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Cloud Storage Based IOT Control Automatic Street Light Activation System

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ABSTRACT: Energy conservation is an important aspect in developing countries. It is important to use the energy produced for the country in a very sustainable and responsible way. This project proposes an efficient system for the conservation of energy in a street lighting system. It is an automatic system that controls the usage of the street lights according to the light present in the environment around it. It also incorporates the concept of Internet of Things (IOT) to help in the data analysis of energy consumed for street lighting system. This data can be accessed from anywhere and produces a lot of scope for further development of the system.

KEYWORDS: IOT, Aurdino, ESP8266 & Sensors.

I. INTRODUCTION

We need to be careful with the usage of electricity. It's important to use energy resources in a sustainable and responsible way. The main source of electricity in India is produced in thermal power plants. When excess energy is produced in these stations, the amount of pollution created also increases. Therefore reducing the amount of energy consumed by street lighting by replacing it with a more efficient system definitively has it's benefits. The proposed automatic street lighting system is a system that controls the street lights depending on the amount of natural light present in its surrounding. If the intensity of light present in the surrounding is enough have a clear vision of the road, the street lights automatically turn off. Similarly, when the intensity of light decreases, for example: after sunset, the system automatically turns on the street lights..

II. RELATED WORK

When the street lighting system is operated manually, at times there is a huge loss of energy due to human error. This system prevents that very loss. Hence it is more efficient and environment friendly [1-6].

The automatic street lighting system also helps in the data analysis of the energy consumed. It sends the data used for lighting to a cloud system. This data can be accessed by anyone. Therefore by sharing this date energy consumption of street lights can be further studied an optimized [7-10].The conventional street lighting system shown in figure 1 is manually operated. This means that due to human error there is a possibility of energy loss in big amounts. It is manually switched on and left causing unnecessary usage of energy.Irregular natural light timings lead to high dependency on manual labor which furthermore increases the chances of energy wastage [11-15].

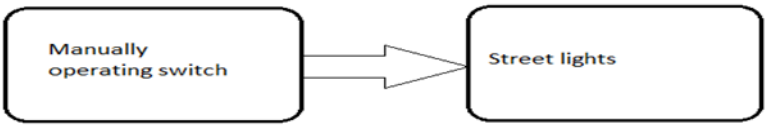

Fig.1.Block diagram of the Existing system

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III. PROPOSED SYSTEM

A. *Block Diagram:*

The proposed system shown in figure 2. The automatic street light system incorporates remote monitoring for easy control. It is a system with zero manual intervention. Weather and natural lighting are used as input parameters. It is triggered by natural lighting throughout the day [16-22]..

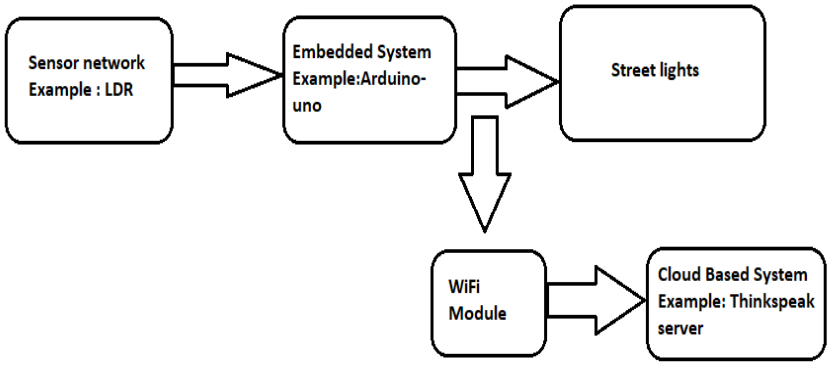

Fig.2.Block Diagram of Proposed System

B. *Components Used:*

Sensor network: Wireless Sensor Networks (WSNs) can be defined as a self-configured and infrastructure-less wireless networks to monitor physical or environmental conditions, such as temperature and light using LDR.

Embedded system, Arduino UNO raspberry pi : The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins.

WiFi Module ESP8266: The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. And structure of components is shown in figure 3.

Cloud system, ThingSpeak server: Thing Speak server is an open data platform and API for the Internet of Things that enables you to collect, store, analyze, visualize, and act on data from sensors. Model connection represents are shown in Table 1.

Relay: A relay is defined as an electrically operated switch; their main use is controlling circuits by a low-power signal or when several circuits must be controlled by one signal.

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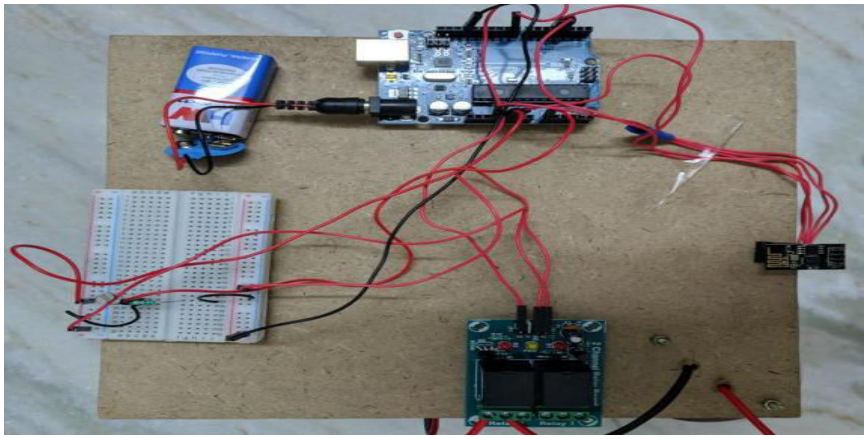

Fig. 3. Hardware circuit developed

Component 1	Pin	Pin Description		Pin	Pin Description	Component 2
Arduino Uno	A0	Analog Read	→	A0	Analog Data	Light Dependent Resistor
	5V	Vcc		Vcc	-	
	GND	Ground		GND	Ground	
Arduino Uno	8	Digital I/O	→	R1	Input 1	Relay Driver Module
	-	-		R2	Input 2	
	5V	Vcc		ENA	Enable	
	GND	Ground		GND	Ground	
Arduino Uno	3 (Rx)	Receiver	→	Tx	Transmitter	ESP8266
	4 (Tx)	Transmitter		Rx	Receiver	
	3V3	3.3 V		Vcc	-	
	3V3	3.3V		CH_PD	Chip Enable	
	GND	Ground		GND	Ground	

Table 1 . Reference table for connections between components

IV. WORKING DESCRIPTION

The automatic street lighting system using IOT uses real time operating system. A sensor is attached to the breadboard. The sensor used here is a Light dependent Resistor (LDR). The resistance of the LDR varies with respect to the intensity of the light around it. This property of the LDR is used in a voltage divider circuit. This data is sent to the micro-controller; Arduino Uno.The arduino uno is interfaced with different components of the system and interacts with them. The different components of the system are the sensor and light components, the Wi-Fi module ESP8266 and the ThingSpeak cloud based system. The sensor and light component reads data from the sensor and activates the light bulb connected to the relay. The ESP8266 Wi-Fi module connects the arduino to the internet with the help of AT commands. The ThingSpeak server gets its data from the arduino through the ESP8266. Therefore, the arduino uno is programmed such that the relay closes when the light intensity is low thereby completing the circuit connected to the bulb, which turns on the bulb. Similarly, when the sensor senses high light intensity, the relay opens, breaking the circuit, thereby turning off the bulb. This data is also sent to the cloud based system, ThingSpeak through the ESP8266 Wi-Fi module. This data is then stored and used for further energy consumption analysis, using ARDUINO code.

V. PSEUDO CODE

Step 1: The set of codes used is an application of Application Programming Interface (API). An API is a computing medium that interacts with the user and the software system. It is an important part of the project as it engages the user with the system and transmits information between the two.

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Step 2: Arduino in-built functions:Analog Read () - This function reads analog data from device connected to a pin. In this case the device connected to the pin is an LDR. The pin parameters are entered in the bracket. It returns an integer between 0 and 1023. It stores the analog data in the integer variable “sensor”.

Step 3: map()- It re-maps a number from one range to another. The syntax of the function is map(value, original lower value, original higher value, new lower value, new higher value). The function returns the mapped value. The lower and higher values of the new range and 0 and 100 respectively.

Step 4: digitalWrite()- The function writes HIGH or LOW to a digitalpin. The syntax is digitalWrite(pin,value) where pin is the pin number of digital output pin to write to, and where is HIGH or LOW. In this case, the function activates or deactivates the light that is connected to pin 8 of the arduino.

Step 5: SoftwareSerial()- It is a function from “SoftwareSerial” Arduino library. It creates an instance of an object for serial communication. The syntax of the function is SoftwareSerial(rxPin, txPin) where rxPin is the pin o which serial data is received and txPin is the to which serial data is transmitted. The function does not retur anything. It is used for serial communication with the Wi-Fi module ESP8266. The 0 and 1 pins of arduino are used for this purpose.

Step 6: User defined functions:

Step 7 : sendAT- The function send AT commands to ESP8266 from arduino. The syntax is sendAT(string command, const int timeout) where string command is the attention command to be sent in string format and const int timeout is the time sent for every AT command to be sent.
This command is used to set ESP8266 to station mode, connect to an access point.

Step 8: Update TS()- The function sends data from the arduino uno to ThingSpeak via ESP8266 and the internet. The syntax of the function is updateTS(L,S,T) where “L” is the light intensity of the ambience, “S” is the light status and “T” is the threshold value beyond which the light should be switched on. The function returns nothing.

Step 9: GET Request- It is used to retrieve information from the server. It uses a URL to retrieve data. It cannot change the data at the source. In this case, the ESP8266 uses the GET request to update the values of the light intensity, light status and threshold value to the Thing Speak system.

Aurdino coding function is drafted below:

```
#include<SoftwareSerial.h>
int sensor;
int data;
int light_status=10;
int threshold=80;

Software Serial esp8266 (3, 4);
#define SSID "One plus 6"
#define PASS "incorrect"

String SendAT (String command, const int
timeout){
 String response="";
  long int time = millis();
 while((time+timeout)>millis())
    response += c;
  }
 }
 Serial.print(response);
 }
```

```
Void connectwifi (){
 SendAT ("AT\r\n", 1000);
 SendAT ("AT+CWMODE=1\r\n", 1000);
 SendAT
("AT+CWJAP=\""SSID"\",\""PASS"\"\r\n
",2000);
 while (!esp8266.find("OK")){
 }
 SendAT ("AT+CIFSR\r\n",1000);
 SendAT ("AT+CIPMUX=0\r\n",1000);
 }
void setup (){
 Serial.begin (9600);// begin the serial
serial communication with baud rate 9600
 SendAT("AT+RST\r\n", 2000);
 connectwifi();
 pinMode(8,OUTPUT);
 pinMode(A0,INPUT);
}
```

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VI. RESULTS AND DISCUSSION

The setup of finalized hardware demo has been made for verifying the results using the demo model with the condition of high intensity of day sun light as per the coding comments the street light should not glow that has been evident the picture represented in Figure 4, to prove the coding the same setup has been placed at the night time at that juncture the condition light intensity has been very low so that the automatic street lighting system has been glow as shown in Figure 5, in addition to it the power consumption and data of the light intensity has been recorded in the cloud as shown in the Figure 6.

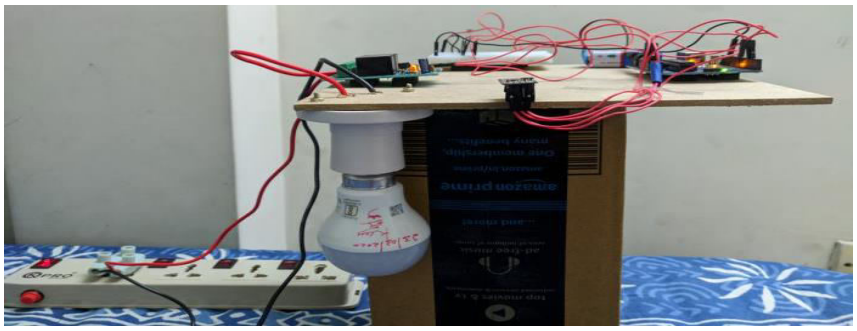

Fig 4.When high light intensity is present in the surrounding

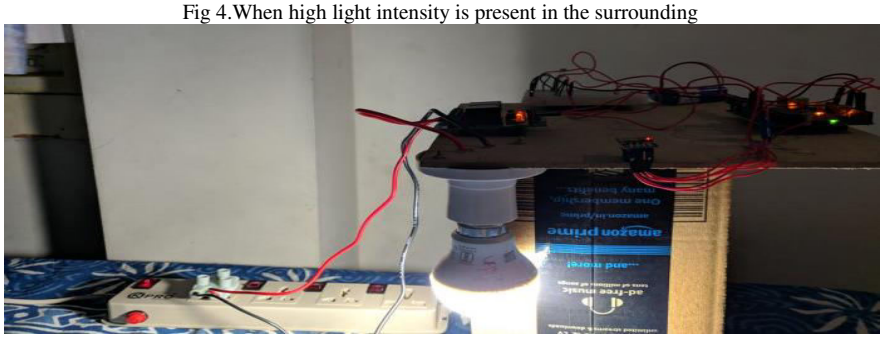

Fig 5. When surrounding light intensity decreases

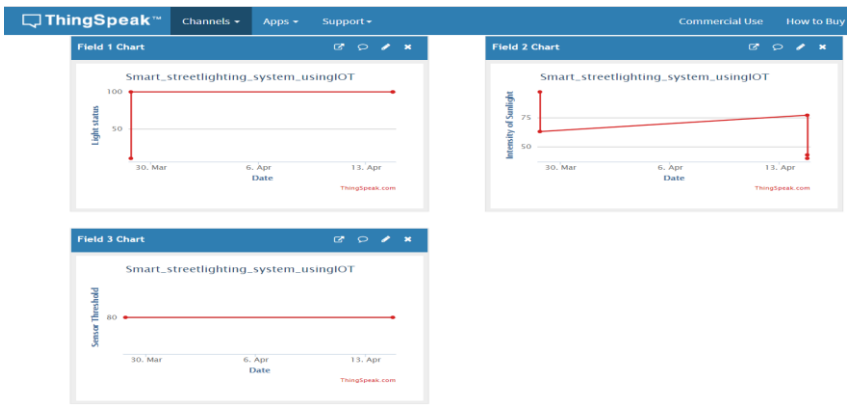

Fig 6. Data analysis available on the cloud

The network showed in Fig. 1 is able to transmit 22 packets if total transmission energy metric is used and 17 packets if used maximum number of hops metric. And the network lifetime is also more for total transmission energy. It clearly shows in Fig. 2 that the metric total transmission energy consumes less energy than maximum number of

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hops. As the network is MANET means nodes are mobile and they change their locations. After nodes have changed their location the new topology is shown in Fig .3 and energy consumption of each node is shown in Fig. 4. Our results shows that the metric total transmission energy performs better than the maximum number of hops in terms of network lifetime, energy consumption and total number of packets transmitted through the network.

VII. CONCLUSION AND FUTURE WORK

In this research, the design of automatic street light system based on IOT control has been made using Ardino and Raspberry pi components the operation of the IOT has been made based on the C coding comments, the results has been checked and verified with all the practical light intensity condition during day and night time and it has been proved that the operations are quite impressive to attain the motive of power savings and all the details has been recorded in the cloud storage for further process of assessments also.

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BIOGRAPHY

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