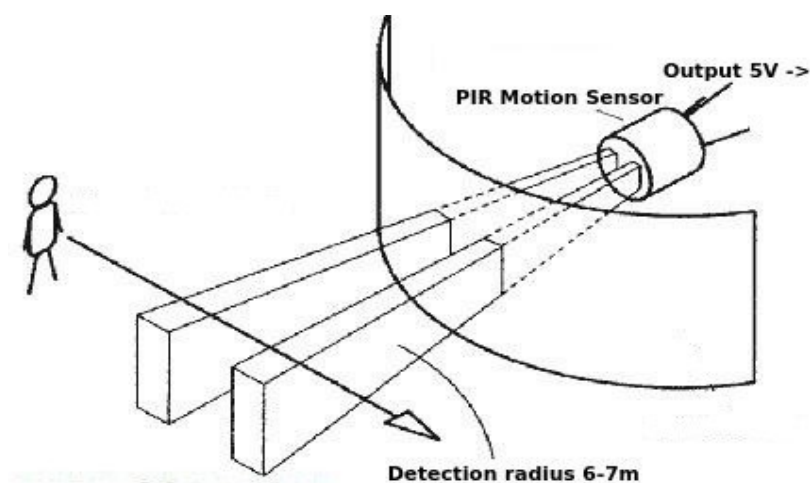


Fig 2.2: pir sensor

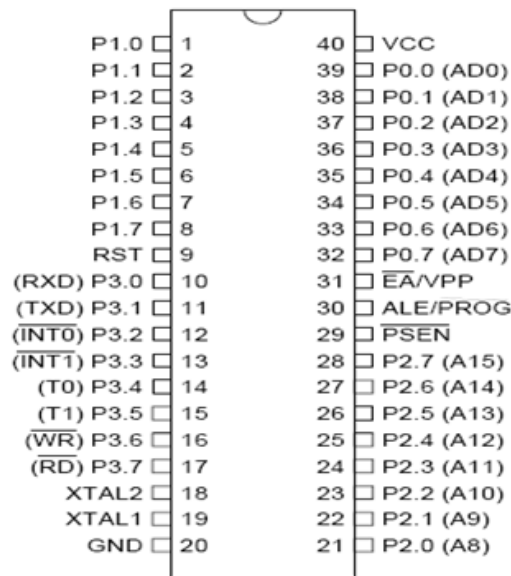


Fig 2.3: microcontroller

Gsm module

Through the Short Messaging Service, a customised Global System for Mobile Communication (GSM) module is built for wireless radiation monitoring (SMS). This module can receive serial data from radiation monitoring devices like survey metres and area monitors and send it to a host server as text SMS. It allows for two-way data transmission, status queries, and configuration setup. GSM module, voltage level shifter, SIM circuit, and Atmega328P microcontroller make up the module hardware. The GSM module is controlled by the microcontroller, which sends, receives, and processes AT commands. The firmware is in charge of tasks involving communication between the device and the host server. It processes all incoming SMS, extracts and saves new

configuration from the Host, sends alert/notification SMS when radiation data reaches/exceeds threshold value, and sends SMS data at certain intervals. When this module is combined with a radiation survey/monitoring device, a mobile and wireless radiation monitoring system is created, complete with a fast emergency alert in the event of high-level radiation.

SYSTEM MODELLING

Working principle

The project's major goal is to provide protection while the user is away from home using mobile technology that allows them to communicate remotely from anywhere. Messages can be sent rapidly, correctly, and at a minimal cost with this facility. Security systems that are integrated with mobile phones deliver

information in the form of a call to the user's phone. This system was created using the C programming language, and the programme was used to develop an automatic security system that can interact with the user's mobile phone when there is a security breach in the residence. Modular design allows for easy expansion of the main system microcontroller platform by adding new sensors.

PIR sensors detect obstacles, and a GSM module allows the system to connect with

a GSM phone. The microcontroller is in charge of the entire system. Using a GSM modem, the system takes all data from PIR sensors, processes it, and then calls the relevant GSM mobile phone number. If the PIR sensors detect an impediment in the covered area, a signal is sent to the microcontroller, the controller activates GSM, and the GSM Module makes a call to the house owner's mobile phone. The microcontroller, interface, GSM module, and PIR sensors are all part of the system.

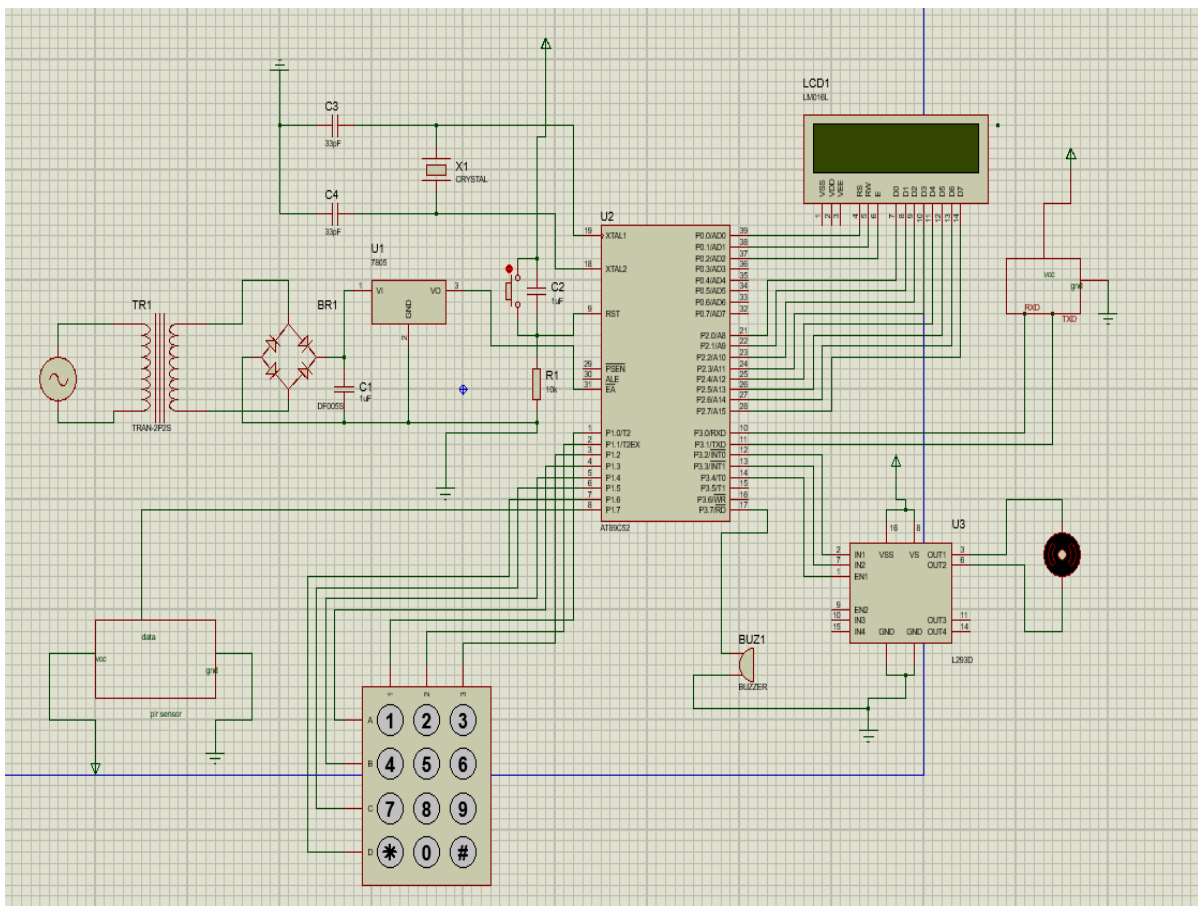


Fig 3.1: schematic diagram

Software requirement

- Programming with the KEIL Microvision IDE.
- ICP-ISP Nuvoton for software loading
- Schematic Designing with Proteus Professional

Keil C programmer

Keil works as a cross compiler. To begin, we must first grasp the concepts of compilers and cross compilers. Following that, we'll learn how to use Keil.

Compiler

Compilers are programmes that translate high-level languages into object code. Desktop compilers generate object code for the CPU in question, but not for other microprocessors. I.e., programmes written in one of the HLLs, such as 'C,' will compile the code to execute on a specific processor, such as the x86 (underlying microprocessor in the computer).

For example Compilers for the Dos platform, for example, differ from those for the Unix platform.

If one were to define a compiler, it would be a programme that converts source code into object code.

The compiler gets its name from the way it works: it examines all of the source code and collects and reorganises the instructions. There is a slight distinction between a compiler and an interpreter. The interpreter simply interprets the entire programme at a time, but the compiler examines and executes each line of source code in turn, without having to look at the entire programme.

Interpreters have the advantage of being able to run a programme right away. Second, compiler-generated programmes execute substantially faster than interpreter-generated programmes. Compilers, on the other hand, take time to produce an executable programme.

Many compilers are now available for the same language because compilers translate source code into object code, which is unique to each type of machine.

Functionality of Keil

- The Keil C51 C Compiler for the 8051 microcontroller is the most widely used C compiler for the 8051 microprocessor.
- It has more functionality than any other 8051 C compiler currently available.

- There are nine different forms of data, including 32-bit IEEE floating-point.
- Bit, data, bdata, idata, xdata, and pdata memory types provide for flexible variable allocation.
- C may be used to write interrupt functions.
- The 8051 register banks are fully utilised.
- For source-level debugging, complete symbol and type information is required.

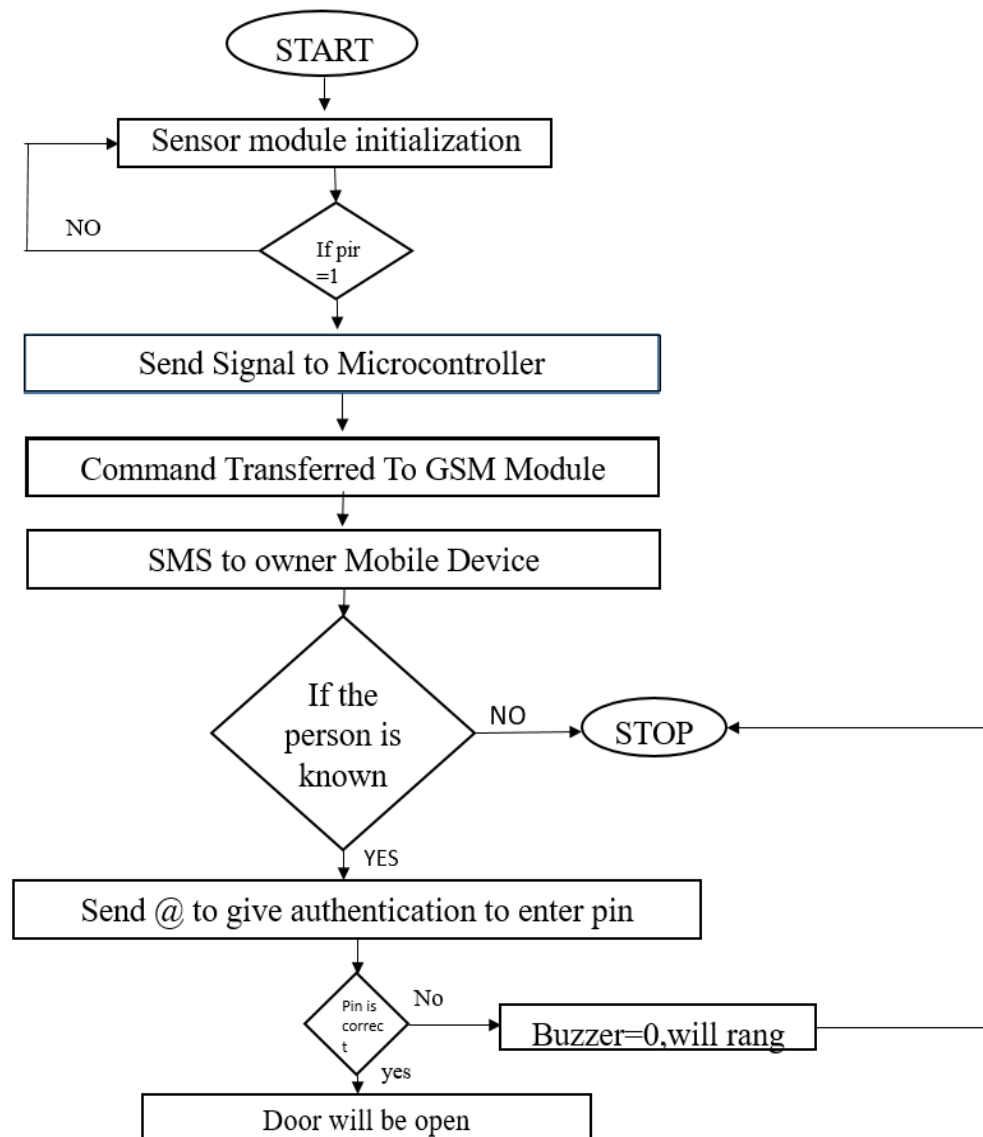


Fig 3.2: flow chart

RESULT & DISCUSSION

Initially, whenever a person enters our premises, the "PIR" sensor detects the person based on their body temperature. If someone enters the premises, the sensor transmits a signal to the microcontroller, which then sends a message to the owner's phone, saying "someone enter into home, please authentication access." If the owner

is the person, the authentication is done by sending a "@" message. If the owner does not recognise the individual, he will not provide authentication, and the door will remain shut. If the person has access to the pin, type the proper pin to get admission to the house. If the pin is correctly inserted, the buzzer will sound.

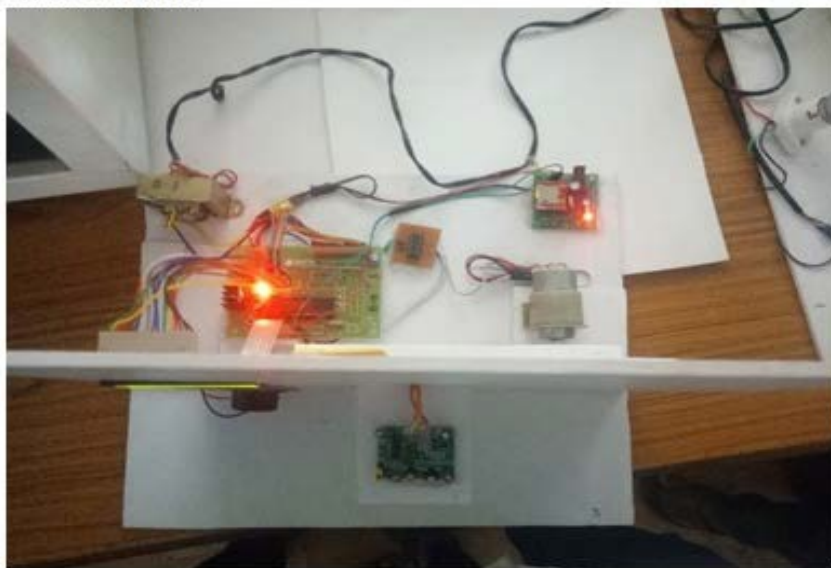


Fig 4.1: Output of the project

CONCLUSION

In the future, the feature of a home security system will attract a lot of attention. People are becoming increasingly concerned about protecting their homes from intruders. This system uses sensors in conjunction with a microcontroller and a GSM device to monitor a home. When a probable breach occurs, a calling method is employed to notify users via cell phone.

Because practically everyone has a smartphone nowadays, users will not need to carry an additional device to monitor their home if they utilise this system. This system is designed with modularity in mind to be a flexible system that can add more sensors without having to update the entire system; instead, only add a few sensors to expand the system's capabilities. As a result, this system is a modular home security system that communicates with the user via a call function.

The project model can be applied in a variety of settings, including banks and offices. It is now possible to restrict theft techniques, which vary depending on the location and type of items. Modern gadgets penetrated all regions, making it simple to limit robbery prospects in a variety of ways without spending a lot of

money. A microcontroller was utilised to create a home security and reliability system.

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