SMART POWER SAVING USING RASPBERRY PI

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Abstract: - This system can be useful for taking a step toward a modern lifestyle, whenever there is an occupancy in the room the lights using raspberry pi turns on and turns off in case of no occupancy, using this system in our daily life situations the electricity can be saved wastage and unwanted illuminance can be reduced, In our day to day life the electrical wastage is more and to reduce the more consumption this system is used for automation, we can also measure light intensity of surroundings using raspberry pi using different light scenarios.

Keywords: Automation, Raspberry Pi, light intensity, modern.

I. INTRODUCTION

Lighting is an essential element of construction. Lights enhance the aesthetics of indoor regions and reduce power costs. Achieving the advantages requires combining natural and artificial mild reasserts early within the development format process. Lighting controls facilitate addressing power conservation, provide customers more desire, and make lighting fixtures devices more flexible. The most, common region lighting fixtures method nowadays is the on/off transfer Artificial lighting fixtures constitute a top factor of power consumption, accounting for an important factor of all power consumed worldwide. Raspberry Pi is more straightforward to apply than the usage of microcontrollers and raspberry must be coded with the usage of python.

II. NEED OF SYSTEM

Electricity is becoming extra luxurious while its consumption is getting massive. To reduce electric-powered consumption in enterprise corporation construction, we need effective lights device. Artificial lights make contributions severely to electric electricity consumption worldwide. People always forget to reveal off the moderate in their house once they go out so the room is lit no matter the reality that there may be no need for it. People always neglect to replace the lighting fixtures whilst now no longer vital these reasons a massive electric powered wastage, raspberry is used on this paper to transfer on/off lighting fixtures the usage of respective sensors. So, we need a realistic lights device, that makes use of the day lights of the room and shuts off while no individual is in.

III. LITERATURE SURVEY

3.1 Automatic Light Control System:

This was completed in 2009 by Mohd Amir Hamzah. His project is predicated on by comparing the encircling light-weight and also the intensity within the space to work out whether or not to modify the light or not. The paper encountered some problems such as the system operating for a limited time because the component heats up pretty fast when the system is turned on but overall[1].

3.2 Intelligent Lighting System for Commercial Building:

This was done by Sukor Bin Muhammad in 2009. He only focused on employing an occupancy sensor and a photosensor to turn on and off the lights in his intelligent lighting system. He also proposes that an intelligent lighting system be completed with a dimming circuit[4].

3.3 Lighting Control System for the Home:

In 2009, Goh Lin Chian completed this task. Based on the project title Itself, this project used an automation concept to control the lights in the house. The system used a motion detector to detect passers-by in the area to turn on and off the lights automatically. He also designed a graphic user interface (GUI) to control the

lights from personal computers and also used a local area network (LAN) to interconnect other computers in any part of the house[8].

IV. DESCRIPTION OF HARDWARE IMPLEMENTATION

4.1 PIR SENSOR:

PIR means passive infrared which detects human movement. A Fresnel lens, an infrared detector, and a motion sensor make up this motion sensor, supporting detection circuitry. Any infrared radiation present on the sensor is focused spherically in the direction of the infrared detector by the lens on the sensor.

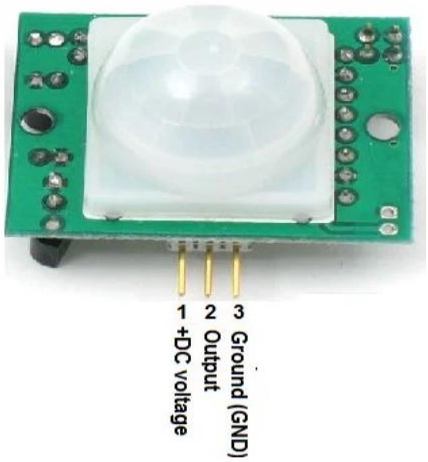

Fig 4.1.1: PIR Sensor

Our bodies produce infrared heated temperatures, which can be detected with the help of a motion sensor. As soon as the sensor senses the presence of a person, it sends out a 5 volt signal for one minute. It has a detection range of around 6 to 7 metres and is quite sensitive.

Fig 4.1.2: PIR knobs

When the Passive Infrared Radiation Motion Sensor detects a person, it sends a 5 volt signal

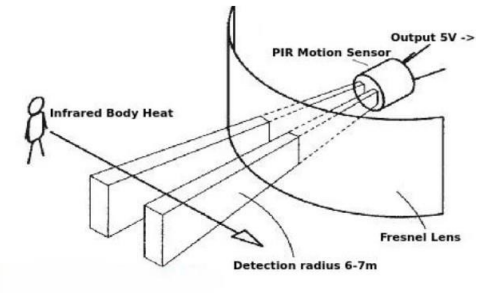

Fig 4.1.3: PIR Human Detection

to the Raspberry Pi's GPIO, and we use Python to define what the Raspberry Pi should do when it detects an intruder.

4.2 RASPBERRY PI PICO:

The Raspberry Pi is a low-cost notebook that connects to a laptop display or television and uses a standard keyboard and mouse. It's a successful small tool that allows people of all ages to learn about computing and programming languages like Scratch and Python. It can perform all of the tasks that a computer laptop can, including accessing the internet and watching high-definition video for spreadsheets, word processing, and casino games. To govern electronics applications, it is used in open-source with the appropriate coding. Each pin on the Raspberry Pi is labelled according to its order (1,2,3,...) as seen in the diagram.

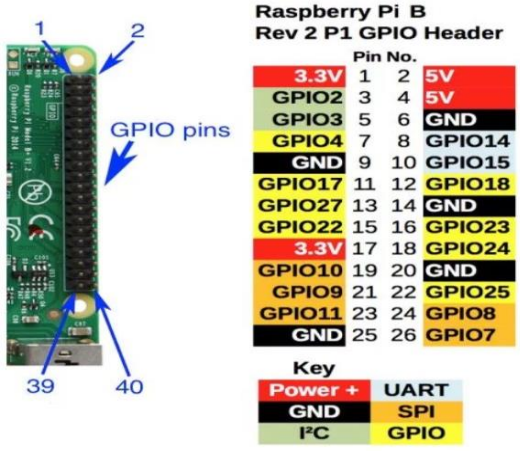

Fig 4.2.1: Raspberry Pi Pins

4.3 LED:

When current is passed via a light-emitting diode, it creates light. The semiconductor's electrons recombine with electron holes to create photons, which have energy released. The colour of the light depends on the amount of energy required for electrons to cross the semiconductor's band gap. White light is produced by a combination of semiconductors or a light-emitting phosphor coating on a semiconductor device.

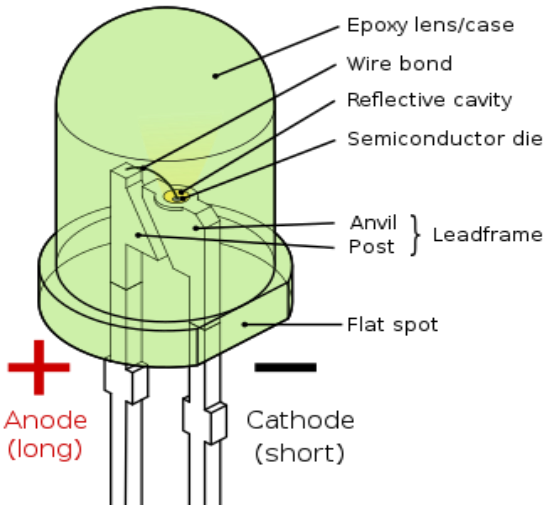

Fig 4.3.1: LED

The energy needed for electrons to pass the semiconductor's band gap determines the colour of the light.

V. BLOCK DIAGRAM

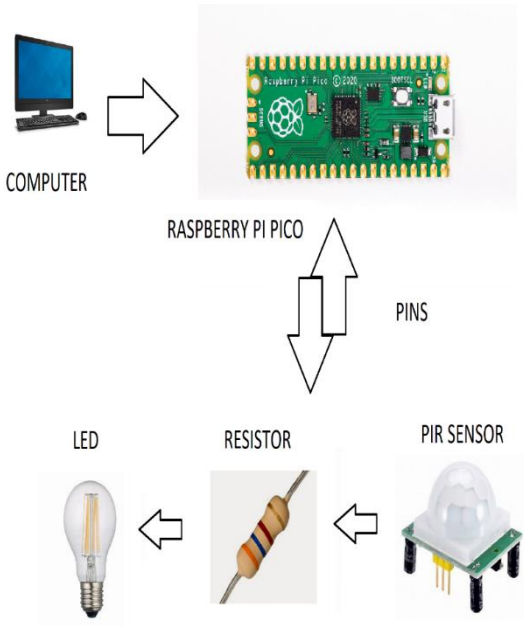

Fig 5.1: Automation of light by a motion sensor and Raspberry

The raspberry pi is connected to the computer to implement the code and the raspberry pi is connected to the PIR sensor to identify the radiations which results in the automation of lights or fans.

VI. INTERFACE WITH PIR SENSOR

When we place our palm over the sensor, we can see that this system prints Intruder detected. We can fix the delay at which the sensor emits a HIGH signal without sacrificing the accuracy of certain PIR motion sensors by turning the two screws on the sensor counter clockwise with a screwdriver. The PIR sensor, resistor, and led are all connected to the Raspberry Pi, and the code is developed to turn the led light on or off as needed.

The file “raspberrypi.py” is implemented in which the infinite loop takes the input from the respective pins until true since the sensor sends the data continuously checks if the output of the sensor is low, and prints no radiations of

humans since it is placed in an infinite loop if there is no detection continuous no detection will be displayed, on the other hand, if the output of motion sensor is high then LED is turned on respectively as in infinite loop the code will be continuous.

VII. MEASURE LIGHT INTENSITY

Additionally, to measure light intensity LDR is used and the respective illuminance is shown with the help of raspberry and resistor. Respective python code is given for measuring light intensity which gives output in lux (units of luminance). The light measurements are not strictly measurements of light at all; they are measurements of the time taken for a capacitor to fill and discharge. Longer times suggest a larger resistance (and a darker room), whereas shorter times indicate the opposite. The capacitor is connected to a light-dependent resistor.

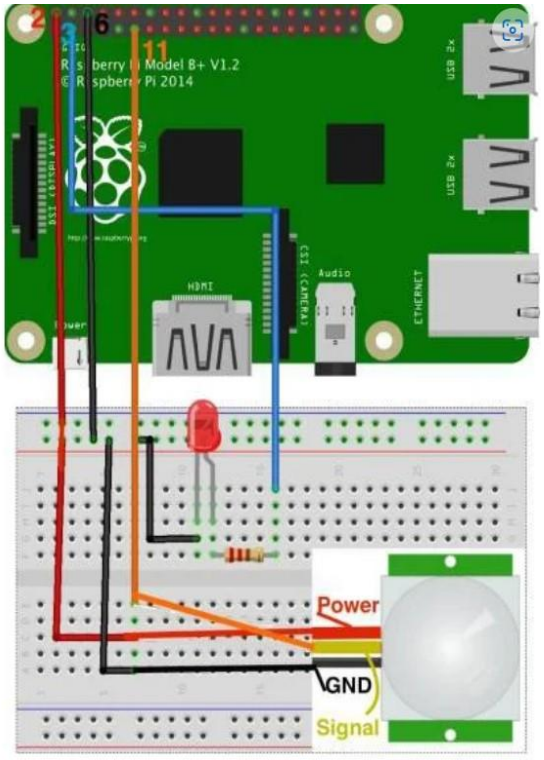

Fig 7.1: A simple setup of automation

These values should be transformed to make interpretation more intuitive. I've played with a few transformations, but my current thinking is to use the normalized inverse of the natural log:

$$y = f\left(\frac{1}{\ln x}\right)$$

Where f is the normalization function:

$$f(x) = \frac{x - \max x}{\max x - \min x}$$

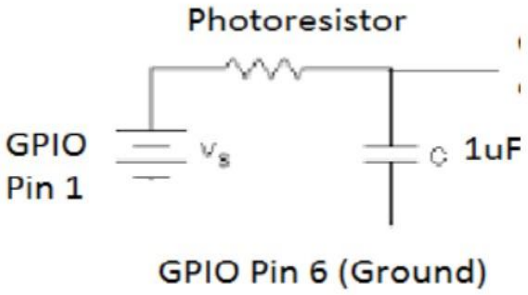

Fig 7.2: Photoresistor circuit for LUX

This transformation has three benefits:

- It reverses the values, so that high numbers relate to more light, which is more intuitive.
- It reduces the distinction between low and high values, making patterns easier to discern, and reducing the impact of outliers.
- It sets the light values on a scale of 0 to 1, with 0 being most dark, and 1 being most light (across the whole year).

The photoresistor's resistance must be measured. The Raspberry Pi serves as the battery, with the photoresistor receiving 3.3 V from GPIO pin 1. Make pin 12 of the GPIO a bidirectional pin (input and output pin). The capacitor will take some time to charge to a voltage that reads as high. The negative side of the capacitor is linked to GPIO pin 6, which is grounded (short end). Calculate the resistance of the photocell by measuring how long it takes for the input pin to get high.

A capacitor is a type of electrical component that can temporarily store electrical energy. It is characterised by capacitance and measured in Farads. The capacitor is made up of two conductors that can keep an electric charge until

it is fully charged, at which point it begins to discharge. AC is generated using this type of alternative behaviour. When the switch is pressed, current begins to flow and the capacitor begins to charge. When the voltage at the capacitor's end approaches the voltage of the battery, the capacitor stops charging. There is no current flow in the upper portion of the circuit because there is no potential difference.

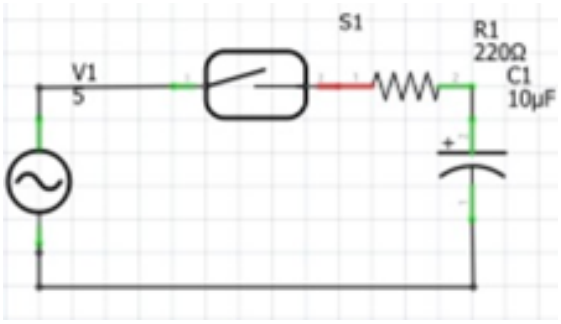

Fig 7.2: Simple Circuit for light intensity measurement

VIII. RESULTS

The above-proposed system automatically controls the lights using raspberry pi to automatically control the lights, and also measure the light intensity. The light intensity varies in presence of lights and in absence of light the illuminance differs in terms of lux (units of luminance).

WITH LIGHT:

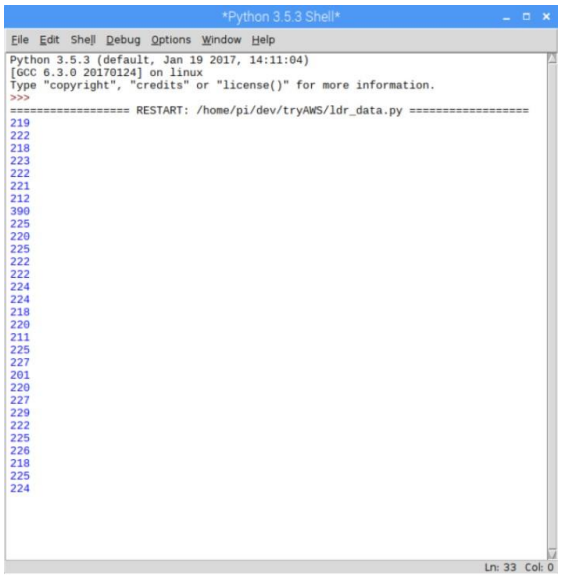

Fig 8.1: LUX with light

WITHOUT LIGHT:

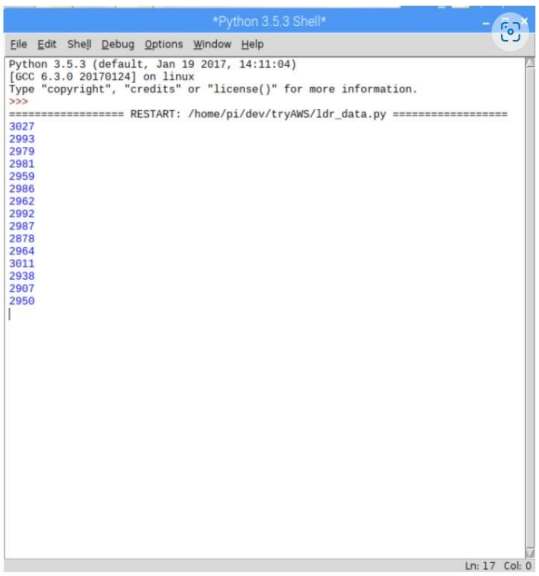

Fig 8.2: LUX without light

The lux(luminance) is more than 2890 LUX when there is no light. Using a Raspberry Pico and appropriate resistors, the LDR or photocell detects the intensity. As demonstrated in the diagrams above, the lux ranges from 200 to 300 LUX.

IX. CONCLUSIONS

In this paper, a smart power-saving system using Raspberry Pi is implemented. The implementation involves sensors that sense when light is to be turned on or off by detection of radiation of respective sensor. With this system, the manual assistance is reduced by switching off the lights and appliances when not needed for certain conditions, as Raspberry Pi is flexible and easy to use future scope is admirable, because wastage is on the rise in India, and this method is simple to set up and operate. The future scope of this system is huge since the use of microcontrollers is tough which includes various difficult wire connections but our system has a great platform to deploy controlling appliances automatically.

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