**SECOND YEAR INDUSTRIAL TRAINING SEMINAR REPORT**

**INTERNET OF THINGS**

Submitted in partial fulfilment of the degree of Bachelor of Technology

Rajasthan Technical University



By

**NITIN KUMAWAT**

**(PIET21CS120)**

DEPARTMENT OF COMPUTER ENGINEERING

POORNIMA INSTITUTE OF ENGINEERING & TECHNOLOGY, JAIPUR (Academic Year 2022-23)

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**RAJASTHAN TECHNICAL UNIVERSITY**

**POORNIMA INSTITUTE OF ENGINEERING & TECHNOLOGY, JAIPUR**

**CERTIFICATE**

This is to certify that Second Year Industrial Training Seminar Report entitled “**MOTION CAPTURE DEVICE**” has been submitted by “Nitin Kumawat” (PIET21CS120) for partial fulfilment of the Degree of Bachelor of Technology of Rajasthan Technical University. It is found satisfactory and approved for submission.

Date-10-09-2022

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|  |  |  |

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|  |
| --- |
| **DECLARATION**  I hereby declare that the Industrial Training Seminar report entitled “**MOTION CAPTURE DEVICE**" was carried out and written by me under the guidance of **Dr. Shruti Thapar,** Assistant Professor, Department of Computer Engineering, Poornima Institute of Engineering & Technology, Jaipur. This work has not been previously formed the basis for the award of any degree or diploma or certificate nor has been submitted elsewhere for the award of any degree or diploma.      Place: PIET Jaipur Student Name – Nitin kumawat  Date: 10-09-2022 Registration Number – PIET21CS120 |

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I would also like to express my hearts felt appreciation to all of my friends whose direct or indirect suggestions help me to develop this project [and to entire team members for their valuable suggestions.

Lastly, thanks to all faculty members of Computer Engineering department for their moral support and guidance.

Submitted by:

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**ABSTRACT**

The purpose of this project was to build a motion detector. The main components used were the Arduino microcontroller [ESP32] and the PIR sensor. The project also used an LED and a Piezo buzzer to indicate when motion was detected. The group sought to demonstrate the workings of each component as well as how they work together to carry out the task. The group also drew up a circuit from which the components were connected. The main objective for the project was to practice the skills learnt over the 1 year and to creatively show how analog signals can be converted to digital signals. The group started their work by researching briefly o what other people had been able to do on the same issue. They later agreed upon the actual project, the components required and the modulus operandi. From the results, it was demonstrated that motion, which is a physical property, can be used to effect changes in a digital device and using the LED and Piezo buzzer, the motion can be announced thereby allowing it to be used as an intruder alarm.

**Keywords: PIR sensor, Detection, LED, Buzzer, Arduino.**

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**List of Abbreviations**

**IoT** Internet of things

**Html** Hypertext Markup Language

**CSS** Cascading Style Sheet

**SoC** System of Chip

**PIR** Passive infrared sensor

**IDE** Integrated Development Environment

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**Chapter 1**

**Introduction to Iot Based Motion Capture Device**

**1.Introdction**

The Internet of Things (IoT) describes the network of physical objects “things” that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet. These devices range from ordinary household objects to sophisticated industrial tools.

“Home automation” refers to the automatic and electronic control of household features, activity, and appliances. In simple terms, it means you can easily control the utilities and features of your home via the Internet to make life more convenient and secure, and even spend less on household bills. Home automation is a network of hardware, communication, and electronic interfaces that work to integrate everyday devices with one another via the Internet. Each device has sensors and is connected through WiFi, so In this paper, we are going to propose a system for controlling household features. In which we used two sensors and other components for making a complete system. In our system we uses PIR and LDR sensors and LED, Relay and many of other components which controls and helps to make it a complete home automation system.

The internet of things helps people live and work smarter, as well as gain complete control over their lives. In addition to offering smart devices to automate homes, IoT is essential to business. IoT provides businesses with a real-time look into how their systems really work, delivering insights into everything from the performance of machines to supply chain and logistics operations. IoT enables companies to automate processes and reduce labor costs. It also cuts down on waste and improves service delivery, making it less expensive to manufacture and deliver goods, as well as offering transparency into customer transactions.

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* 1. **Significance of the training**

The most important thing of this training is that it provided us with an inspiration. To summarize, this training provides us endless possibilities to explore and develop a career path. Awesome training content and we people can have done deep analysis on IoT stuff which is great. And we all Keep did good work and Enhanced our skills.

**1.2 Applications of IOT:**

IoT applications run on IoT devices and can be created to be specific to almost every industry and vertical, including healthcare, industrial automation, smart homes and buildings, automotive, and wearable technology. Increasingly, IoT applications are using AI and machine learning to add intelligence to devices. Internet of things is an emerging technology that allows the connection of various electronic devices. If this technology has not developed we should have connected manually. The advantage of this technology is it shares information between connected devices.

**1.3 Scope Of IOT:**

The Internet of Things (IoT) has risen to prominence as a global technology. It has grown in popularity in a short period. Moreover, advances in Artificial Intelligence and Machine Learning have made IoT device automation easy. In general, AI and machine learning programs are paired with IoT devices to provide proper automation. As a result, the Internet of Things (IoT) has broadened its field of application across various industries. We will address the implementations and potential IoT scope in the healthcare, automotive, and agriculture industries in this blog. The industry has turned to technology to boost productivity to meet the growing food demand. Precision farming, agricultural drones, and smart farming apps are all part of it. All of this is installed on top of an Internet of Things framework. So in many ways the scope of IOT is great in future.

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**1.4 Company Profile**

AICTE-IDEA (Idea Development, Evaluation & Application) Labs are being established across the country for encouraging students for application of science, technology engineering and mathematics (STEM) fundamentals towards enhanced hands-on experience, learning by doing and even product visualization. As a common facility embedded in the institution, the IDEA Lab will make engineering graduates more imaginative and creative, besides getting basic training in the 21st century skills like- critical thinking, problem solving, design thinking, collaboration, communication, lifelong learning etc. IDEA Lab can empower the students and faculty to “engage, explore, experience, express and excel”, addressing the need of new age learning. IDEA Lab would serve as an infrastructure for faculty to take up and promote multidisciplinary education and research. Accordingly, faculty would be encouraged to get trained in these Labs and strive for creating problems/ projects/ internships in their own subjects/ disciplines and mentor the students.

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**Chapter 2**

**Technology Specification**

The term IoT, or Internet of Things, refers to the collective network of connected devices and the technology that facilitates communication between devices and the cloud, as well as between the devices themselves.

**2.1 Language Learned**

One of the most important programming languages in the IoT system is C. This is the lowest layer of software that is close to the hardware. C has been the foundation for many other coding languages over the year. This makes its knowledge of the basic necessity for anyone in the IoT projects. The reason behind this is that it doesn’t require a lot of processing power. C is available on almost every advanced embedded system platform. C is procedural rather than object-oriented as it does not have built-in capabilities. This programming language is compiled making it great for IoT projects.

**2.2 Tools used in project**

**ESP-32**

ESP32 is a low-cost System on Chip (SoC) Microcontroller from Espressif Systems, the developers of the famous ESP8266 SoC. It is a successor to ESP8266 SoC and comes in both single-core and dual-core variations of the Tensilica’s 32-bit Xtensa LX6 Microprocessor with integrated Wi-Fi and Bluetooth. The good thing about ESP32, like ESP8266 is its integrated RF components like Power Amplifier, Low-Noise Receive Amplifier, Antenna Switch, Filters and RF Balun. This makes designing hardware around ESP32 very easy as you require very few external components.

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ESP32 has a lot more features than ESP8266 and it is difficult to include all the specifications in this Getting Started with ESP32 guide. So, I made a list of some of the important specifications of ESP32 here. But for complete set of specifications, I strongly suggest you to refer to the Datasheet.

* Single or Dual-Core 32-bit LX6 Microprocessor with clock frequency up to 240 MHz.
* 520 KB of SRAM, 448 KB of ROM and 16 KB of RTC SRAM.
* Supports 802.11 b/g/n Wi-Fi connectivity with speeds up to 150 Mbps.

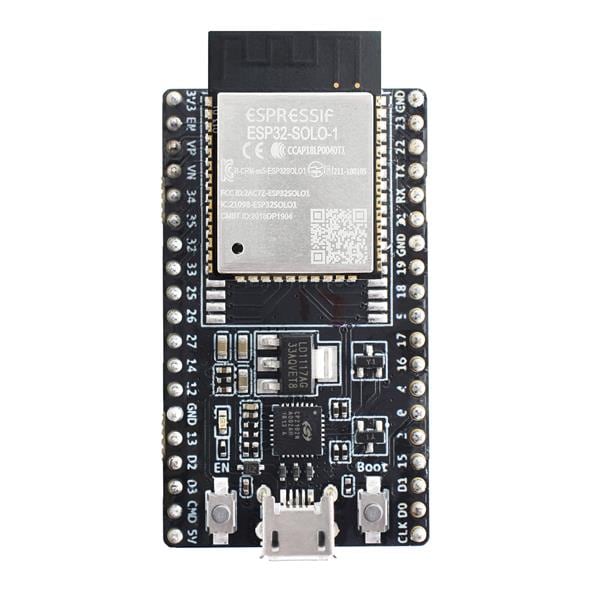
This is a complete beginner’s tutorial on ESP32, an excellent SoC with integrated Wi-Fi and Bluetooth connectivity. You learned about the ESP32 Microcontroller, its specifications, development board layout and a brief pinout as well.

Figure: ESP32

**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, but do not give information on who or what moved. For that purpose, an imaging IR sensor is required.

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PIR sensors are commonly called simply "PIR", or sometimes "PID", for "passive infrared detector". The term passive refers to the fact that PIR devices do not radiate energy for detection purposes. They work entirely by detecting infrared radiation (radiant heat) emitted by or reflected from objects.

Figure: PIR

### 

### Breadboard

A breadboard is a rectangular plastic board with a bunch of tiny holes in it. These holes let you easily insert electronic components to prototype (meaning to build and test an early version of) an electronic circuit, like this one with a battery, switch, resistor, and an LED (light-emitting diode). The connections are not permanent, so it is easy to *remove* a component if you make a mistake, or just start over and do a new project. This makes breadboards great for beginners who are new to electronics. You can use breadboards to make all sorts of fun electronics projects, A picture containing diagram

Description automatically generatedfrom different types of robots or an electronic drum set, to an electronic rain detector to help conserve water in a garden, just to name a few.

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**Jumper Wire**

Chart, line chart

Description automatically generatedA jump wire (also known as jumper, jumper wire, DuPont wire) is an [electrical wire](https://en.wikipedia.org/wiki/Electrical_wire), or group of them in a cable, with a connector or pin at each end (or sometimes without them – simply "tinned"), which is normally used to interconnect the components of a [breadboard](https://en.wikipedia.org/wiki/Breadboard) or other prototype or test circuit, internally or with other equipment or components, without soldering.

Figure: Jumper wires

**Resistor**

A **resistor** is a [passive](https://en.wikipedia.org/wiki/Passivity_(engineering)) [two-terminal](https://en.wikipedia.org/wiki/Terminal_(electronics)) [electrical component](https://en.wikipedia.org/wiki/Electronic_component) that implements [electrical resistance](https://en.wikipedia.org/wiki/Electrical_resistance) as a circuit element. In electronic circuits, resistors are used to reduce current flow, adjust signal levels, to [divide voltages](https://en.wikipedia.org/wiki/Voltage_divider), [bias](https://en.wikipedia.org/wiki/Biasing) active elements, and terminate [transmission lines](https://en.wikipedia.org/wiki/Transmission_line), among other uses. High-power resistors that can dissipate many [watts](https://en.wikipedia.org/wiki/Watt) of electrical power as heat may be used as part of motor controls, in power distribution systems, or as test loads for [generators](https://en.wikipedia.org/wiki/Electric_generator).

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**Chapter 3**

**Project Description**

In this project we uses the technology Internet of things. The IoT is used to connect devices embedded in various systems with the help of internet. When devices or objects can represent themselves digitally and they can be control from wherever you are in the world. The connectivity helps us to capture more data from many places, ensuring more ways of increasing efficiency, which improves safety and IoT security. IoT is a transformational force that helps to improve performance of companies through IoT analytics and IoT Security in order to deliver better results.

A motion sensor (or motion detector) is an electronic device that is designed to detect and measure movement. Motion sensors are used primarily in home and business security systems, but they can also be found in phones, paper towel dispensers, game consoles, and virtual reality systems. An active electronic motion detector contains an optical, microwave, or acoustic sensor, as well as a transmitter. However, a passive contains only a sensor and only senses a signature from the moving object via emission or reflection Motion detectors have found wide use in commercial applications. One common application is activating automatic door openers in businesses and public buildings. Motion sensors are also widely used in lieu of a true occupancy sensor in activating street lights or indoor will be able to view the email notifications from IFTTT regarding the motion detection and its exact date and time. lights in walkways, such as lobbies and staircases. In such smart lighting systems, energy is conserved by only powering the lights for the duration of a timer, after which the person has presumably left the area. A motion detector may be among the sensors of a burglar alarm that is used to alert the home owner or security service when it detects the motion of a possible intruder. Such a detector may also trigger a security camera to record the possible intrusion.

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# **WORKING**

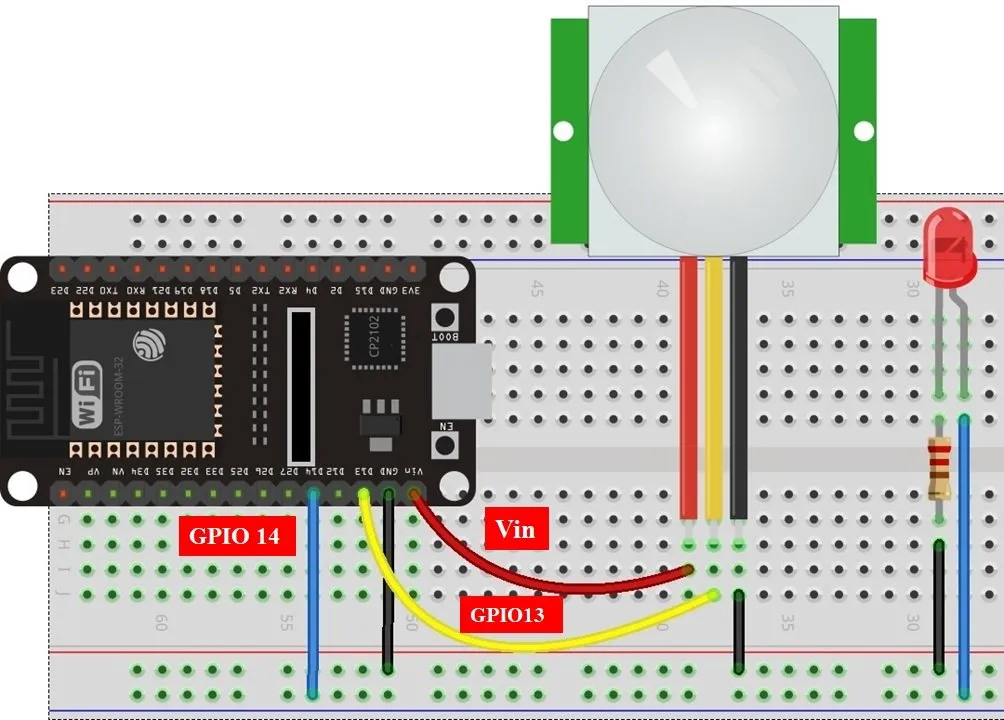
PIR Sensor is short for passive infrared sensor, which applies for projects that need to detect human or particle movement in a certain range. It is also known as PIR (motion) sensor or IR sensor.

PIR sensor is a low-cost motion detector sensor. It is a passive motion sensor that means it can only detect something around it and it cannot transmit anything. Whenever there is a motion around the sensor, it will detect the heat of the human body and produces a high output logic at the output of the sensor. Every object emits infrared rays when they are heated and on the same principle, the human body emits IR rays due to body heat. Hence, whenever the motion sensor detects the human body around it, its output becomes high. We can also adjust the sensitivity of this sensor by changing the variable resistors available on the sensor. One variable resistor is for sensitivity adjustment of distance and another variable resistor is for sensitivity adjustment of time that is the amount of time for which the output should be high.

In the above schematic, we can see that GPIO14 is connected with the anode pin of LED, and the cathode pin is connected with the common ground through the 220 ohm resistor.

The PIR Sensor which we are using in this tutorial consists of three pins. Two of them are power supply pins such as VCC and ground pins. We can power PIR motion sensor directly from the ESP32 3.3V power pin or Vin as shown in the above schematic diagram. The center pin is the output pin which provides an active high pulse whenever motion is detected. Otherwise, this pin remains active low. That means a rising edge occurs when a PIR sensor detects motion. Here we have connected the output pin of the sensor with GPIO13. All are the grounds are in common.

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**Fig:** Circuit Diagram

**Range of Different PIR Sensors**

* **Indoor passive infrared**: Detection distances range from 25 cm to 20 m.
* **Indoor curtain-type**: The detection distance ranges from 25 cm to 20 m.
* **Outdoor passive infrared**: The detection distance ranges from 10 meters to 150 meters.
* **Outdoor passive infrared curtain detector**: distance from 10 meters to 150 meters

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### How the Code Works?

The first step is to include the necessary libraries. Include the following ESP32 libraries for the proper functionality of the project.

#include <WiFi.h>

#include <WiFiClient.h>

#include <WebServer.h>

Next, we will create two global variables, one for the SSID and the other for the password. These will hold our network credentials which will be used to connect to our wireless network. Replace both of them with your credentials to ensure a successful connection.

const char\* ssid = "Your\_SSID";

const char\* password = "Your\_Password";

The next step is very important. We will create two global variables. One will hold the IFTTT private key which we previously saved when we created our applet. This will be unique for your created applet. The other variable will hold the server (host) which will be identical for everyone.

const char \*host = "maker.ifttt.com";

const char \*privateKey = "gkb\_HtIpE-FeOWMH20obLTvUR7\_fPipDyj\*\*\*\*\*\*\*\*\*";

In the following line of code, we will create an object of WebServer called server() and specify 80 as a parameter inside it. This will be the default port where the object will listen for HTTP requests.

WebServer server(80);

Then we will define some variables. First, the integer variable ‘led\_pin’ to hold the ESP32 GPIO pin where the LED will connected. Also, we will specify the PIR sensor middle pin as well. It is GPIO14 for the LED and GPIO13 for the PIR sensor in our case. You can use any appropriate GPIO pin.

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Moreover, we will also create a string variable called ‘message’ that will save the text that we want to display on the web server after motion gets detected.

int led\_pin = 14;

int sensor\_pin = 13;

String Message;

#### **Building the Web Page**

The following lines of code include the HTML, CSS and JavaScript required for building the web page.

const char MAIN\_page[] PROGMEM = R"=====(

<!doctype html>

<html>

<head>

<title>IoT Motion detector</title>

<meta name="viewport" content="width=device-width, initial-scale=1">

<h1 style="text-align:center; color:red;font-size: 2.5rem;">IoT Motion Detector</h1>

<style>

canvas{

-moz-user-select: none;

-webkit-user-select: none;

-ms-user-select: none;

}

#data\_table {

font-family: New Times Roman;

border-collapse: collapse;

width: 100%;

text-align: center;

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font-size: 0.8rem;

}

#data\_table td, #data\_table th {

border: 3px solid #ddd;

padding: 15px;

}

#data\_table tr:nth-child(even){background-color: #f7dada;}

#data\_table tr:hover {background-color: #f7dada;}

#data\_table th {

padding-top: 20px;

padding-bottom: 20px;

text-align: center;

background-color: #e00909;

color: white;

}

</style>

</head>

<body>

<div>

<table id="data\_table">

<tr><th>Time</th><th>Activity</th></tr>

</table>

</div>

<br>

<br>

<script>

var Avalues = [];

var dateStamp = [];

setInterval(function() {

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getData();

}, 3000);

function getData() {

var xhttp = new XMLHttpRequest();

xhttp.onreadystatechange = function() {

if (this.readyState == 4 && this.status == 200) {

var date = new Date();

var txt = this.responseText;

var obj = JSON.parse(txt);

Avalues.push(obj.Activity);

dateStamp.push(date);

var table = document.getElementById("data\_table");

var row = table.insertRow(1);

var cell1 = row.insertCell(0);

var cell2 = row.insertCell(1);

cell1.innerHTML = date;

cell2.innerHTML = obj.Activity;

}

};

xhttp.open("GET", "read\_data", true);

xhttp.send();

}

</script>

</body>

</html>

)=====";

We will start with the title of the web page. The <title> tag will indicate the beginning of the title and the </title> tag will indicate the ending. In between these tags, we will specify “ IoT Motion detector ” which will be displayed in the browser’s title bar.

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<title>IoT Motion detector</title>

Next, we will create a meta tag to make sure our web server is available for all browsers e.g., smartphones, laptops, computers etc.

<meta name="viewport" content="width=device-width, initial-scale=1">

We will insert the heading as “IoT Motion Detector” in blue colour and specify the font size and text allignment.

<h1 style="text-align:center; color:red;font-size: 2.5rem;">IoT Motion Detector</h1>

Next, we will include the <style> </style> tags which mark the beginning and end of the CSS styling file. We will set the display text to font type Times New Roman and align it in the centre of the webpage. For all the different texts, the font size, font type, colour, positioning and everything relating to the overall visuals of the web page will be is specified. This section of code shows the CSS styling which we will incorporate in our web page.

<style>

canvas{

-moz-user-select: none;

-webkit-user-select: none;

-ms-user-select: none;

}

#data\_table {

font-family: New Times Roman;

border-collapse: collapse;

width: 100%;

text-align: center;

font-size: 0.8rem;

}

#data\_table td, #data\_table th {

border: 3px solid #ddd;

padding: 15px;

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}

#data\_table tr:nth-child(even){background-color: #f7dada;}

#data\_table tr:hover {background-color: #f7dada;}

#data\_table th {

padding-top: 20px;

padding-bottom: 20px;

text-align: center;

background-color: #e00909;

color: white;

}

</style>

Our IoT Detection web server will display the data in the form of a table. It will have two columns. The first columns will show the Date/Time when the motion will be detected. The second column will display the status of the motion detection which we will specify as Activity.

<table id="data\_table">

<tr><th>Time</th><th>Activity</th></tr>

</table>

##### **JavaScript**

Inside the <script> </script> tags we will include the JavaScript. It includes the getData() function as defined below. This function takes in no parameters. It is responsible to acquire the PIR motion detection data from ESP32 board. This will be used to update the web server by adding the table contents. The current date and time of motion detection will get added in the first cell and the activity in the second cell. Inside this function we use the XMLHttpRequest. This will allow us to make an HTTP request in JavaScript. This will make sure that the web server updates automatically with out the need to reload it.

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function getData() {

var xhttp = new XMLHttpRequest();

xhttp.onreadystatechange = function() {

if (this.readyState == 4 && this.status == 200) {

var date = new Date();

var txt = this.responseText;

var obj = JSON.parse(txt);

Avalues.push(obj.Activity);

dateStamp.push(date);

var table = document.getElementById("data\_table");

var row = table.insertRow(1);

var cell1 = row.insertCell(0);

var cell2 = row.insertCell(1);

cell1.innerHTML = date;

cell2.innerHTML = obj.Activity;

}

};

xhttp.open("GET", "read\_data", true);

xhttp.send();

We will initialize the request by using the xhttp.open() method. Inside it we will pass on three arguments. The first argument specifies the type of HTTP method which is GET in our case. The second argument is the URL. In our case, it is the read\_data URL. The last argument is true which specifies that the request is asynchronous.

xhttp.open("GET", "read\_data", true);

Lastly, we will use xhr.send() to open the connection. This will send the request to the server.

xhttp.send();

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##### handleRoot()

The handleRoot() function takes in no parameters. It is responsible for ESP32 handling the /root URL. We will configure the root / URL where our server will listen to HTTP GET requests.  
The handling function will respond to the client by using the send() method on the server. This method will take in three parameters. The first is 200 which is the HTTP status code for ‘ok’. The second is “text/html” which will correspond to the content type of the response. The third input is the text saved on the ‘s’ variable which will be sent as the response. It is the MAIN\_page.

void handleRoot() {

String s = MAIN\_page;

server.send(200, "text/html", s);

}

##### **read\_data()**

The read\_data() function also takes in no parameters. It acquires the sensor data from the PIR sensor and saves it in the integer variable ‘state.’ This is achieved by using the digitalRead() function and specifying the sensor\_pin as the parameter.

Then we will use an if statement to check whether the state of the PIR sensor is HIGH. If it is, them the LED will be turned ON. This will be achieved through the digitalWrite() function and passing the led\_pin and “HIGH” as parameters inside it. The LED will turn OFF after a second. Moreover, we will store the string variable ‘message’ that we initially defined with “Motion Detected” text. This will be saved in the string variable ‘data’ and sent to the web server as a response to an HTTP request. All of this will occur if the PIR sensor is in a HIGH state i.e. when it detects motion.

void read\_data() {

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int state = digitalRead(sensor\_pin);

delay(500);

Serial.print(state);

if(state == HIGH){

digitalWrite (led\_pin, HIGH);

delay(1000);

digitalWrite (led\_pin, LOW);

Message = "Motion Detected";

String data = "{\"Activity\":\""+ String(Message) +"\"}";

server.send(200, "text/plane", data);

send\_event("Motion\_Detection");

Serial.println("Motion detected!");

}

#### **setup()**

Inside, the setup() function we will open a serial communication at a baud rate of 115200.

Serial.begin(115200);

The following section of code will connect our ESP32 board with the local network whose network credentials we already specified above. After the connection will be established, the IP address will get printed on the serial monitor. This will help us access the web server.

WiFi.begin(ssid, password);

while (WiFi.status() != WL\_CONNECTED) {

delay(500);

Serial.print("Connecting...");

}

Serial.println("");

Serial.println("Successfully connected to WiFi.");

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Serial.println("IP address is : ");

Serial.println(WiFi.localIP());

To start the server, we will call begin() on our server object.

server.on("/", handleRoot);

server.on("/read\_data", read\_data);

server.begin();

Moreover, we will configure the PIR sensor pin as an input and the led pin as an output using the pinMode() function. Using digitalWrite(), we will set the led pin in a LOW state initially so that the LED is OFF at the start of the project.

pinMode(sensor\_pin, INPUT);

pinMode(led\_pin, OUTPUT);

digitalWrite (led\_pin, LOW);

#### **loop()**

Inside the loop() function we will call handleClient() on the server object so that the server can listen to the HTTP requests continuously.

void loop(){

server.handleClient();

}

#### **send\_event()**

The send\_event() function is responsible for connecting with the IFTTT server. It takes in a single parameter which is the event pointer. In our case, we had set our IFTTT event name as ‘Motion\_Detection.’ We will pass this as a parameter inside the send\_event() function. This function will be called inside the read\_data() function.

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void send\_event(const char \*event)

{

Serial.print("Connecting to ");

Serial.println(host);

WiFiClient client;

const int httpPort = 80;

if (!client.connect(host, httpPort)) {

Serial.println("Connection failed");

return;

}

String url = "/trigger/";

url += event;

url += "/with/key/";

url += privateKey;

Serial.print("Requesting URL: ");

Serial.println(url);

client.print(String("GET ") + url + " HTTP/1.1\r\n" +

"Host: " + host + "\r\n" +

"Connection: close\r\n\r\n");

while(client.connected())

{

if(client.available())

{

String line = client.readStringUntil('\r');

Serial.print(line);

} else {

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delay(50);

};

}

Serial.println();

Serial.println("Closing Connection");

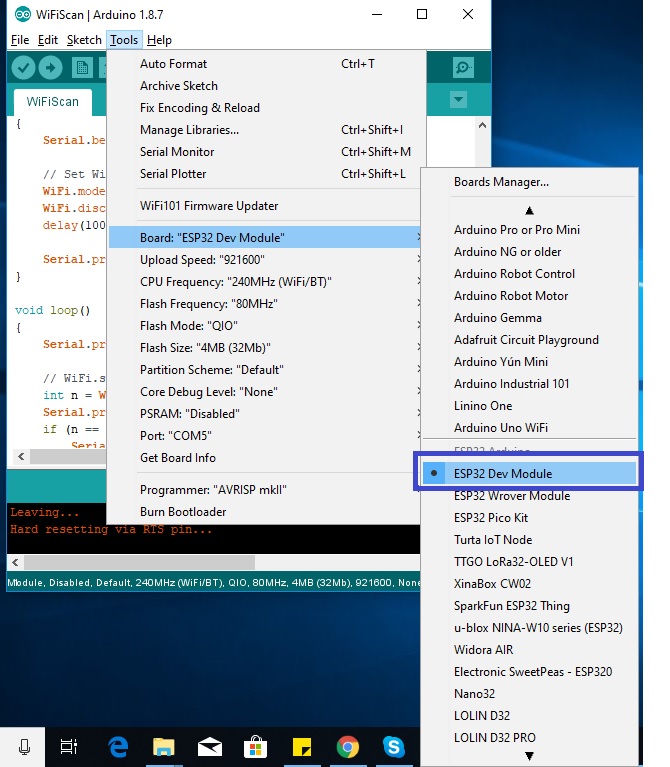
client.stop();

}

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### Chapter 4

### Demonstration Of Project

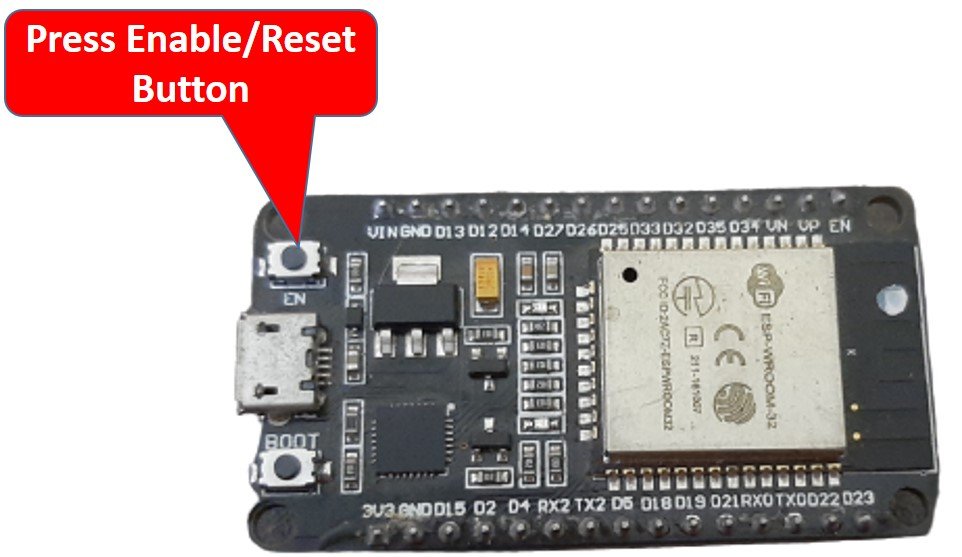
Make sure you choose the correct board and COM port before uploading your code to the board. Therefore go to Tools > Board and select ESP32 Dev Module.

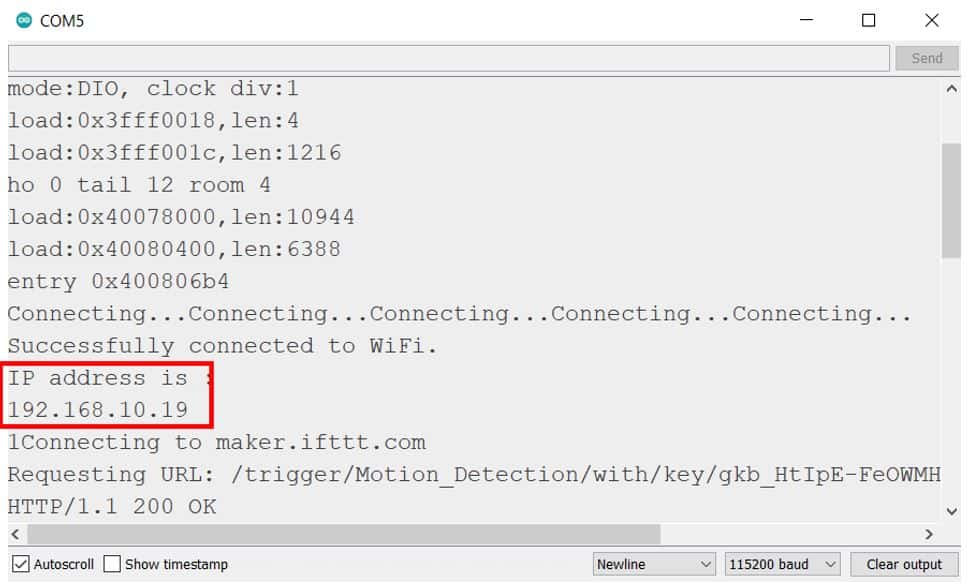
Then, go to Tools > Port and select the appropriate port through which your board is connected.

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Click on the upload button to upload the code to ESP32 development board.

After you have uploaded your code to the ESP32 development board, press its ENABLE button.



In your Arduino IDE, open up the serial monitor and you will see that the IP address will be assigned to your ESP32 board.

**Fig:** Serial Monitor

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Type the IP address in a new web browser and press enter. The web server will open up. Move your hand in front of the PIR sensor and immediately the LED will turn ON. The web server will also get updated with new values.

**Fig:** Serial Monitor

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## 

## **Conclusion**

In conclusion, we were able to build an ESP32 IoT-based motion detection project using a PIR sensor in Arduino IDE. We were able to create a web server that displayed motion detection with date and time and updated them in a table format. Moreover, the LED connected with the ESP32 and the PIR sensor also turned ON in response to the sensor’s state getting HIGH (motion detected). But, you can also attach a buzzer or bell to notify someone of emergency. We also integrated IFTTT services to generate an email to us specifying the exact date and time every time a motion was detected.

**Limitations**

1.As it is wireless in nature, it is prone to hacking by hackers.  
2. It cannot be used for high speed communication as it is designed for low speed applications.  
3.It is expensive to build such network and hence cannot be affordable by all.

**Future scope**

Home security of the future is a space for the digital natives. With the invention of lots of automation technologies featuring IOT and AI, home automatic security has become a reality. One can implement several of their tasks with just a single command of verbal instructions.

There are several new technologies which can become a part of home security in the near future:

**1.Increased efficiency, control, and customization**

2.**Integration of services like email, Alexa**

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