PIR SENSOR BASED SECURITY ALARM SYSTEM

A
MINI PROJECT REPORT

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IN
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CERTIFICATE

This is to certify that the project *entitled "**PIR SENSOR BASED SECURITY ALARM SYSTEM**" is the bonafied work done by, K.PRAKASH(20R21A0482), K.VINAY(20R21A0492), L.YASHASVI(20R21A0494), M.NANDINI(20R21A04A1)* in partial fulfilment of the requirement for the award of the degree of B.Tech in Electronics and Communication Engineering, during the academic year 2022-23.

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ABSTRACT

In general, a normal electronic security system comprises of a transmitter and a receiver. Here the transmitter is used to send or transmit an IR laser and this is received by the receiver. When an intruder walks or pass through the device the IR beam is cut and hence the alarm will be activated. A simple cost effective solution for security systems is introduced in this project. Where we will learn about PIR based security alarm system in which a PIR sensor is used in the place of transmitter or receiver. This sensor is helpful in saving power and also it's implementation is cost effective i.e. low cost.

PIR sensor is the short form of passive Infrared sensor. The main ideology is to provide security. This is based on PIR sensor with an IC that produces siren or buzzer sound. The PIR sensor detects the IR radiation which is emitted from the humans and then it produces a digital output.

SIM800L GSM module is a miniature GSM modem where we can use this module to accomplish almost anything a normal cell phone can SMS text messages, make or receive phone calls, connecting to the internet through GPRS..

This project has the high accuracy of detecting motion and Particularly it suitable for environments where optical sensors are unusable such as in smoke, and dust.

PIR sensors are called passive devices as they do not emit any energy to detect the presence of objects .

They work entirely by detecting infrared radiation emitted by or reflected from objects. Due to their property of detecting infrared rays they are mostly used to detect motion of humans . They are having small, inexpensive, low-power, easy to use properties also they don't wear out.

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CHAPTER – 1

INTRODUCTION

1.1 Introduction

The project developed is the Application of Wireless Motion Detection System using Arduino. This system app uses Arduino with the aim to help users from becoming victims of criminal cases such as house breakage, theft and aggression. The Arduino Security System is a technology that uses PIR (Passive Infrared Sensor) sensors to detect the movement. This device has been created for home security systems. Using Arduino Uno as a data processor, it can be a suitable security system in accordance with the current development. When the PIR detector detects movement, Arduino processes the data and triggers an alarm. At the same time. Arduino will also send the data via the Wi-Fi module to the user through the application in user's smart phone. There were many criminal offenses such as house breakage, invasion and theft. Such cases can be seen from the mass media or in the newspapers. They occurred when the occupants of the house were not at home or even with the the possibility of occupants were in the house. Intruders can easily unlock the house unnoticed by anyone. The existing alarm system may be helpful or vice versa. Among the advantages that can be seen is that if there are movements detected, the alarm system will notify users with a sound. But if the occupants are not at home, how would they get the notification? It is because the alarm system has no connection with the users. This project is set to develop an application of Wireless Motion Detection System by using Arduino platform and performing User Acceptance Testing as well as implementing external tester beta test (end user). This system application will be used by homeowners. Only the homeowners can turn off the alarm system using a smart phone. The apps and the circuit are connected using a GSM module. GSM module is connected only within limited distances. The alarm system between the Arduino circuits will be connected with the application developed for user. GSM module is used to connect the circuit and the application and it allows users to communicate between circuits through the developed applications.

Generally, PIR sensor can detect animal/human movement in a requirement range. PIR is made of a pyroelectric sensor, which is able to detect different levels of infrared radiation. The detector itself does not emit any energy but passively receives it. It detects infrared radiation from the environment. A passive infrared sensor is an electronic sensor that measures infrared light radiating from objects. PIR sensors mostly used in PIR-based motion detectors.

Simply, when a human body or any animal passes by, then it intercepts the first slot of the PIR sensor. This causes a positive differential change between the two bisects. When a human body leaves the sensing area, the sensor generates a negative differential change between the two bisects.

Since crimes rate is increasing day by day and to cope with such situations an intelligent monitoring system is required to secure homes even in the absence of owner. Several security systems are already available to counter measure the security problems but most of them are either expensive or require high storage space for recording surveillance video. As we know Home Automation is one of the most discussed topics in IoT as it is very challenging to implement. To make it efficient and more cost effective, different approaches have been used. Constructing a cost efficient and secure system for indoor use has been a broader research area which has made advancement in technology and availability of smart and flexible systems. Inspired by the concepts of IoT this paper presents an intelligent home security system. The proposed systems approach is based on Global System for Mobile (GSM), 3G and 2 sensor modules namely (Passive Infrared Sensor (PIR) and Microwave sensor). Security system will use PIR and Microwave sensors to detect the intruder and send alert notification to the user using GSM and another alert to the nearest police station. In case, GSM service is unable to send an alert message to the user, the system will still be able to alert the user via Email service. The system is also equipped with power bank. So in-case of electricity failure the system can stay active for up to 10 hours.

TYPES OF SENSORS:

TEMPERATURE SENSORS:

This sensor's operation is very simple and is required to measure temperature in a wide variety of applications. The healthcare industry, agriculture sector, and many manufacturing processes require these temperature sensors to provide accurate and precise results. It even allows for increased productivity in each of these sectors.

PROXIMITY SENSORS:

When it comes to motion detection or the security sector, proximity sensors are widely used. We have noticed that the automotive industry incorporates proximity sensors to improve vehicle functionality. Many airports, stadiums, and shopping malls also incorporate proximity sensors.

PRESSURE SENSORS:

Pressure sensors can be of great use in the maintenance of heating systems and complete water systems. Pressure sensors, in particular, can detect a pressure drop or fluctuation. It is a clear sign of some failure or malfunction that can be remedied without too much delay.

WATER QUALITY SENSORS:

Water quality sensors are often incorporated in water distribution systems as well as in many production processes. This type of sensor can detect organic elements of different types. They can even operate very precise measurements of important water bodies, such as sewage, streams, and rivers, among other options.

CHEMICAL SENSORS:

Chemical sensors are widely used in different industries and production processes. This type of application is very useful for the pharmaceutical industry and laboratories, space station recycling processes, explosive and radioactive detection, detection of harmful chemicals released accidentally or intentionally, and many other important processes.

GAS SENSORS:

These types of sensors are very similar to chemical sensors. Gas sensors are often very useful for detecting different gases or measuring the air quality at a specific location.It means that a wide variety of sectors require gas sensors. Some of these sectors are healthcare, agriculture, oil and gas industries, and manufacturers of plastics, paints, and rubbers, among many others.

SMOKE SENSORS:

Smoke sensors are efficient when it comes to the development of the internet of things. In different industries, these sensors allow alerting about some problem in a productive process.The most common sensors are the optical smoke sensor and the ionization smoke sensor. Either of them provides increased safety and security in different locations.

INFARED SENSORS:

This type of sensor allows the measurement of heat from objects or infrared radiation. Blood pressure and blood flow monitoring can be measured. The most common objects incorporating infrared

sensors are smartphones and smartwatches. When it comes to increasing security in a home, infrared sensors provide a great result.

LEVEL SENSORS:

This type of sensor is widely used in a variety of situations. The point level sensor allows a user to be alerted to an above or below a certain level. The continuous level sensor provides similar functionality within a specific range. This operation is implemented in a wide variety of industries and processes.

IMAGE SENSORS:

These sensors are typically used in digital modules and cameras. Some of the most common uses are biometric devices, media houses, sonar, radar, thermal imaging devices, medical imaging equipment, and night vision electronic equipment. These types of devices can also enhance security systems.

MOTION DETECTION SENSORS:

These types of sensors are really useful in an incredible number of applications. Security systems incorporate motion detection for automated monitoring of all types of spaces. We can also find passive infrared, ultrasonic, and microwave motion sensors .

ACCELEROMETER SENSORS:

Accelerometer sensors have been incorporated into smart phones in recent years. These sensors provide acceleration, tilt, and vibration information on devices. These sensors are also commonly used in automotive control and sensing in the aviation industry, free-fall detection, motion detection, consumer electronics, and industrial and construction sites.

GYROSCOPE SENSORS:

One of the most important objectives of these sensors is to monitor the orientation of a given object. That is why the most common applications of these sensors are drone control, helicopter control, robotics control, consumer electronics, cellular and camera devices, game controllers, and automotive navigation systems, among many other applications.

HUMIDITY SENSORS:

This sensor type is interested in the amount of water vapor in different gases or an air atmosphere. It is about detecting relative humidity. The functionality of this sensor is very similar to the operation of temperature sensors. Some applications are in air conditioning, ventilation, and heating system control.

OPTICAL SENSORS:

This type of sensor is responsible for detecting the number of light rays. These sensors are one of the most preferred sensors because they have been incorporated to monitor electromagnetic energy such as light and electricity. The most common uses are high-speed network systems, civil and transportation fields, and oil and gas applications for electrical isolation. Optical sensors for communications and fiber optics, digital optical switches, and ambient light detection are also incorporated.

1.2 AIM:

- To execute specific tasks with little or zero human efforts for providing security by alerting using PIR sensor.
- To provide security for valuable things .
- To alert people by call using SIM800L .

1.3 Objectives:

- Objective is to build a security alarm system using PIR sensor
- To provide security for valuable things
- To alert people by call.

1.4 Problem statement:

- The main objective behind this project is to develop a system to provide security for their valuable things by using PIR sensor, which is a motion detector.

- The purpose of this system is to produce alarm with the help of buzzer in case of motion detection and also to give a call to respective owners with the help of SIM800L
- In this project, one can protect their valuable things, one can know if their things are in danger even they are not at that place.

1.5 Project Scope

The project is to make a PIR sensor-based security alarm system using SIM800L GSM module . The scope of this project is mainly based on developing a security system that tracks movement and gives a alert in the form of call to the user.

CHAPTER-2

LITERATURE SURVEY

According to Suresh S.etal , “The system designed for Home observance and Security system consists of sensors that are meant to collect the information that may be employed by the owner to create sensible choices. Passive Infrared Sensor (PIR) is employed to find the motion and therefore the temperature sensing element is employed to find the temperature of the space. Numerous modules specifically the PIR module, temperature module and therefore the GSM module communicate with one another to coordinate and increase the safety of the system. In this, the PIR sensing element and therefore the Temperature sensing element are connected to the Arduino board. The digital signal is distributed to the board. The GSM module is employed to send and receive signal from the Arduino board. The received signal is distributed to the house owner through a text message via GSM module’s path. If the owner needs to modify off the alarm, he sends an indication to the GSM module. The GSM module can send the signal to the Arduino board. The Arduino board converts this signal into the sensing element comprehendible format and sends it to the sensors. The sensors are transitioned in real time. the most element is that the Arduino board. The motion detection, temperature sensing element and GSM’s code is burned within the Arduino chip. On activating the system, the SMS is straight away sent to the house owner. the required signaling is embedded within the GSM module.

According to Akanksha Singh et.al proposed GSM Based Home Automation, Safety and Security System Using Android Mobile Phone. Here the appliances can be controlled in the absence of an android phone by sending a normal SMS. GSM technology provides the wireless access to the devices to be controlled.

The works by Kaushik Ghosh et.al.and Vinay sagar et.al proposed Home automation system using IoT. These two systems used both WIFI and GSM for communication between the device and user.

By using the GSM, both the systems allow the user to remotely monitor and control the household appliances.

According to "Abel A. Zandamela". presented a low-cost smart home security system using an ATmega2560 microcontroller in "AN APPROACH TO SMART HOME SECURITY SYSTEM USING ARDUINO". The author integrated and tested humidity and temperature sensors for 24 hours. He also developed an android app to control the system. In case of break-in situation, the system has an integrated GSM module which will alert the owner immediately. The author measuresthe response time between Arduino generated alert and the user being notified. This low-cost system provides real time surveillance with an average response time of 9.4s.

According to "S. Jyothirmai" at el. designed a security system with the help of temperature, light and gas sensors to protect people's house from intruders in "Design and Implementation of an SMS Based Home Security System". The sensors have been integrated with microcontroller and GSM unit. In case of intrusion, or fire detection the owner of house is informed immediately via SMS.The system is designed using modularity i.e. it is a flexible system. More sensors can be added to the existing system without changing whole design of system.

CHAPTER – 3

METHODOLGY

3.1 Methodology

A PIR sensor based security system is a wireless security system in which pyro electric infrared motion sensors are placed in four sides I.E front, back, left and right of the area to be covered. By this it can detect motion from any side and turns on the audio.

1) Connect TXD pin of SIM GSM module to pin 2 on the Arduino.
2) Connect RXD pin of SIM GSM module to pin 3 on the Arduino.
3) Connect SIM GSM module's vcc and ground to bread
4) Plug the PIR sensor vcc (+5v) using jumper wires to the breadboard and the Ground to breadboard using
5) jumper wires. It's output is connected to the Arduino pin 11.
6) Short the SIM GSM module and PIR Sensor vcc in bread board and connect it to the Arduino 5v pin using jumper wires.
7) Short the SIM GSM module and PIR Sensor ground in bread board and connect it to the Arduino gnd pin using jumper wires.
8) Insert a sim in the SIM800L GSM Module
9) Verify the connections properly.
10) Then give the power supply to Arduino.
11) After detecting the motion it generates a call to the user.

3.4 BLOCK DIAGRAM

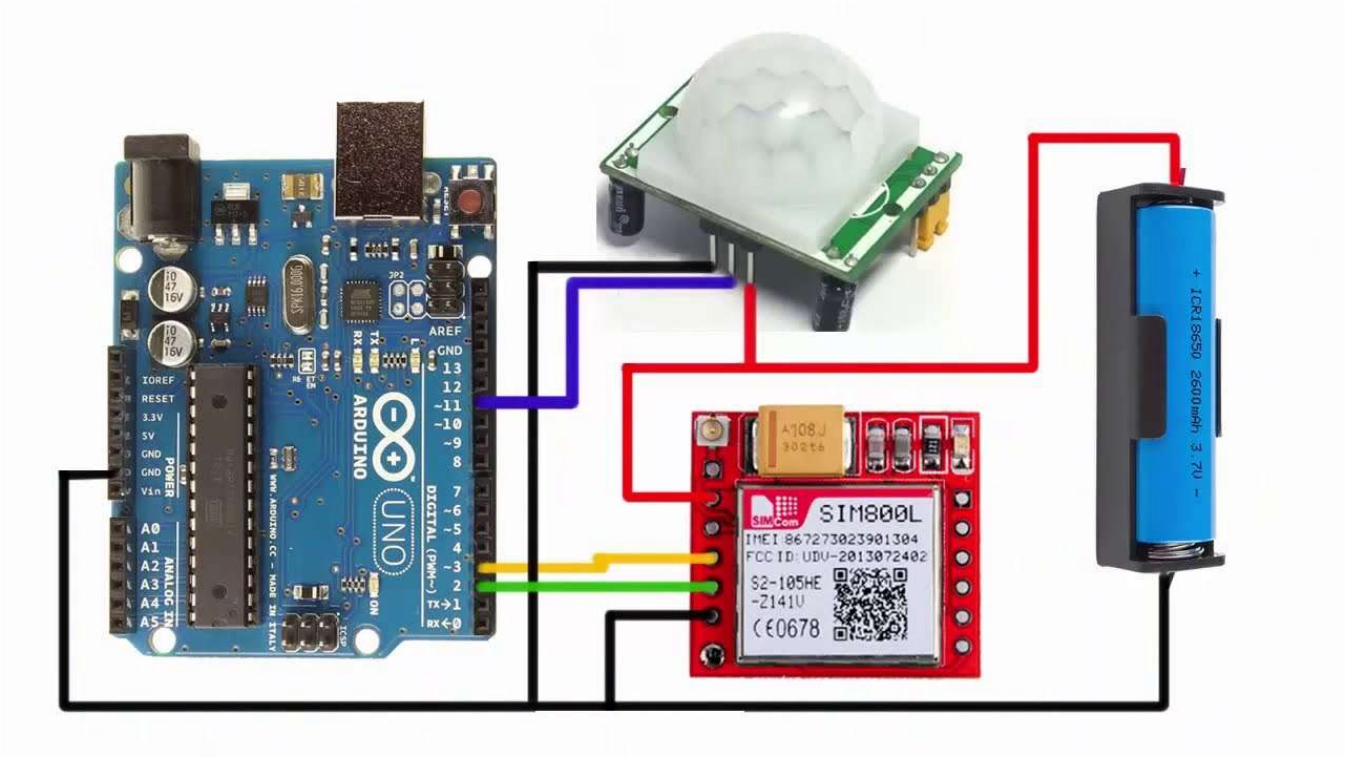


Fig: Block diagram of PIR sensor based security alarm system.

3.5 FLOWCHAT

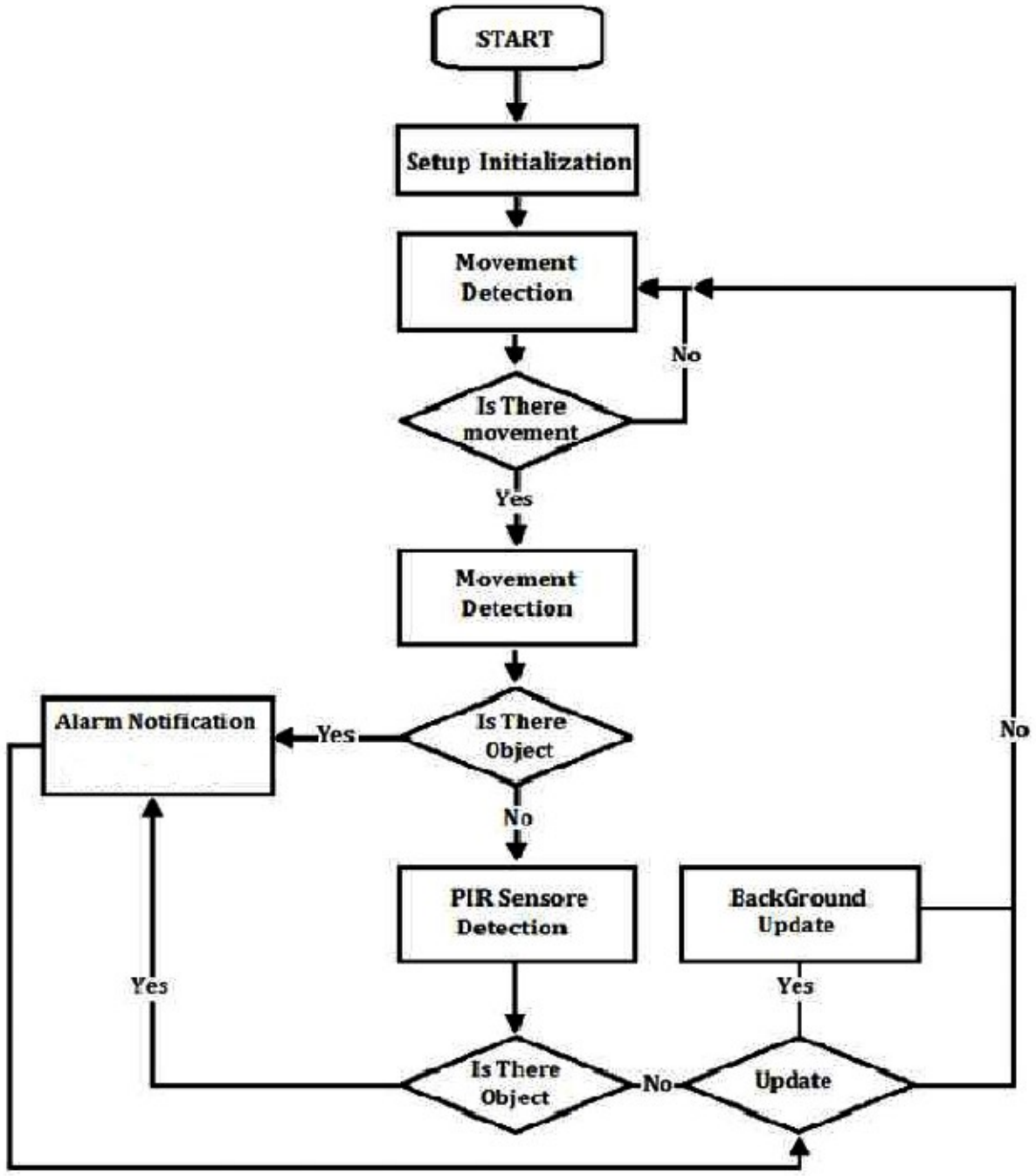


Fig: Flowchart of working of PIR sensor based security alarm system

3.6 HARDWARE SPECIFICATIONS:

- SIM800L
- Arduino UNO
-
- PIR sensor
- Bread board

Arduino UNO

Fig : Arduino uno

The Arduino Uno is an open-source microcontroller board based on the MicrochipATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 Digital pins, 6 Analog pins, and programmable with the Arduino IDE (Integrated Development Environment) via a type B USB cable. It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts. It is also similar to the Arduino Nano and Leonardo. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.

ARDUINO CODE:

setup( ): A function present in every Arduino sketch. Run once before the loop( ) function. Often used to set pin mode to input or output. The setup( ) function looks like:

```
void setup( ){

        //code goes here

        }
```

loop (): A function present in every single Arduino sketch. This code happens over and over again. The loop () is where (almost) everything happens. The one exception to this is setup( ) and variable declaration. ModKit uses another type of loop called “forever( )” which executes over Serial. The loop( ) function looks like:

```
void loop( ) {

    //code goes here

     }
```

input: A pin mode that intakes information.

output: A pin mode that sends information.

HIGH: Electrical signal present (5V for Uno). Also, ON or True in Boolean logic.
LOW: No electrical signal present (0V). Also, OFF or False in Boolean logic
digitalRead: Get a HIGH or LOW reading from a pin already declared as an input.
digitalWrite: Assign a HIGH or LOW value to a pin already declared as an output.
analogRead: Get a value between or including 0 (LOW) and 1023 (HIGH). This allows you to get readings from analog sensors or interfaces that have more than two states.
analogWrite: Assign a value between or including 0 (LOW) and 255 (HIGH). This allows you to set output to a PWM value instead of just HIGH or LOW.

PWM: Stands for Pulse-Width Modulation, a method of emulating an analog signal through a digital pin. A value between or including 0 and 255. Used with analogWrite. These boards below use the same micro-controller, just in a different package. The Lilypad is designed for use with conductive thread instead of wire and the Arduino Mini is simply a smaller package without the USB, Barrel Jack and Power Outs. It depends on what you want to do with it really. There are two different purposes outlined above for the voltage divider, we will go over both.

If you wish to use the voltage divider as a sensor reading device first you need to know the maximum voltage allowed by the analog inputs, you are using to read the signal. On an Arduino this is 5V. So, already we know the maximum value we need for Vout. The Vin is simply the amount of voltage already present on the circuit before it reaches the first resistor. You should be able to find the maximum voltage your sensor outputs by looking on the Datasheet; this is the maximum amount of voltage your sensor will let through given the voltage in of your circuit. Now we have exactly one variable left, the value of the second resistor. Solve for R2 and you will have all the components of your voltage divider figured out! We solve for R1's highest value because a smaller resistor will simply give us a smaller signal which will be readable by our analog inputs. Powering an analog Reference is exactly the same as reading a sensor except you have to calculate for the Voltage Out value you want to use as the analog Reference.

All of the electrical signals that the Arduino works with are either Analog or Digital. It is extremely important to understand the difference between these two types of signal and how to manipulate the information these signals represent.

DIGITAL

An electronic signal transmitted as binary code that can be either the presence or absence of current, high and low voltages or short pulses at a particular frequency.

Humans perceive the world in analog, but robots, computers and circuits use Digital. A digital signal is a signal that has only two states. These states can vary depending on the signal, but simply defined the states are ON or OFF, never in between.

In the world of Arduino, Digital signals are used for everything with the exception of Analog Input. Depending on the voltage of the Arduino the ON or HIGH of the Digital signal will be equal to the system voltage, while the OFF or LOW signal will always equal 0V. This is a fancy way of saying that on a 5V Arduino the HIGH signals will be a little under 5V and on a 3.3V Arduino the HIGH signals will be a little under 3.3V.

To receive or send Digital signals the Arduino uses Digital pins # 0 - # 13. You may also setup your Analog In pins to act as Digital pins. To set up Analog In pins as Digital pins use the command:

pinMode(pinNumber, value); Where pinNumber is an Analog pin (A0 – A5) and value is either INPUT or OUTPUT. To setup Digital pins use the same command but reference a Digital pin for pinNumber instead of an Analog In pin. Digital pins default as input, so really you only need to set them to OUTPUT in pinMode. To read these pins use the command:

digitalRead(pinNumber); Where pinNumber is the Digital pin to which the Digital component is connected. The digitalRead command will return either a HIGH or a LOW signal. To send a Digital signal to a pin uses the command:

digitalWrite(pinNumber, value); Where pinNumber is the number of the pin sending the signal and value is either HIGH or LOW. The Arduino also has the capability to output a Digital signal

that acts as an Analog signal; this signal is called Pulse Width Modulation (PWM). Digital Pins # 3, # 5, # 6, # 9, # 10 and #11 have PWM capabilities. To output a PWM signal use the command:

analogWrite(pinNumber, value); Where pinNumber is a Digital Pin with PWM capabilities and value is a number between 0 (0%) and 255 (100%). For more information on PWM see the PWM worksheets or S.I.K. circuit 12.

THINGS TO REMEMBER ABOUT DIGITAL:

- Digital Input/Output uses the Digital pins, but Analog In pins can be used as Digital
- To receive a Digital signal use: digitalRead(pinNumber);
- To send a Digital signal use: digitalWrite(pinNumber, value);
- Digital Input and Output are always either HIGH or LOW

All of the electrical signals that the Arduino works with are either Analog or Digital. It is extremely important to understand the difference between these two types of signals and how to manipulate the information these signals represent.

ANALOG

Humans perceive the world in analog. Everything we see and hear is a continuous transmission of information to our senses. The temperatures we perceive are never 100% hot or 100% cold, they are constantly changing between our ranges of acceptable temperatures. (And if they are out of our range of acceptable temperatures then what are we doing there?) This continuous stream is what defines analog data. Digital information, the complementary concept to Analog, estimates analog data using only ones and zeros.

In the world of Arduino an Analog signal is simply a signal that can be HIGH (on), LOW (off) or anything in between these two states. This means an Analog signal has a voltage value that can be anything between 0V and 5V (unless you mess with the Analog Reference pin). Analog allows you to send output or receive input about devices that run at percentages as well as on and off. The Arduino does this by sampling the voltage signal sent to these pins and comparing it to a voltage reference signal

(5V). Depending on the voltage of the Analog signal when compared to the Analog Reference signal the Arduino then assigns a numerical value to the signal somewhere between 0 (0%) and 1023 (100%). The digital system of the Arduino can then use this number in calculations and sketches.

To receive Analog Input the Arduino uses Analog pins # 0 - # 5. These pins are designed for use with components that output Analog information and can be used for Analog Input. There is no setup necessary, and to read them use the command:

analogRead(pinNumber); Where pinNumber is the Analog In pin to which the the Analog component is connected. The analogRead command will return a number including or between 0 and 1023.

The Arduino also has the capability to output a digital signal that acts as an Analog signal; this signal is called Pulse Width Modulation (PWM). Digital Pins # 3, # 5, # 6, # 9, # 10 and #11 have PWM capabilities. To output a PWM signal use the command:

analogWrite(pinNumber, value);Where pinNumber is a Digital Pin with PWM capabilities and value is a number between 0 (0%) and 255 (100%). On the Arduino UNO PWM pins are signified by a ~ sign. For more information on PWM see the PWM worksheets or S.I.K. circuit 12.

THINGS TO REMEMBER ABOUT ANALOG:

Analog Input uses the Analog In pins, Analog Output uses the PWM pins

1. To receive an Analog signal use: analogRead(pinNumber);
2. To send a PWM signal use: analogWrite(pinNumber, value);
3. Analog Input values range from 0 to 1023 (1024 values because it uses 10 bits, 210) .
4. PWM Output values range from 0 to 255 (256 values because it uses 8 bits, 28)

.

All of the electrical signals that the Arduino works with are either input or output. It is extremely important to understand the difference between these two types of signals and how to manipulate the information these signals represent.

OUTPUT SIGNALS :

Output to the Arduino pins is always Digital, however there are two different types of Digital Output; regular Digital Output and Pulse Width Modulation Output (PWM). Output is only possible with Digital pins # 0 - # 13. The Digital pins are preset as Output pins, so unless the pin was used as an Input in the same sketch, there is no reason to use the pinMode command to set the pin as an Output. Should a situation arise where it is necessary to reset a Digital pin to Output from Input use the command:

pinMode(pinNumber, OUTPUT); Where pinNumber is the Digital pin number set as Output. To send a Digital Output signal use the command:

digitalWrite(pinNumber, value); Where pinNumber is the Digital pin that is outputting the signal and value is the signal. When outputting a Digital signal value can be either HIGH (On) or LOW (Off).

analogWrite(pinNumber, value); Where pinNumber is a Digital Pin with PWM capabilities and value is a number between 0 (0%) and 255 (100%). For more information on PWM see the PWM worksheets or S.I.K. circuit 12.

Output can be sent to many different devices, but it is up to the user to figure out which kind of Output signal is needed, hook up the hardware and then type the correct code to properly use these signals.

THINGS TO REMEMBER ABOUT OUTPUT:

- Output is always Digital
- There are two kinds of Output: regular Digital or PWM (Pulse Width Modulation)
- To send an Output signal use analogWrite(pinNumber,value); (for analog) or digitalWrite(pinNumber, value); (for digital).
- Output pin mode is set using the pinMode command: pinMode(pinNumber, OUTPUT).
- Regular Digital Output is always either HIGH or LOW
- PWM Output varies from 0 to 255

All of the electrical signals that the Arduino works with are either input or output. It is extremely important to understand the difference between these two types of signals and how to manipulate the information these signals represent.

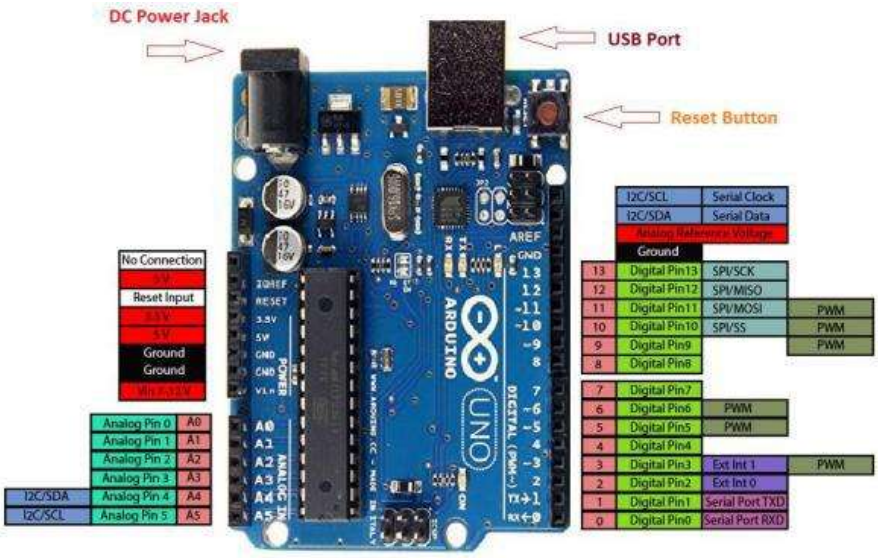


Fig 3.5: All different ports of Arduino including analog and digital ports and connecting points

INPUT SIGNALS :

Analog Input enters your Arduino through the Analog In pins # 0 - # 5. These signals originate from analog sensors and interface devices. These analog sensors and devices use voltage levels to communicate their information instead of a simple yes (HIGH) or no (LOW). For this reason, you cannot use a digital pin as an input pin for these devices. Analog Input pins are used only for receiving Analog signals. It is only possible to read the Analog Input pins so there is no command necessary in the setup () function to prepare these pins for input. To read the Analog Input pins use the command:

Where pinNumber is the Analog Input pin number. This function will return an Analog Input reading between 0 and 1023. A reading of zero corresponds to 0 Volts and a reading of 1023 corresponds to 5 Volts. These voltage values are emitted by the analog sensors and interfaces. If you have an Analog Input that could exceed Vcc + .5V you may change the voltage that 1023 corresponds to by using the Aref pin. This pin sets the maximum voltage parameter your Analog Input pins can read. The Aref pin's preset value is 5V.

Digital Input can enter your Arduino through any of the Digital Pins # 0 - # 13. Digital Input signals are either HIGH (On, 5V) or LOW (Off, 0V). Because the Digital pins can be used either as input or output you will need to prepare the Arduino to use these pins as inputs in your setup () function. To do these types the command:

pinMode(pinNumber, INPUT); inside the curly brackets of the setup( ) function where pinNumber is the Digital pin number you wish to declare as an input. You can change the pinMode in the loop () function if you need to switch a pin back and forth between input and output, but it is usually set in the setup () function and left untouched in the loop () function. To read the Digital pins set as inputs use the command:

digitalRead(pinNumber); Where pinNumber is the Digital Input pin number.

Input can come from many different devices, but each device's signal will be either Analog or Digital, it is up to the user to figure out which kind of input is needed, hook up the hardware and then type the correct code to properly use these signals.

X1: DE-9 serial connector

Used to connect computer (or other devices) using RS-232 standard. Needs a serial cable, with at least 4 pins connected: 2, 3, 4 and 5. Works only when JP0 is set to 2-3 position.

DC1: 2.1 mm. power jack

Used to connect external power source. Centre positive. Voltage Regulator Works with regulated +7 to +20 volts DC (9v. to 12v. is recommended). It is possible to alternatively connect external power using 9v. pin or 5v. pin. (See POWER PINOUT)

ICSP: 2x3 pin header Used to program Atmega with bootloader. The number 1 on both sides of the board indicates cable pin1 position. Used to upload sketches on Atmega ICs without bootloader (available only in Arduino IDE versions 0011 and 0012)

JP0: Two pins jumper When in position 2-3, this jumper enables serial connection (through X1 connector) to/from computer/devices. Use this as default position. When in position 1-2, it disables serial communication, and enables external pull-down resistors on pin0 (RX) and pin1 (TX). Use this

only to prevent noise on RX (that seems incoming data to Atmega), that sometimes makes sketch not starting. When removing this jumper, serial communication is disabled, and pin0 and pin1 work as a normal (floating) digital pin. Useful when more digital pins are needed, but only when serial communication is not necessary. External pull-down/pull-up resistor is required.

JP4: Two pins jumper When in position 1-2, this jumper enables auto reset feature, useful when uploading a sketch to Arduino, resetting Atmega automatically. It makes unnecessary to press reset button (S1) when uploading sketches. Be sure that computer COM Port speed is set to 19200bps otherwise auto reset will not work properly. If removed, disables auto reset feature. Very useful to prevent undesired Atmega reset when using sketches that needs serial communication. Auto reset works with DTR pulse on serial pin4. Sometimes Arduino senses a DTR pulse when connecting X1 (serial connector) and some software's sends a DTR pulse when it starts or when it closes, that makes Atmega reset when not desired.

S1: Tactile button This button resets Atmega, to restart uploaded sketch or to prepare Arduino to receive a sketch through serial connector (when auto reset is not active).

LEDS: Indicative led POWER led Turns on when Arduino is powered through DC1, +9v. pin or +5v. pin. RX led Blinks when receiving data from computer/device through serial connection. TX led Blinks when sending data to computer/device through serial connection. L led This led is connected to digital pin13 with a current limiter resistor (that doesn't affect pin13). Useful to test sketches. It is normal to blink when boot loading too.

POWER PINOUT

6 pin headers

RST pin: Makes Atmega reset when connected to GND. Useful for Shield Boards, or to connect external reset.

NC pin: This pin is not connected in Arduino S3v3. Arduino Diecimila has a 3.3 volts pin in the same position.

+9v pin: When Arduino DC1 is powered (with battery or DC adaptor), this pin is used as Vout, with the same voltage supplied on DC1 (see DC1), minus 0,7 volts. The total supplied current depends on external power source capacity When Arduino DC1 is not powered, +9v. pin can be used as Vin, connecting it to an external regulated power source (+7 to +20 volts) and connecting 0v. pin to external power source GND. In this case,

+5v pin: It can be used as Vout, supplying +5 volts. +5v.pin When Arduino DC1 is powered (with battery or DC adaptor), +5v. pin supplies +5 volts as a Vout pin. The total supplied current depends on Voltage Regulator (7805 supplies up to 1A). This applies only to +5v. pin: Atmega in/out pins only supplies max. 40mA on each pin. When Arduino DC1 is not powered, this pin can be used Vin, connecting it to a regulated +5v. and connecting 0v. pin to power source GND. In this case, +9v.pin is inactive. 0v. pin (GND) Two 0v. pins between +5v. and +9v. / One

0v. pin: Beside AREF pin. When Arduino DC1 is powered, 0v.pin supplies 0 volts' reference (GND) for +5v. pin and +9v. pin. When DC1 is not powered, and Arduino is powered through +5v.pin or +9v. pin, 0v. pin must be used as GND reference, connecting it to the external power source GND.

GND pin: see 0v. pin (GND).

AREF pin: The AREF can be set to A Vcc (default), internal 2.56 volts (Atmega8), internal 1.1 volts (Atmega168), or external AREF. In case of A Vcc or internal AREF, AREF pin can be used to attach an external capacitor to decouple the signal, for better noise performance. In case of external AREF, AREF pin is used to attach the external reference voltage. Remember that it is necessary to change de fuses (wiring.c file), and re-upload sketch, before connecting external voltage to AREF.

SIM800L

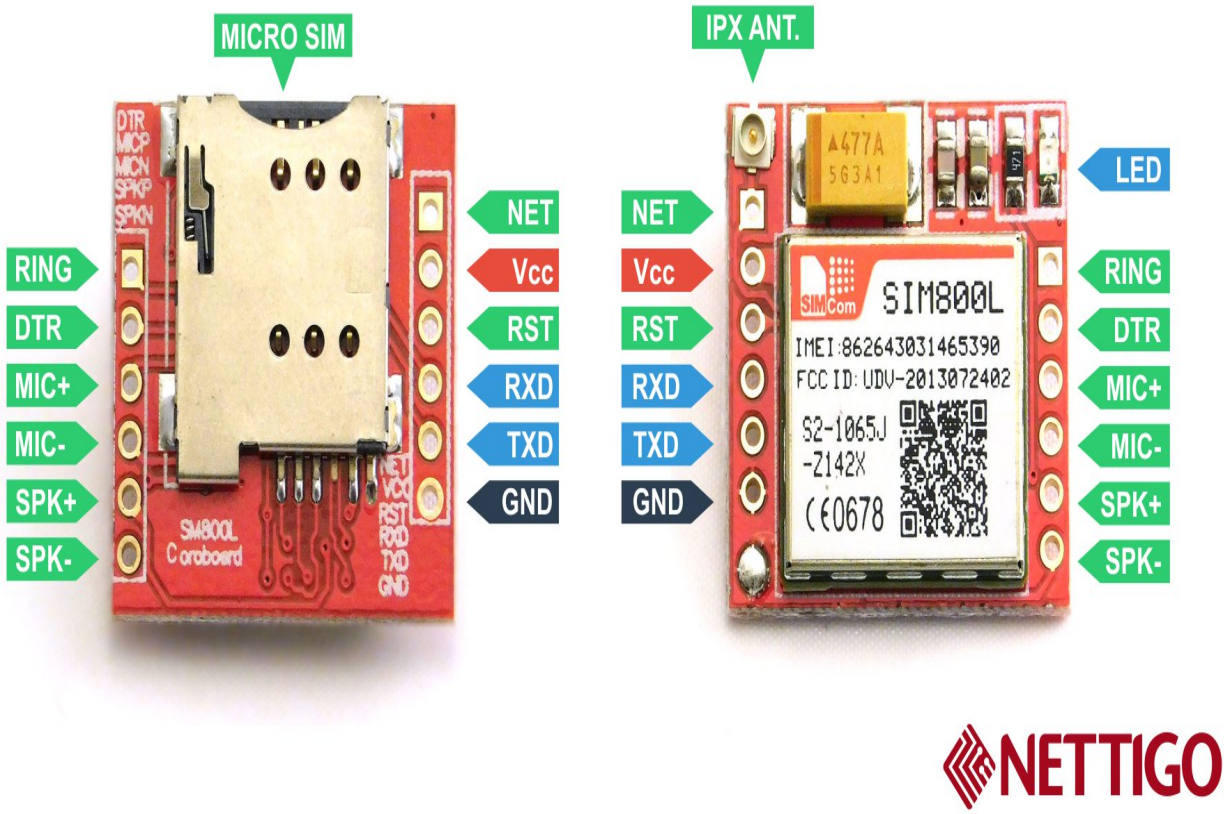


Fig: SIM800L GSM module

On the top surface of the GSM module, we can see a chip is mounted on the module board. This is a Quad-band SIM800L GSM/GPRS cellular chip from SimCom in SMT type. SIM800L supports Quad-band frequency its works on frequencies 850MHz, 900MHz, 1800MHz, and 1900MHz, it can transmit and receive voice, SMS, and data information with low power consumption. The operating voltage of this chip is from 3.4V to 4.4V which makes it ideal to operate by a LiPo battery supply. This chip supports a baud rate from 1200bps to 115200bps with Auto-Baud detection. It has a tiny size of 17.6*15.7*2.3mm which makes it a good choice for embedding into projects without a lot of space.

NET:The NET pin is used to attach an external antenna. Where we can solder Helical Antenna which comes along with the module.

VCC:The VCC pin is used to supply the positive (+) voltage to the module. Power supply 3.4V to 4.4V with min 2 Amp required to work the module finely. Remember, never connect it to a 5V power supply, which can destroy your module. Also, It doesn't work on a 3.3 V power supply.

RST:This pin is a hard reset pin. Pulling this pin low for 100 ms to perform hard reset of the module.

RECEIVER: RX pin is used for Serial communication

TRANSMITTER:TX pin is used for Serial communication

GND: This is the Ground Pin of the module that needs to be connected to the GND pin on the microcontroller.

SPK+/SPK-: SPK + and SPK – is a differential speaker interface. The two pins of a speaker can be connected to these two pins. The positive pin of the speaker is connected to the SPK+ pin and the negative Pin to the SPK-.

MIC +/MIC- :MIC+ and MIC- pins are differential microphone inputs. The two pins of the microphone can be connected to these pins. The positive pin of the microphone is connected to the MIC+ pin and the negative Pin to the MIC-.

DTR: Pulling this pin HIGH to activate sleep mode. In sleep mode, the module disables serial communication. Pulling it LOW to deactivate sleep mode, means the module wakes up.

RING:The RING pin acts as a Ring Indicator, which is used in detecting calls and SMS. Basically, this is the 'interrupt' out pin from the module. It is by-default high, but when a call is received it gives a LOW pulse for 120ms. Also, it can be configured to pulse when an SMS is received.

Features

- Receive and make calls using the external speaker and electret microphone
- Receive and send SMS/ Text messages

- Send and receive GPRS data (TCP/IP, HTTP, etc.)
- Scan and receive FM radio broadcasts
- GPRS multi-slot class12 connectivity: max. 85.6kbps(download/upload)
- GPRS mobile station class B
- Controlled by AT Command (3GPP TS 27.007, 27.005 and SIMCOM enhanced AT Commands)
- Supports Real-Time Clock
- Supports A-GPS
- Low power consumption, 1mA in sleep mode

Power Supply for SIM800L GSM Module

One of the biggest issues with the SIM800L GSM module is the power supply to the module. If the power supply can't fulfill the required current well, then the module can't make the connection to the cellular network or it will shut down/reset in the middle of the action.

The operating voltage range of the module is 3.4- to 4.4-V. But another problem is the SIM800L module doesn't have an integrated voltage regulator. So, we need an external power supply between 3.4V to 4.4V (Ideal 4.1V). Also, remember that this module is a bit power-hungry and the current consumption can be up to 2 A in peaks. So, the power supply should be able to source 2A.

PIR sensor:

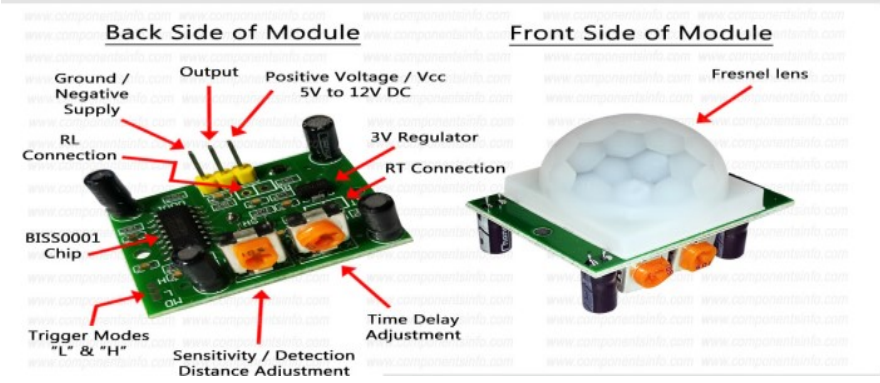


Fig: PIR sensor

A pyroelectric sensor consists of a window with two rectangular slots and is made of a material (typically coated silicon) that allows infrared radiation to pass through. Behind the window, there are two separate infrared sensor electrodes, one responsible for producing the positive output and the other for producing the negative output.

The two electrodes are wired such that they cancel each other out. This is because we are looking for changes in IR levels and not ambient IR levels. That's why when one half sees more or less IR radiation than the other, we get the output.

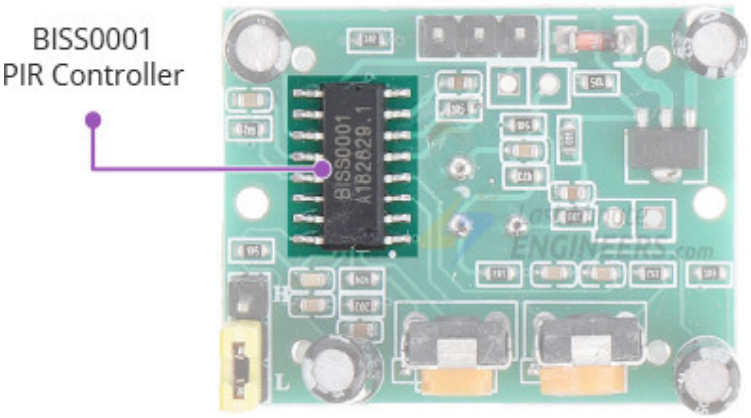
When there is no movement around the sensor, both slots detect the same amount of infrared radiation, resulting in a zero output signal.

But when a warm body like a human or an animal passes by, it first intercepts half of the sensor. This causes a positive differential change between the two halves. When the warm body intercepts the other half of the sensor (leaves the sensing region), the opposite happens, and the sensor produces a negative differential change. By reading this change in voltage, motion is detected.

BISS0001 PIR Controller

At the heart of the module is a passive infrared (PIR) controller IC – BISS0001. Because of the noise immunity it provides, the BISS0001 is one of the most stable PIR controllers available.

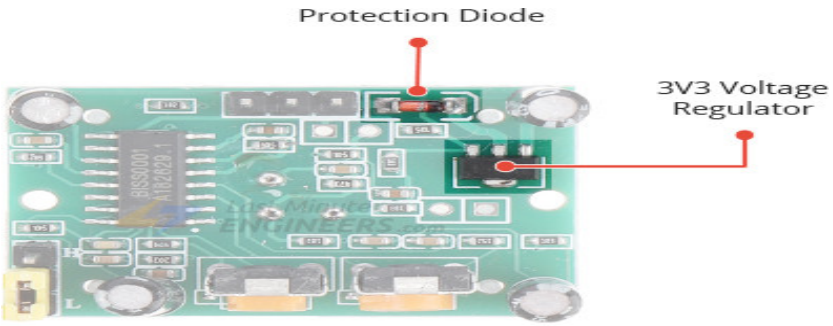
This chip takes the output from the Pyroelectric sensor and does some minor processing on it to emit a digital output pulse.



Power

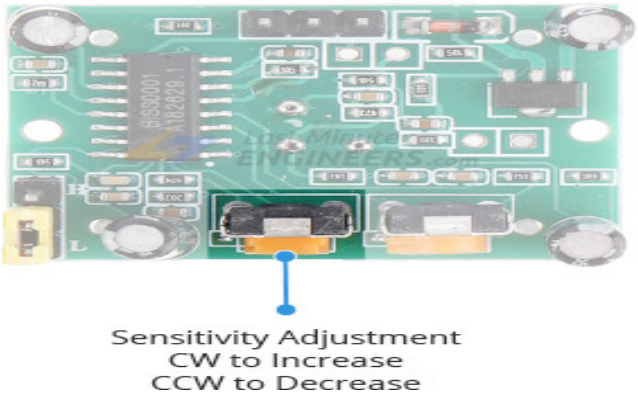
The module comes with a 3.3V precision voltage regulator, so it can be powered by any DC voltage from 4.5 to 12 volts, although 5V is commonly used.

The module comes with a protection diode (also known as a safety diode) to protect the module from reverse voltage and current. So even if you accidentally connect the power with incorrect polarity, your module will not be damaged.



Sensitivity Adjustment

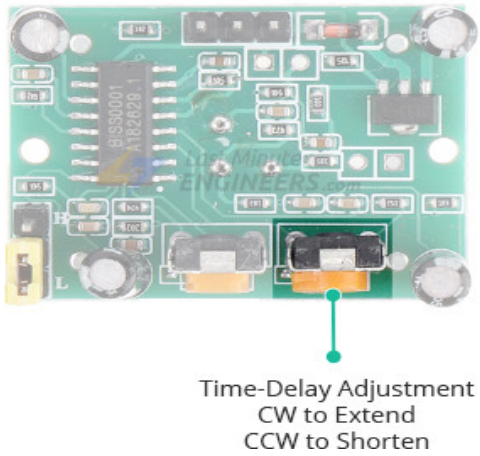
The PIR sensor has a potentiometer on the back to adjust the sensitivity.



This potentiometer sets the maximum detection range. Sensitivity can be adjusted over a range of approximately 3 meters to 7 meters (9 to 21 feet). However the topology of your room can affect the actual range you get. Rotating the pot clockwise will increase the sensitivity and thus the range, and vice versa.

Time-Delay Adjustment

There is another potentiometer on the back of the PIR sensor to adjust the Time-Delay.



This potentiometer sets how long the output will remain HIGH after motion is detected. It can be adjusted from 1 second to about 3 minutes. Turning the potentiometer clockwise increases the delay, while turning the potentiometer counter-clockwise decreases the delay.

Vcc is the power supply for the sensor. You can connect an input voltage anywhere between 5 to 12V to this pin, although 5V is commonly used.

Output pin is the 3.3V TTL logic output. It goes HIGH when motion is detected and goes LOW when idle (no motion detected).

Gnd is the ground pin.

Using PIR Sensor as a standalone unit.

Applications:

- Lighting Controls
- Thermostats And HVAC Systems
- Smart Home And IoT
- IP Cameras And Surveillance Systems
- Digital Signage

BREAD BOARD:

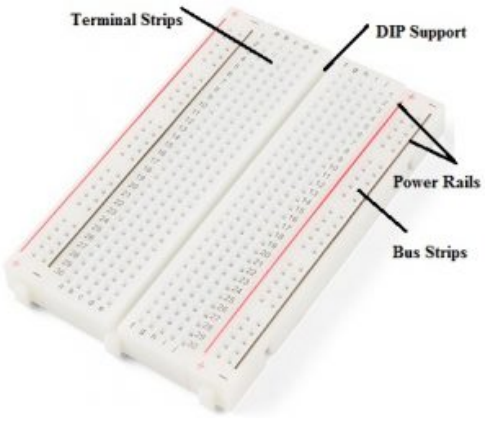


Fig: bread board

The arrangement of different components on a breadboard can be done by inserting their terminals into the breadboard, so it is frequently known as a plugboard. Breadboard definition is a plastic board in rectangular shape that includes a lot of small holes in it to allow you to place different components to build an electronic circuit is known as a breadboard. The connection on the breadboard is not permanent but they can be connected without soldering the components.

If you make any mistake while connecting the components, you can place or remove the components effortlessly. For beginners of electronics, this device is very helpful to make mini-projects. If a designer builds a simple circuit that they desire to analyze, then a breadboard gives a quick solution. The breadboard diagram is shown below.

The material used to make the breadboard is white plastic. At present, most of the breadboards are solderless types, so we can directly plug in the components directly and connected them through the exterior power supply. The different kinds of breadboards are accessible according to the specific point holes. For instance 400 point type, 830 point type, etc.

Different electronic components are compatible with breadboards like resistors, capacitors, switches, diodes, etc. These components which include lengthy metal legs are known as leads whereas components that include shorter metal legs are known as pins. All the electronic components including different sizes of leads will function through a breadboard.

Breadboards are mainly designed with holes to insert the components in the holes tightly, so they cannot fall out but they can drag them to detach them. The appearance of a breadboard includes rows, column, numbers, letters, blue & red lines

CHAPTER – 4

RESULT AND DISCUSSION

4.1 ARDUINO:

Code:

Program for security system:

```
include <SoftwareSerial.h>
//Alarm reciever's phone number with country code
const String PHONE = "Enter_Your_Phone";
//GSM Module RX pin to Arduino 3
//GSM Module TX pin to Arduino 2
#define rxPin 2
#define txPin 3
SoftwareSerial sim800(rxPin,txPin);

//the pin that the pir sensor is attached to
```

```
int pir_sensor = 11;

void setup() {
  pinMode(pir_sensor, INPUT); // initialize sensor as an input
  Serial.begin(115200); // initialize serial
  sim800.begin(9600);
  Serial.println("SIM800L software serial initialize");
  sim800.println("AT");
  delay(1000);
}
void loop(){
/////////////////////////////////////////////////
while(sim800.available()){
  Serial.println(sim800.readString());
}
/////////////////////////////////////////////////
while(Serial.available()) {
  sim800.println(Serial.readString());
}
/////////////////////////////////////////////////
  int val = digitalRead(pir_sensor); // read sensor value
  if (val == HIGH) { // check if the sensor is HIGH
    //state = HIGH;
    Serial.println("Motion detected!");
    Serial.println("calling....");
    delay(1000);
    sim800.println("ATD"+PHONE+";");
    delay(20000); //20 sec delay
  }
}
```

4.2 OUTCOME:

The tracking system was the hardware used to track movement and send data to the application. This sensor system uses sophisticated technology such as Arduino Uno R3 Atmega , Pir sensor and Sim800L module.

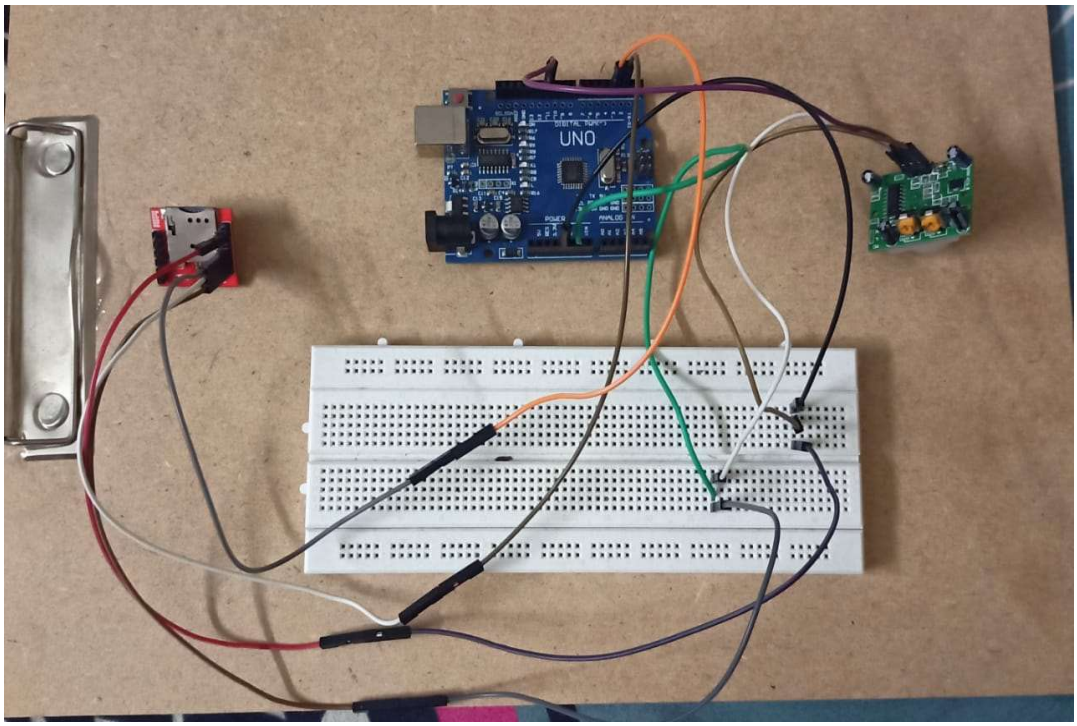


Fig [1]

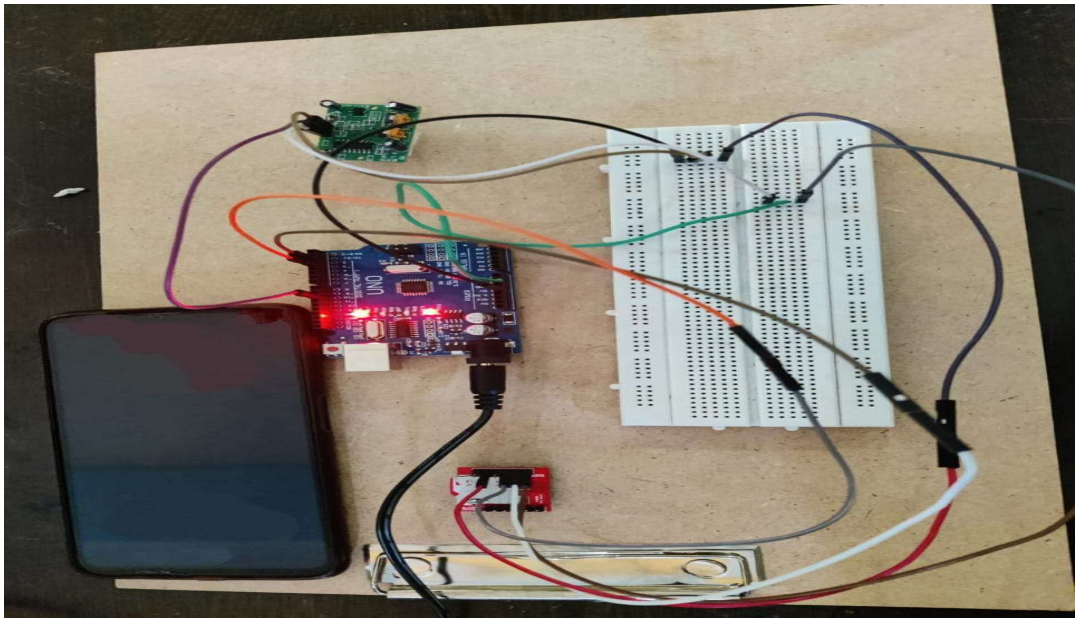
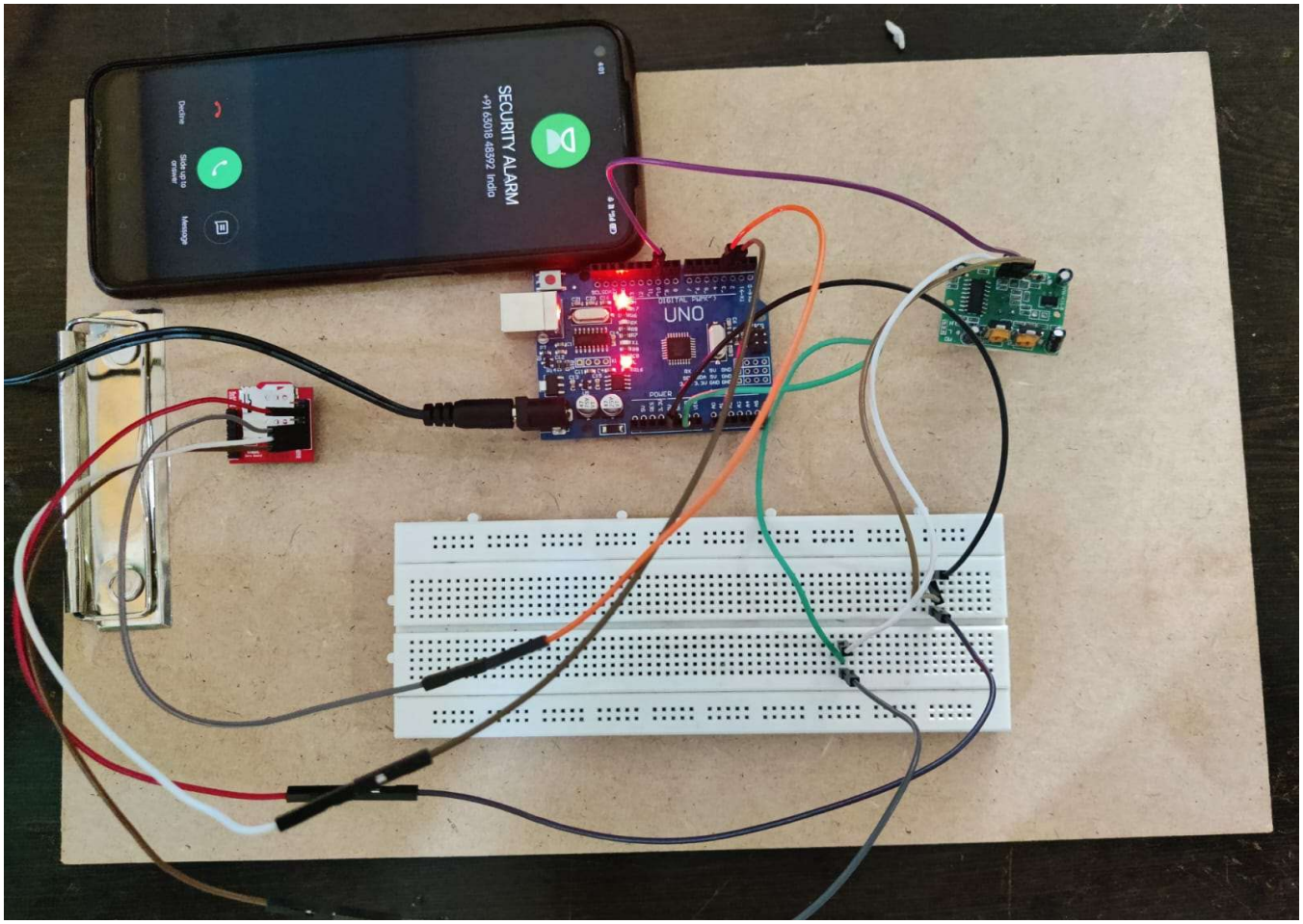


Fig [2]

If the sensor detects the movements, the alarm system triggered the alarm and sends a call to the user. Users will only found out about their home security.



Fig[3]:movement detected and sends a call to the user.

CHAPTER - 5

CONCLUSION

6.1 Conclusion :

For the whole system, the PIR sensor is the heart of the project. The human motion across the entire area can detect by altering the infrared radiation by means of passive infrared sensor (PIR). The uses of PIR sensor are very applicable for security. In addition, the design of the system is efficient in energy consumption and it also applicable in the area of low energy supply or inadequate electricity supply. The operation of the circuit is simple and easy to install in any condition. Due to its good response to the motion detector, the proposed security system is suitable for home surveillance application.

6.2 Advantages:

1. Detects motion reliably in indoors as well as in day or dark.
2. It consumes less energy(0.8W to 1.0W)compare to other sensors such as microwave sensor.
3. PIR sensors are small ,inexpensive ,easy to use and don't wear out.
4. PIR sensors can detect motion without coming in contact with them.
5. Easy to install and do not require much wiring .
6. Reduces lot of human efforts by making things to work automatically.
7. These are good for electrical applications not only in smaller but also compact premises, very easy to interface.

6.3 Disadvantages:

1) PIR sensors have less Coverage.
2) Insensitive to very slow motion of objects.
3) PIR sensors works effectively in LOS(line of sight) and will have problems for corner regions.
4) Low sensitivity.
5) They usually last for 8_12 months under high usage.

6.4 Future Scope

1. In this security system PIR sensor has been used which is low power, and low cost, pretty rugged, have a wide lens range, and are easy to interface with.
2. This security system can be implemented in places like home, office, shop etc.
3. The sensitivity range for detecting motion of the system is about 3 to 4 feet. It can be raised up to 20 feet through careful use of concentrating optical lenses as future development.
4. In addition to this, this system can be equipped with glass break detectors to enhance the level of protection.
5. Use of multi_sensor data fusion and complex algorithm can be used to increase the effective FOV for larger spaces.

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