Automatic Street Light Control and Fault Detection Using Node-MCU

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ABSTRACT

Objective of the project is to provide automatic control and fault detection on street lamps. The lighting system which targets the energy and automatic operation on economical affordable for the streets and immediate information response about the street lamp fault. Moreover, errors which occur due to manual operation can also eliminate. The street light switched ON/OFF through an Internet of Things (IOT). The street light system is checking the weather for street lamp ON/OFF condition. The weather is noted through an LDR sensor, If the weather is bright , the system will OFF. If the weather is dark, the light system will ON. After the light ON the light condition also check through LDR sensor for glow or not glow status. If light is not glowing, the sensor sends the value to street light system. The street light system will generate message and send SMS to ward member and ward serviceman mobile number.

Keywords : NODE-MCU, LDR,LM-324, LM-358,Relay Module, IFTTT Maker(website).

I. INTRODUCTION

A street lighting system which is designed well should allow users to travel at night with good visibility in the sense of safety and comfort. The system enhance the appearance of the neighborhood reduces the accident during late night. On the other hand, poorly designed existing lighting systems can lead to poor visibility which may not be helpful for any footer and who are passing by that street. According to global grid electricity consumption for lighting was about 2650 TW in 2005, which was an equivalent of 19% of total global electricity consumption. The building dedicate about 50% of their electricity for lighting, whereas the share of electricity for lighting is around 20-30% in hospitals, 10-15% in schools,10% in residential building and 15%

in factories. Automatic smart lighting control system is a perfect solution especially in public lighting management. It realizes on/off and intensity control of lights, which save energy by 40%, save lights maintenance costs by 50%, and prolong lamp life by 25%.
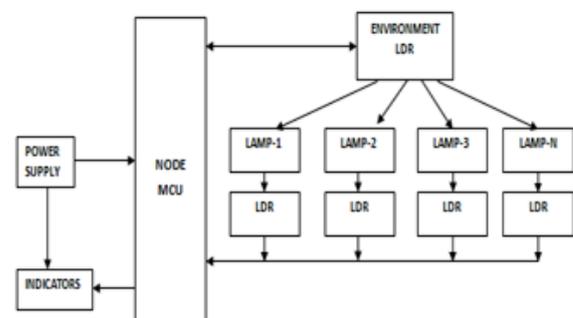

Fig.1: Block Diagram

II. DESCRIPTION

We have several parts in this system to explain. We can look at them one by one. Firstly, we take

A. NODE-MCU:

NodeMCU is an open source IOT platform. It includes firmware which runs on the ESP8266 Wi-Fi So C from Espress if Systems, and hardware which is based on theESP-12f module .The term "NodeMCU" by default refers to the firmware rather than the dev kits. Nodemcu pin out is having labels D0 to D8 and RX-TX but when programming it using Arduino IDE we observe that its labels are not matching with IO connections. Lets see actual connections of NodeMCU with ESP8266 i.e. ESP-12f.

B. ESP12F MODULE:

ESP-12F Wi-Fi module is developed by Aithinker Team. core processor ESP8266 in smaller sizes of the module encapsulates Ten silica L106 integrates industry-leading ultra low power 32-bitMCU micro, with the 16-bit short mode, Clock speed support 80 MHz, 160 MHz, supports the RTOS, integrated Wi-Fi MAC/BB/RF/PA/LNA, on-board antenna. The module supports standard IEEE802.11 b/g/n agreement, complete TCP/IP protocol stack. Users can use the add modules to an existing device networking, or building separate network controller.ESP8266 is high integration wireless SOCs, designed for space and power constrained mobile platform designers. It provides unsurpassed ability to embed Wi-Fi capabilities within other systems, or to function as a standalone application, with the lowest cost, and minimal space requirement.ESP8266EX offers a complete and self-contained Wi-Fi networking solution; it can be used to host the application or to off load Wi-Fi networking functions from another application processor. When ESP8266EX hosts the application, it boots up directly from an external flash. It has integrated cache to improve the

performance of the system in such applications. Alternately, serving as a Wi-Fi adapter, wireless internet access can be added to any micro controller based design with simple connectivity (SPI/SDIO or I2C/UART interface).ESP8266EX is among the most integrated Wi-Fi chip in the industry; it integrates the antenna switches, RF balun, power amplifier, low noise receive amplifier, filters, power management modules, it requires minimal external circuitry, and the entire solution, including front-end module, is designed to occupy minimal PCB area.ESP8266EX also integrates an enhanced version of Tensilica's L106 Diamond series 32-bit processor, with on-chip SRAM, besides the Wi-Fi functionalities. ESP8266EX is often integrated with external sensors and other application specific devices through its GPIOs, codes for such applications are provided.
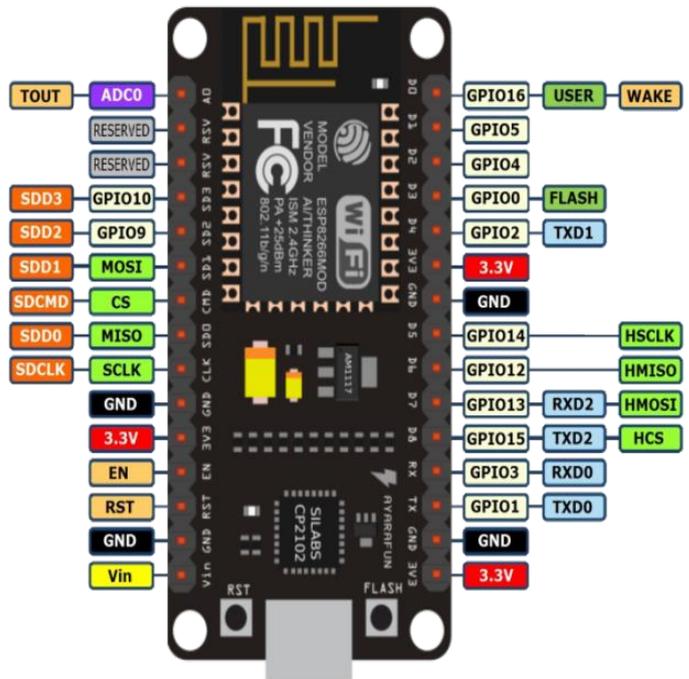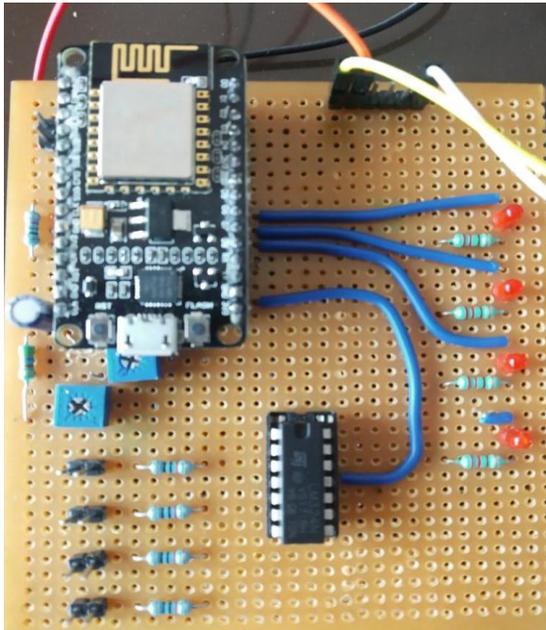

Fig.2:Pin Diagram of NODE-MCU

Fig.3 NODE-MCU

C.LDR:

A **light dependent resistor** works on the principle of photo conductivity. Photo conductivity is an optical phenomenon in which the materials conductivity is increased when light is absorbed by the material. When light falls i.e. when the photons fall on the device, the electrons in the valence band of the semiconductor material are excited to the conduction band. These photons in the incident light should have energy greater than the band gap of the semiconductor material to make the electrons jump from the valence band to the conduction band. Hence when light having enough energy strikes on the device, more and more electrons are excited to the conduction band which results in large number of charge carriers. The result of this process is more and more current starts flowing through the device when the circuit is closed and hence it is said that the resistance of the device has been decreased. This is the most common **working principle of LDR**
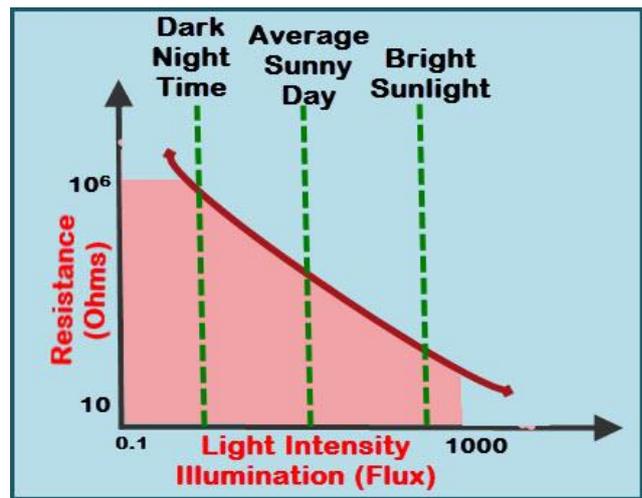

Fig.4: Light Dependent Resistor (LDR)

Fig.5 characteristics of LDR

E. LM- 324:

LM324 is a 14pin IC consisting of four independent operational amplifiers (op-amps) compensated in a single package. Op-amps are high gain electronic voltage amplifier with differential input and, usually, a single-ended output. The output voltage is many times higher than the voltage difference between input terminals of an op-amp. These op-amps are operated by a single power supply LM-324 and need for a dual supply is eliminated. They can be used as amplifiers, comparators, oscillators, rectifiers etc. The conventional op-amp applications can be more easily implemented with LM324.
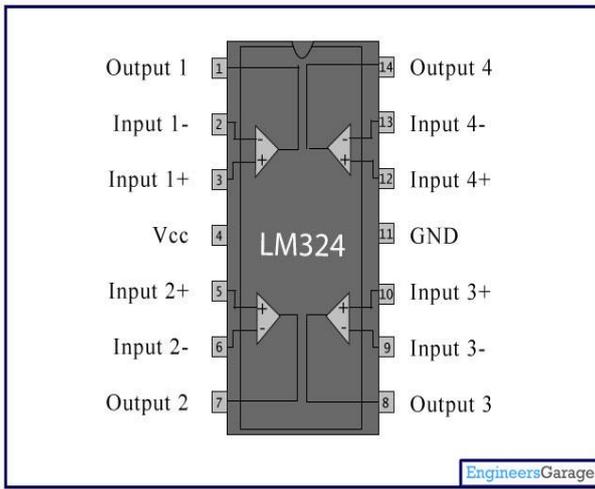
Fig.6: Pin Diagram of LM-324

F.LM-358:

The LM358 is a low power dual operational amplifier integrated circuit originally introduced by National Semiconductor. It is used in detector circuits. The abbreviation LM358 indicates an 8-pin integrated circuit, comprising two operational amplifiers a low power. The LM358 is designed for general use as amplifiers, high-pass filters, low band pass filters, and analog adders.
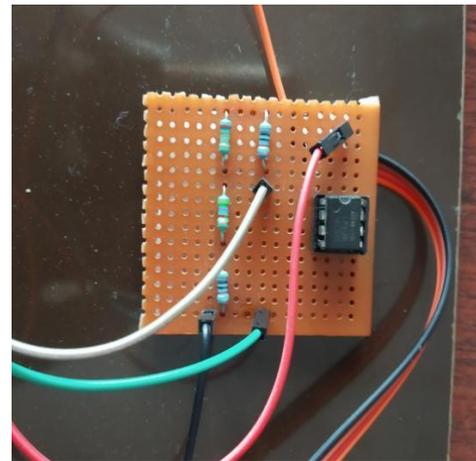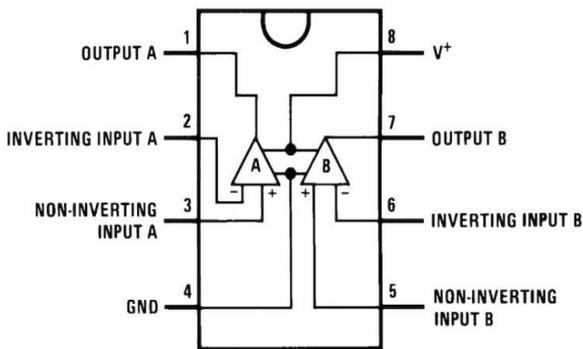

Fig.7: Pin Diagram of LM-358

G. RELAY MODULE:

A relay is an electromagnetic switch. It is activated when a small current of some micro-ampere is applied to it. Normally a relay is used in a circuit as a type of switch, automatic switch. There are different types of relays and they operate at different voltages. When a circuit is built the voltage that will trigger it has to be considered. In this system the relay circuit is used to turn the appliances ON/OFF. The high/low signal is supplied from the Node-MCU microcontroller. When a low voltage is given to the relay of an appliance it is turned off and when a high voltage is given it is turned on. The relay circuit to drive four appliances in the Home automation system is shown below in figure. The number of appliances can be modified according to the user's requirements.
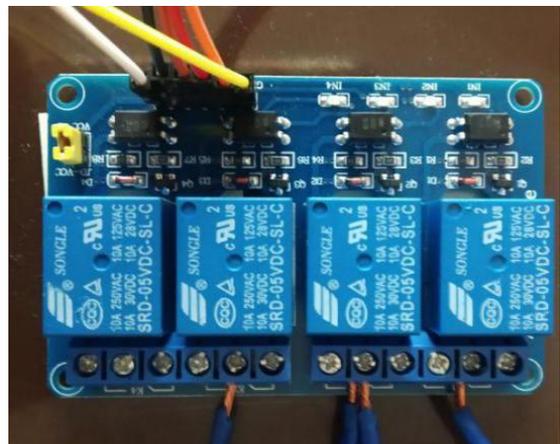

Fig.8: 4-Channel Relay Module

III. RESULT

IFTTT(WEBSITE): If This Then That, also known as IFTTT. It is a free web-based service to create chains of simple conditional statements, called applets. An applet is triggered by changes that occur within other web services such as Email, Face book.

Now, we should upload the program which was written in "**ARDUINO SOFTWARE**" to the node-mcu by using an "**DATA CABLE**". Now if any light gets effected or not worked the output get will be an SMS to the registered mobile number. The sms is as follows,
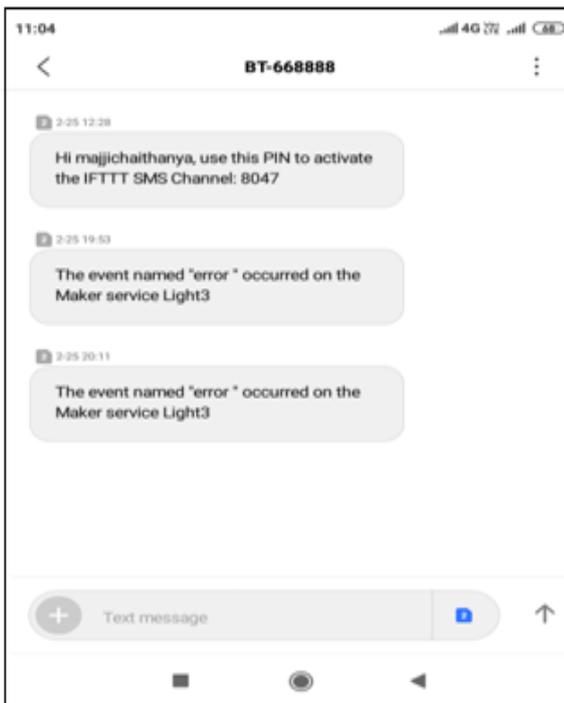
Fig.9: SMS output

IV. CONCLUSION

The street light system is checking the weather for street lamp ON/OFF condition. The weather is noted through an LDR sensor, If the weather is bright, the system will OFF. If the weather is dark, the light system will ON. After the light ON the light condition also check through LDR sensor for glow or not glow status. If light is not glowing, the sensor sends the value to street light system. The street light

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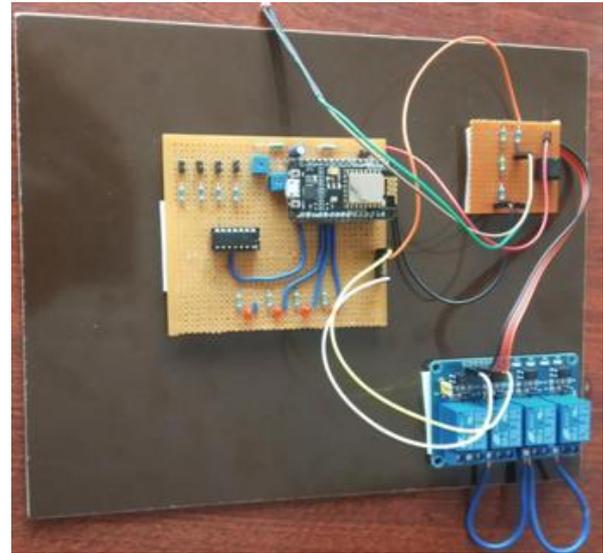

Fig.10: outlook of our project

V. ACKNOWLEDGMENT

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