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Automated Street Light Controlling System

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Abstract - *An Internet of Things has taken the world by storm since its conception. The idea of connecting everything by wireless technology sums up IoT. We can connect anything using the sensor designed specifically for objects. Automated Street Lighting System will automatically switch the street light ON and OFF based on the amount of sunlight present using the LDR sensor and ADC module. By this technique power wastage will get reduced.*

Key Words: LDR sensor, ADC (MCP3008) module, LED's, Raspberry Pi.

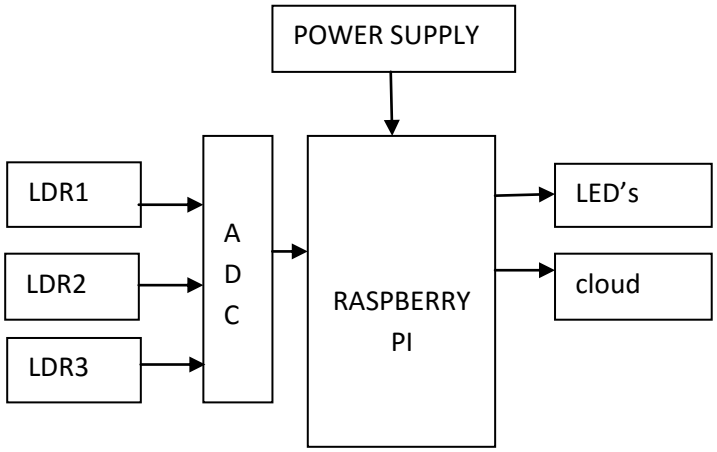
1.INTRODUCTION

Street lighting provides a number of important benefits. It is used to promote security and to increase the quality of life by artificially extending the hours in which it is light so that activity can take place. Street lights also improves safety of drivers, pedestrians. But due to busy life style of humans, switching operations are not carried not on time and a huge amount of electricity is being wasted. As lighting can account 10-38% of total energy bill in typical cities worldwide. Also the accident rate is also increasing. Our project aims to overcome these situations by automatic street light controlling system. Automatic Street Light controlling system is a simple and powerful concept, which uses the LDR sensor to sense the amount of sunlight in the environment. With the help of these LDR values street lights switching ON/OFF will be done automatically. It automatically switches ON the light when the sunlight goes below the visible region of our eyes. It automatically switches OFF the light under illumination by sunlight. Initially operation of street lights was done manually. This caused to wastage of energy, as the street lights were not switched OFF even when there is ample of sunlight and not turned On even when sun sets. Later on timer circuits came into existence. Even these did not provide the solution, as due to the seasonal changes the switching of street lights are not carried out properly.

1.1 SYSTEM OVERVIEW

The project consists of four major components;

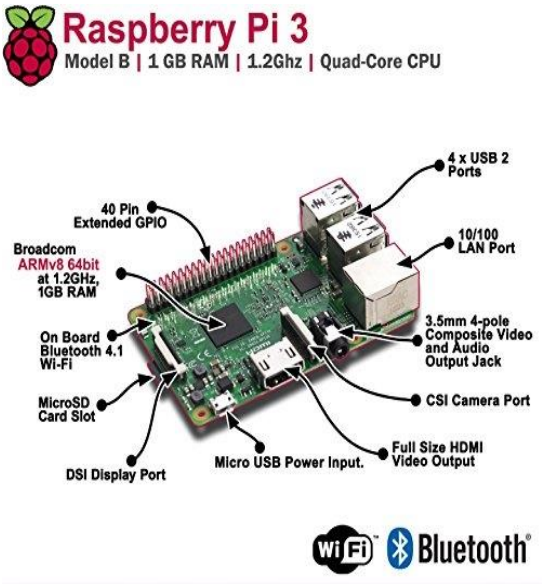
Raspberry Pi, LDR Sensor, ADC module, LED's . The block diagram is shown below:



Block Diagram

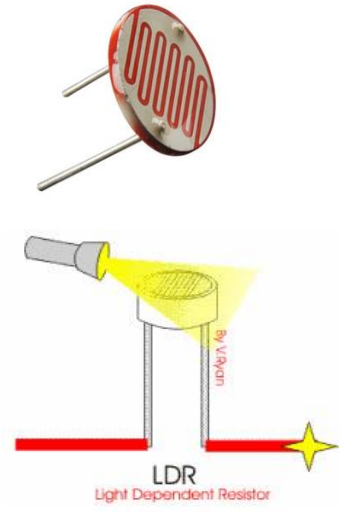
a) Raspberry Pi:

The Raspberry Pi is a series of small single-board computers. It is the main element in the field of internet of things. It provides access to internet and hence the connection of automation system with remote location controlling device becomes possible. Raspberry Pi is available in various versions. Here in our project we are using Raspberry Pi 3 model B. It has quad-core ARM Cortex-A53 CPU of 900 MHz, and RAM of 1 GB. It also has 40 GPIO pins, FULL HDMI port, 4 USB ports, Ethernet port, 3.5mm audio jack, video camera interface (CSI), the Display interface (DSI), and Micro SD card slot.



b) LDR Sensor:

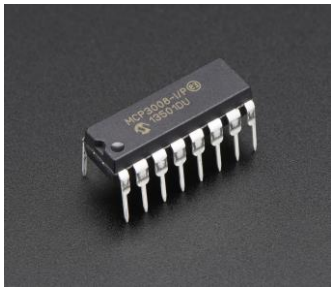
LDR is device whose sensitivity depends upon the intensity of light falling on it. When the light falling on LDR increases the LDR resistance decreases, while the light falling on LDR decreases resistance will increases. In the time of darkness, the resistance of LDR is in the range of mega ohms, while in the presence of light it decreases by few hundred ohms.



c) ADC module:

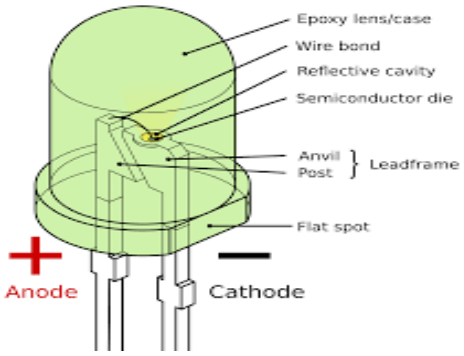
As Raspberry Pi does not contain any analog pins, we have to interface Analog to Digital Converter (ADC) with Raspberry Pi. The MCP3008 is a low cost 8-channel 10 bit analog to digital converter. The precision of this ADC is similar to that of an Arduino Uno. ADC combines high performance and low power consumption in a small package, making it ideal for embedded control applications. The MCP3008 features a successive approximation register (SAR) architecture and an industry-standard SPI serial interface, allowing 10-bit ADC capability to be added to any PIC microcontroller. The MCP3008 features 200k samples/second, 8 input channels, low power consumption, and is available in 16-pin PDIP and SOIC packages.

Applications for the MCP3008 include data acquisition, instrumentation and measurement, multi-channel data loggers, motor control, robotics, industrial automation, smart sensors and home medical appliances.



d) LED:

In this system LED's are used as street lights. A light-emitting diode is a two lead semiconductor light source. It is a p-n junction diode that emits light when activated. The color of the light is determined by the energy band gap of the semiconductor.



SOFTWARE USED

a) Python:

Python is an interpreted high-level programming language. Python has a design philosophy that emphasizes code readability, and a syntax that allows programmers to express concepts in fewer lines of code, notably using significant white space. Python features a dynamic system and automatic memory management.

b) ThingSpeak:

ThingSpeak is an open source Internet of Things application and API to store and retrieve data from things using the HTTP protocol over the internet or via a LAN. ThingSpeak enables the creation of sensor logging applications, location tracking applications. MAT Lab supports for ThingSpeak. ThingSpeak has close relationship with Mathworks.

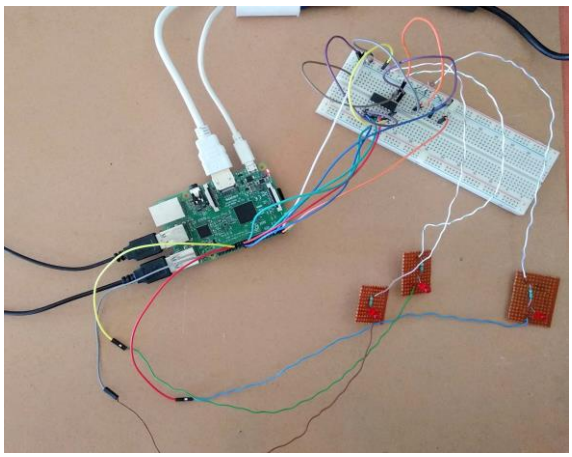
2.Graph Plots: The outputs of LED's are shown below

Chart1: Street 1

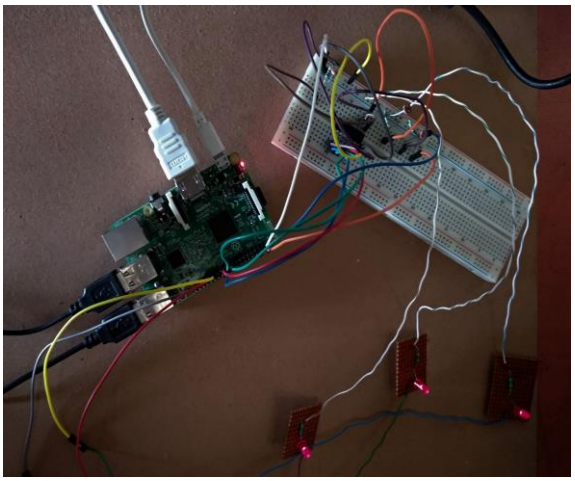
Chart2:Street2

Chart3:Street3

The LDR sensor is connected to ADC module. The digital output of ADC is given to Raspberry PI and power supply is given. The raspberry pi reads the values from LDR sensor and switch on/off the led's. If ample of light is present in the environment, means if ADC values reach threshold value then LED's will switched OFF automatically and if it is dark, means ADC values are below the threshold level then LED's will switch ON automatically through raspberry pi. This information is posted to the cloud server.



LED's OFF



LED's ON

3. CONCLUSIONS

The sensors and ADC module are successfully interfaced with raspberry pi and wireless communication is achieved. All observations and experimental tests prove that this project is a complete solution to eliminate man power and wastage of power.

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