

# Application of Iot with Motion Sensor for Smart Learning Environment

Anurag Yadav, N.Gayathri

**Abstract:** Considering the estimate of the potential system in the classroom, lights and fan control is expected to be performed in three modules. Thus, in the case of light and ventilator power, occupancy sensor is used to estimate the amount of output voltage increases in the diode while the rotational speed increases simultaneously. Motion sensors are common where safety and energy efficiency are concerned. They can be used for burglary alarms or surveillance cameras, which activate such devices when it detects nearby motion. This can be an energy saver by turning off lights in a building as it no longer detects activity and is commonly used in office buildings and toilets. The PIR is a motion sensor that you might have seen when you enter a bathroom or office space, normally with a white mask. They are lightweight, low powered, simple to use and low cost. The way it detects motion is by sensing the temperature differences between the surroundings PIRs are fitted with a passive sensors level of infrared radiation –all emits some low-level radiations, but a human body emits good heat. This triggers a pulse when the sensor senses a different shift between the two slots which is what it detects as ‘movement’ Technology is available that combines both PIR and microwave sensors to have less false alarms, a sudden increase in room temperature will cause the PIR to go off while wind will push an object and activate the microwave sensor.

**Keywords:** - sensors, fans, LED, DC motor, classes, etc.

## I. INTRODUCTION

In several classrooms after the class is over the students and teacher leaves the class without turning OFF the electricity of the classes, the security personnel appear to shut them off at the moment the classrooms are locked. Thus electrical energy is lost during the undesirable period. PIR sensors and LDR are used to automatically control this to solve. PIR senses the humans inside the classroom and only turns ON when there is some person inside the classroom. LDR senses ambient lighting it will turn ON the lights during the dark hour and vice versa. PIR sensors are more complex as compared to any other kinds of sensors, as many variables affect sensors input and output. Inside the PIR sensor itself there are two slots; each slot is made of a special material that is sensitive to IR detector. A light based detector is also known as LDR, photo-resistor, photo-conductor or photo-cell is a resistor whose resistance increases or decreases depending upon amount of light. The resistance and functions of an LDR can be varied. For example if the LDR is in darkness it can be used to turn ON the light due to of intensity of light and if there is no darkness, proper intensity of light in classroom LDR should help in turning OFF the lights.

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Anurag Yadav, Student School of Computing Science & Engineering  
Galgotias University Greater Noida

N.Gayathri, Assistant Professor School of Computing Science & Engineering Galgotias University Greater Noida

It can also operate the other way around, so that when the LDR is in light it switches on the circuit and resistance rises and disrupts the circuit when it is in the dark. Relays are kind of switch which are operated by electric. In the normal form, when ample coil current flow a coil pull into an armature. Relays for DC or AC excitation are available, and coil voltages from 5 volts up to 110 volts are popular. The electrical relay in response to control signal provides a quick on/off switching operation. A magnetic field is created as current for flows through the wire coil. The sensors plays major role in this project. And first of all we must have to know that what are sensors. We live in sensor universe. In our homes, workplaces, vehicles and smart devices, we will find various kinds of sensors. Sensor is an input device that gives an output (signal) for specific physical quantities. Sensor makes the stuff easy to use. Different kinds of sensors are- temperature sensors, pressure sensors, humidity sensors, light sensors etc.

Sensors which are used in this project are

- PIR sensors
- Arduino

### ➤ PIR sensors

PIR sensors (passive infrared sensors) are an electronic system that monitors the emission of infrared lights from objects in the field of view and can be used for motion detection within 6 metres. These sensors detect the nearest movements in specific set range, so if range is not set up then several movements will occur and sensors will find it difficult to sense. To obtain a continuous function, it obtains discrete values which are connected together.



### ➤ Arduino

Arduino is an open source, hardware and software-based electronics platform.

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Arduino boards can read inputs-light on a sensor, a finger on a button, or a Twitter message and transform it into an output –trigger a motor, a switch on an LED, and publish there are numerous projects planned for different applications using Arduino sensors. Arduino is said to be used to realise a dream concept.

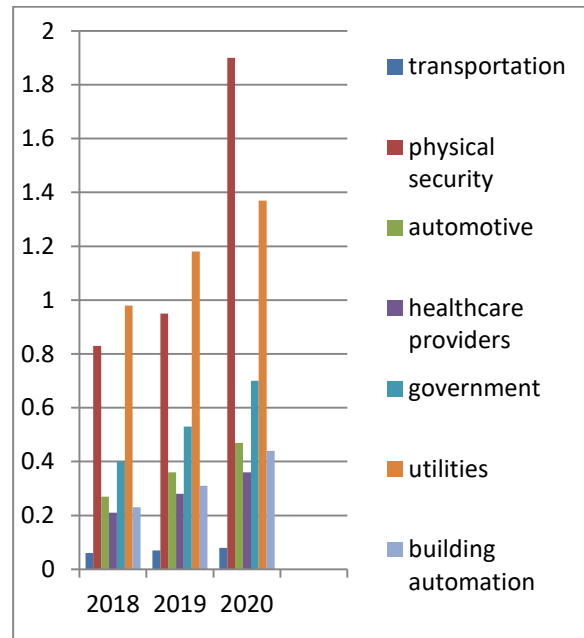
Example include: sensors for moisture and rain detection, sensors for soil moisture, sensors for microphones etc.

## II. INTERNET OF THINGS

Internet of things (IOT) is a system that is commonly connected to electronic devices, mechanical machines with unique identifier (UIDs) and is capable of transmitting data across the network without requiring contact of any type, either human or machine to machine. Generally IOT is everything which is connected to the internet. If there is no internet then it can be say that there is no IOT exist in this universe. IOT shares the data with the cloud server so that other internet-connected computing devices can get the data from the cloud server. It's possible to change anything as small as pills to as big as buildings everything can be controlled by the IOT. It has sensor devices which can be wireless sensor devices or wired sensor devices. An IOT ecosystem is composed of web-enabled smart devices that use embedded systems such as processors, sensors, and communication hardware to collect, distribute, and act on data that they acquire from their environment. IOT devices share sensor data they obtain while connecting to other edge systems of the IOT gateway where data is either sent to the cloud for analysis or analysed locally. Such devices often interact with other similar devices, and act on the information they obtain from each other. Much of the research is performed without human interference by the machines-for example, set them up, send them instruction or access the data. The internet of things allows people to live and work better and to take complete control of their lives. IOT is essential for business, in addition to offering smart devices to automate homes. IOT offers business a real-time look at how their process actually operate, offering insights into everything from computer efficiency to supply chain and logistics operations. IOT lets business simplify processes and reduce labour costs. This also reduces waste and increases services quality, making it less costly to produce and supply products, as well as keeping consumer purchases open. The internet of things gives companies several benefits. Many of the benefits are unique business, and others are common across various industries. Some of IOT's common benefits require undertakings to:

- 1-monitor overall business processes
- 2-save time and money
- 3-generate more revenue
- 4-integrate and adapt business models
- 5-enhance employee productivity
- 6-make better decisions
- 7-improve the customer experience

Tech analyst tells that there will be more than 40 billion connected IOT devices in the world by 2025. They also suggest that industrial and automotive equipment represent the higher no. of IOT devices.



## III. IOT APPLICATIONS

Various applications of internet of things (IOT) are.

- **Smart wearable watches**

Now a day's smart watches came into market. Those smart watches have sensor in it. Smart watches can tell the heartbeat, pulse rate of a person just by sensing the nerves. And also they are connected to smart mobile phones and phones can be operated by smart watches through the Bluetooth settings.

- **Health department**

Healthcare department are using this IOT for their medic purpose. Smart medicines are prepared which helps the patients in various diseases. Smart pills are used which have tiny micro digestible sensor in it. Which undergo the stomach gives out the report through sensors.it can be help in treating the patients.

- **Airlines**

To track the location of flights and communication medium is also become easy by the use of IOT. Many flights take off with same time and it's hard to communicate with everyone at same time but IOT makes it easy by dealing with newly technologies.

- **Buildings and home automation**

Buildings and home have all those things which human needed from windows to roof and lights, fans, lifts all are necessary for human. To make it easily useable IOT came into existent. Now everything is connected either windows or doors, home electricity and more appliances. All can be automatically operated. By using remotes doors, lights, AC's can be switched ON/OFF. WSN (Wireless Sensor Networks) operates these all smart activities. WSN is a network topology. All these activities are performed under internet. Everything which is connected to internet is IOT.

#### IV. PURPOSE

The purpose of this project is very clear to our community, and very beneficial. This initiative aims to reduce power or energy wastage in school/universities. As we all know the importance of electricity in our lives. Energy consumption is very high in colleges/schools and energy wastage ratio is also very high. So we will handle the loss of energy in universities and schools through this project. And with this power can be diverted to areas where there is a very high demand for it but its efficiency is not in the right proportion. With this project we can manage the lights and fans of classrooms automatically. When there is someone in classroom then fans and lights will be turned ON automatically otherwise it will be OFF automatically. In this project DC motor, IR sensor, photodiode plays vital role. By applying this project we make our school/ universities smart. By upgrading this project in future not only classrooms but also toilets and administration department all can become smart by this IOT technology.

#### SCOPE

This project has very wide scope. Intelligent classroom with motion sensor is a major development that will certainly play a crucial role in the future. As the universities and schools ratio is rising day by day. And the consumption of energy decreases in the same ratio as well. This project is best for controlling the extra and unnecessary use of energy. Not only in universities but it also occurs in offices and houses. It only senses human behaviour and it works under certain conditions. IOT has a very high demanding scope in today's aspects. It has scope on various privacies. IOT is making things smarter like as smart homes, smart cities. In the field of medical department IOT is adopted for various medicines. It will be best used for tracking purpose. And now days smart transportation are going on likely cab services which is based on IOT's.

#### V. MERITS AND DEMERITS

##### ➤ MERITS

- Smart classroom with motion sensors enhanced the whole classroom which gives better atmosphere to the students.
- It'll help to control the whole campus power supply. By using electric fans and lights in classroom.
- It will help in reducing the no. of electric faults in classes.
- By these activities it can help in electricity bill.
- It has ability to access information from anywhere at any time on any type of device.

##### ➤ DEMERITS

- In Smart Classroom with Motion Sensors we use lots of sensors which makes classroom smart but those sensors sometime will not be able to work properly.
- Those sensors are not for high time usage. At some time they will stop working because all sensors have their time period. Which is a difficult task to change sensors at every continuous of time period.

- Sensors have their specific range on which only they can work. If activity is performed out of that range it will not detect it.
- If there is any bug in the system then all connected devices to the system will be corrupted.

#### VI. PROPOSED MODEL

This project model is composed of different sensor types. Those sensors can help to assess the activity occurring outside the classrooms. We use PIR sensor (passive infrared sensor) to locate activity outside the classroom. That gives us a 0 or 1 output. If 0 occurs means that no motion is detected or if it provide 1 means that motion is detected outside the classroom. This PIR sensor operates within 6-8 meters. In this project we are using LDR which is known as Light Based Resistor. In LDR it has resistance, it can increase or decrease based on its intensity of light in classroom. So if the weather is cloudy in the rainy season and darkness is there, the lights will be ON automatically. Whole layout on Arduino will be completed. Arduino is forum for open-source electronics. It is used by both the hardware and the software. Arduino boards that use a sensor, a finger on a switch, to read input lights. This whole project relies on the internet of things (IOT). That makes for a smarter classroom. PIR sensors sense people's movements near classroom and control the fans and lights. Occupancy controls were used and are still used. An occupancy sensor is an illumination control system that senses occupancy, numbers the people inside the room and Arduino receives the signal from it. The exact individual count will be reflected in the LCD panel. Sensors are not workable at any time, so large numbers of sensors are helpful in preventing any errors.

Circuit function is very simple and self-explanatory. That fan begins running at a very slow pace when the attached ceiling ventilator is powered up. However, if a passive infrared motion sensor senses a legitimate human movement, the circuit wakes up from its standby mode, and switches the fan for a finite time to its full rpm. Photodiode is attached to the circuit. It can helps in switching the lights ON/OFF. It checks out the intensity of light in classroom.

#### SYSTEM DESIGN

The sensors used in this project are

##### • IR SENSOR

The IR Sensor senses infrared light, used to turn on/off lights. An IR sensor shows that the object is reflecting through a light sensor. The darker the colors of the surface, the surface, the less of an IR light reflected. The lighter the color of an object, the more the IR light reflected.



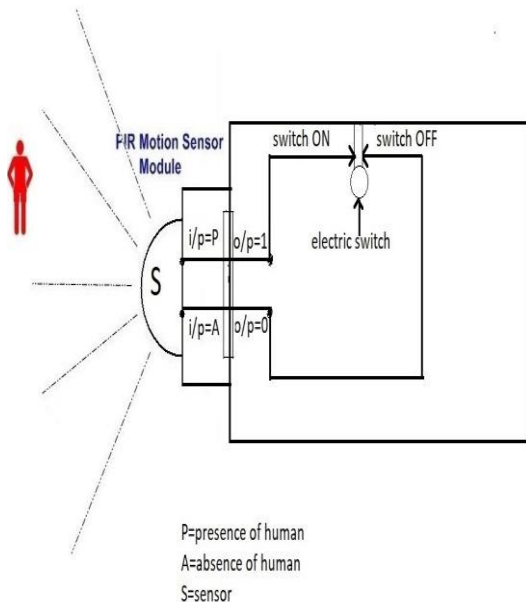
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- **LDR SENSOR**

The Resister theory based on LDR-light is that the resistance of a photo resistor decreases with an increase in incident light intensity and helps monitor the light intensity present in the environment.

- **ARDUINO**

The board of Microcontroller is Arduino Uno. It has 14 digit input/output pins, 6 analog inputs, 16MHz quartz oscillation crystal, a USB port, a power jack, an ICSP header and a reset key.



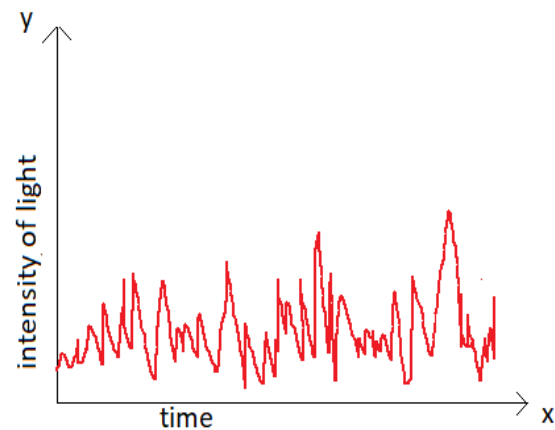
### VII. ALGORITHM:

- 1-Sensors are connected with Arduino
- 2-Detects presence of human
- 3-In range of 6-8 meters
- 4-sensors give output 0 or 1
- 5-i/p= presence of human
- 6-o/p=1
- 7-i/p=absence of human
- 8-0/p=0
- 9-0/p=1, sensors activated
- 10-arduino switches ON lights and fan
- 11-o/p=0, switches OFF
- 12-photodiode in circuit
- 13-check intensity of light
- 14-less intensity, lights ON
- 15-high intensity, lights OFF

### VIII. IMPLEMENTATION DETAIL

An Arduino initially relates to the IR sensor which helps to detect the presence of an object. The LED mounted on the 13-pin Arduino which is a digital pin. The A1 analog pin is connected onto a DC motor. In the IR sensor we have 3 pins; one is the digital output pin where the remaining pins are ground and one is VCC. The power that we supply to the

IR sensor is 5v, so we attached VCC to the Arduino 5v slot. The following configuration works when an object is present in front of the IR sensor. When an object is detected within the IR range, both the LED and the Dc motor turn on. If no object is present on the IR sensor range then LED and DC motor is turned OFF. When object is in the IR sensor range, the Arduino switches the LED and DC motor on. We also added a photodiode to obtain the luminous power. The idea of photodiodes to make sure the room is dark. We may get enough light in certain situations that the person in that room need, so they don't have to turn on the light and even the atmosphere may be cool and they don't have to turn ON the fan. To satisfy this condition we perfect photodiode that gathers the light intensity and more can reduce the overall cost of the product over photodiode. We continued our project by connecting the photodiode to Arduino, which helps us get the required output that meets the condition that is satisfied.



As in above fig. it is shown that intensity of light is increasing and decreasing at different time. At Some time intensity is increasing and sometime it decreasing.

### IX. DATA GENERATION

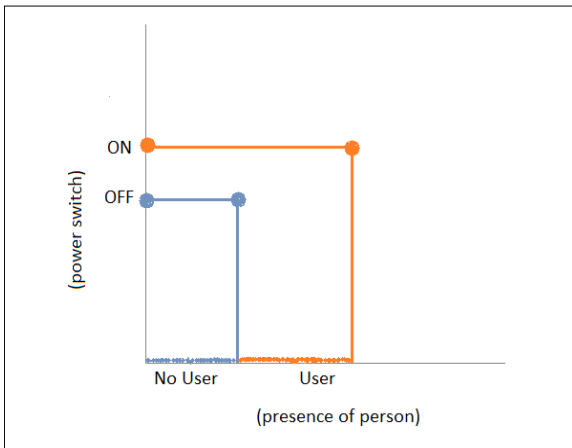
It produces two outputs one from photodiode and other from IR sensor. IR sensor gives digital output such as HIGH or LOW and analog output is provided by photodiode. IR sensor is of high value if it detects the presence of humans in classroom and if it does not detect the presence of human in classroom it gives low value. Photodiode collects the light intensity present in the classroom and will turn OFF/ON the lights, fans in the classroom according to the algorithm. Let's assume the minimum intensity of light in classroom is 340.

INTENSITY	IR READINGS	LED	FAN
<340	HIGH	ON	ON
<340	LOW	OFF	OFF
>340	HIGH	OFF	ON
>340	LOW	OFF	OFF

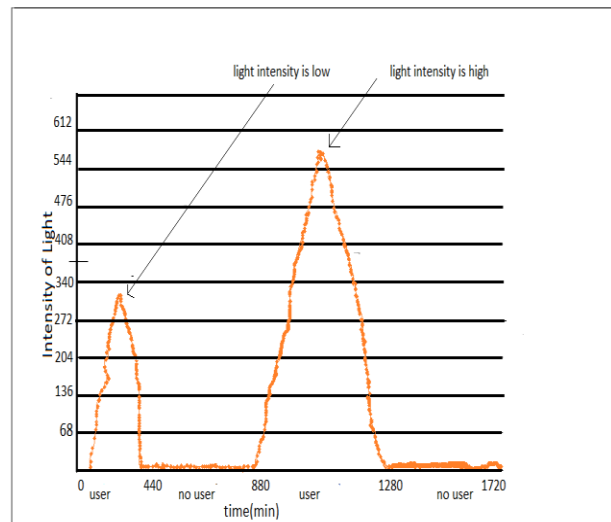
We have LED and FAN condition in the table above, based on the intensity and IR sensor readings. If the intensity is HIGH and a person enters the room, which means that the IR value is HIGH enough that the lights stay OFF and the fans are switched ON, the lights stay OFF so there is enough light in the classroom to help us retain electricity.

### X. RESULT

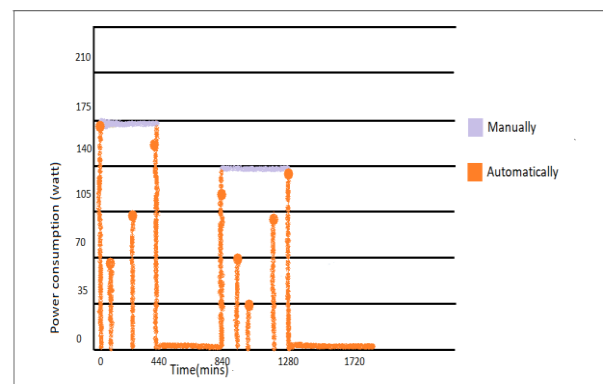
In this project we have worked for automatic power supply control in classroom with the help of sensors. Let's see the experimental activity based on sensors.



In the above fig. it's shown that presence of person in classroom with the power supply to in the classroom. As shown in fig if presence of person is detected in the classroom then power supply is switched ON as seen in result orange bar line is representing presence of person in classroom and power switch is ON. And in blue bar line result shows that no one is present in classroom and power supply is turned OFF. This process is worked on the basis of sensors, which are attached in classroom to detect the presence of person in classroom. So accordingly that power supply is given to classroom.



In above fig. it is shown that when user is present in class then intensity of light is working and if there is no one present in classroom then light intensity is constant to zero means there is no intensity of light in classroom. Intensity of light in classroom is representing two graph lines. One is showing less intensity of light in class which means LED is automatically on user is in classroom. And in other its showing high intensity which means already there is proper light available in classroom, so no need of LED light to be ON. That's why LED bulb is OFF. As in data generation is given that if intensity is less than 340 then LED lights will be ON. And when intensity is higher than 340 then LED lights will be OFF. In this fig it's shown same. In different time period result is calculated. Between 0 to 440 min presence of human is detected in classroom, between 440 min to 880 min no one is present in classroom so graph is constant to 0, and then again between 880 min to 1280 min presence of human detected and graph accelerated, and after that 1280 min class is empty no one is present there so power supply is OFF which means graph = 0.



In above fig. it's showing the power consumption of electricity. As shown that operation is done by manually and automatically. In the case of automatically, PIR sensor and LDR helps in operating the electricity automatically and these activities are performed in different time duration.

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This operation of automatically switching ON/OFF power supply helps a lot in reducing wastage of electrical supply. When no one is present in classroom then automatically power supply will be OFF as shown in above fig. line is constant to Zero wherever there are absence of person in classroom.

## XI. CONCLUSION

In this project we are referring immediately to the power wastage in classrooms. The information derived from our estimation will make several variable social good applications such as the efficient use of the available power and we find our project to be a contribution to the creation of smart cities. Thus we fix the issue by setting up a smart class space. By taking note of the details above, we conclude that these methods can also be implemented at institute level, college level. In this project different sensors are used and this whole concept is based on IOT. In this project we worked on how to control the wastage of electric supply. By making the classroom smart. Sensors are used to track the presence of human in classroom and accordingly that operates the power supply. Photodiode is used to control and work on Intensity of light in classroom. Apart that PIR sensor and Arduino are used in this project in making the classroom smarter.

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## AUTHORS PROFILE



**ANURAG YADAV**, is Btech student in Department of Computer Science & engineering, Galgotias University, Greater Noida, U.P. currently in the 8th semester of Btech, 2020.



**N.GAYATHRI**, received her B. Tech as well as M. Tech. degree in Computer Science and Engineering from Anna University Chennai, India. Currently, she is working as an Assistant Professor in School of Computing Science and Engineering. She has published reputed 12 (SCI journals & Scopus indexed journals), and also presented paper in National/International Conferences, published book chapters in CRC Press, IGI global, Springer, Elsevier and also have edited books in Wiley and CRC press. She has six Indian patents. She is a guest editor for Recent Patents on Computer Science.