

IOT Based Energy Efficient Smart Street Lighting Technique with Air Quality Monitoring

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ABSTRACT

Automatic Street Lightning System is a basic, yet Powerful Concept, which involves LDR sensor as a switch. It consequently turns OFF lights at whatever point the daylight comes noticeable to the sensor. By utilizing this framework energy utilization is likewise diminished on the grounds that these days the physically worked streetlamps are not turned off even after the daylight comes apparent and furthermore turning ON prior before nightfall. Besides, real time online air quality monitoring helps authorities to know the environmental parameters like temperature, humidity, detection of leakage of any gas like smoke, alcohol, LPG. The value of temperature and humidity are transmitted over internet also so that every person in the range of the system can check it over their smart phones and laptops as these parameters hold importance to everyone. A text message is sent to corresponding persons through GSM module whenever its volume exceeds a particular safe limit intended for a particular application. The LDR value and air quality parameters are uploaded to thingspeak server.

Keywords: LDR, Automatic Street Lightning System

Article Info

Volume 9, Issue 6

Page Number : 01-07

Publication Issue

November-December-2022

Article History

Accepted : 01 Nov 2022

Published : 04 Nov 2022

I. INTRODUCTION

Internet of Things (IOT) is a biological system of associated actual items that are open through the web. The 'thing' in IOT could be an individual with heart monitor or a automobile with worked in-sensors, and can gather and move information over an organization without manual assistance or intervention. Smart lighting can be used to solve these issues. Here the traditional street lamps are replaced using the LED lights which are more efficient and less

polluting when compared with the traditional ones. The LEDs are turned Here and there naturally relying upon the force of light accessible in the outside encompassing and the lights are turned ON just when there is a vital. The automation of streetlamps is done by utilizing Arduino and different sensors. One more main issue of the world is air contamination which is increasing at an alarming rate. The metropolitan regions significantly air polluted because of additional utilization of vehicles and ventures which use advancements which are unsafe to the climate. The

information perusing the convergence of air pollutants fluctuate in various regions. Accordingly by estimating how much air contamination we can make mindfulness among individuals.

II. EXISTING SYSTEM

Wastage of energy in any structure is the recent concern from one side of the planet to the other. The significant one among this one is wastage of power. 19% of energy use on the planet is utilized for lighting. The energy utilization for lighting is squandered by not exchanging of the lights after use. The turning OFF of lights is done physically.

Drawbacks:

- Manual turning ON/OFF of Streetlamps.
- More Energy Utilization.
- High cost.
- More labor.

III. PROPOSED SYSTEM

In this proposed system we are have two frameworks. One is Arduino where all sensors are interacted. Other one is PC where python code is incorporated. LDR, MQ2 Sensor, DHT11 Sensor for estimating the boundaries like Light power, harmful gases, temperature and humidity values. This large number of boundaries will be transferred to cloud server through python. In view of LDR values the LED's will ON and OFF.

BLOCK DIAGRAM

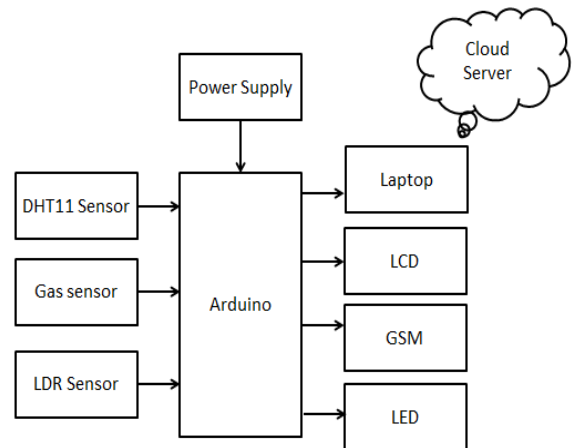


Fig 1: Block diagram of proposed method
HARDWARE REQUIREMENTS

Arduino:

Arduino UNO is a much precious add-on to the electronics, which contains USB interface, six analog pins and fourteen digital Input/output pins along with a Atmega328-powered microcontroller. Furthermore, the Arduino UNO also aids serial interaction with the help of Rx and Tx pins.

These Arduino is available in several variants, which exist in the market such as Arduino Due, Arduino UNO, Arduino Mega, and Arduino Leonardo. But, among the four variants, Arduino Mega and Arduino Uno are readily available than the other two. Those who you are aiming to execute a project in line with the digital electronics could choose Arduino UNO as it imparts more convenient and also be cost effective when dealing with IOT, robotics, embedded system, etc.



Fig2: Arduino

These Arduino UNO are generally open-sourced (i.e.) the related software and boards are much easily accessible that any person could alter and improvise

those boards for obtaining desirable functionalities in diverse applications.

Power Supply:

Transformer:

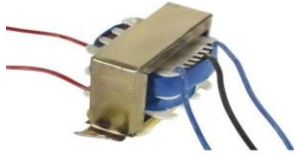


Fig 3: Transformer

Transformer is a device which reduces A.C current into required D.C current.

Bridge Rectifier:



Fig 4: Bridge rectifier

A diode bridge is a technique of four diodes in a bridge circuit arrangement that provides equal polarity of output for mutually polarity of input. While used in its maximum shared application, for transformation of an alternating-current input into a direct-current output, it is called as a bridge rectifier.

Capacitor:



Fig 5: Capacitor

A capacitor could be a passive two terminal electrical component that stores current in a electric field. The result of this can be termed as capacitance.

Regulator:

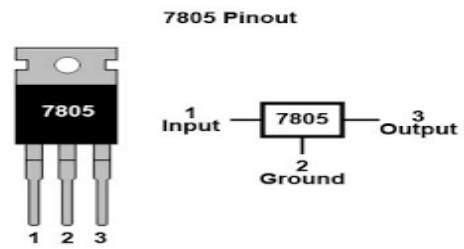


Fig 6: Regulator

A voltage regulator IC keeps the output voltage at a continuous value. 7805 IC is one of the IC of 78xx family. It maintains fixed linear regulators which are used to maintain fluctuations.

Gas Sensor:

MQ2 gas sensor can be used to detect the presence of LPG, Propane and Hydrogen, also could be used to detect Methane and other combustible steam, it is with low cost and suitable for different application. Sensor is sensitive to flammable gas and smoke.



Fig 7 : Gas Sensor

DHT11 Sensor

The DHT11 is a fundamental, minimal expense computerized temperature and dampness sensor. It utilizes a capacitive dampness sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the information pin (no analog input pins required). It's genuinely easy to utilize, however requires careful timing to get information. The main drawback of this sensor is you can get new information from it once every 2 seconds.

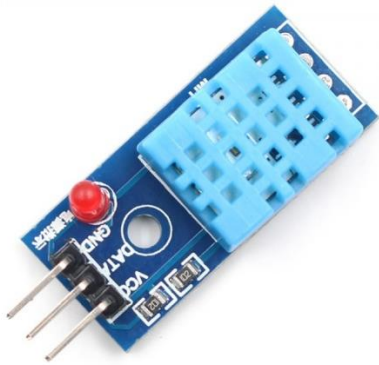


Fig 8: DHT11 Sensor

LDR Sensor

A Light Dependent Resistor (otherwise called a photo resistor or LDR) is a gadget whose resistivity is a component of the occurrence electromagnetic radiation. Thus, they are light-touchy gadgets. They are also called as photoconductors, photoconductive cells or basically photocells. They are made up of semiconductor materials that have high resistance. There are a wide range of symbols used to indicate a photoresistor or LDR.



Fig 9: LDR Sensor

GSM Module:

GSM speaks to Global System for Mobile Communications. It is a standard set made by the European Telecommunications Standards Institute (ETSI) to depict traditions for second time (2G) automated cell frameworks used by PDAs.

A Modem is a gadget which modulates and demodulates signals as per communication requirements. It converts an analogue carrier signal to digital signal and also converts such a carrier signal to required information.



Fig 10: GSM

LCD:

LCD (Liquid Crystal Display) is the innovation utilized in scratch pad shows and other littler PCs. Like innovation for light-producing diode (LED) and gas-plasma, LCDs permit presentations to be a lot slenderer than innovation for cathode beam tube (CRT). LCDs expend considerably less power than LED shows and gas shows since they work as opposed to emanating it on the guideline of blocking light.



Fig 11: LCD

LED

A light-emitting diode (LED) is a semiconductor light source that transmits light when current flows through it. Electrons in the semiconductor recombine with electron holes, releasing energy as photons.



Fig 12: LED

SOFTWARE REQUIREMENTS

Arduino IDE:

The acronym of IDE is “Integrated Development Environment”. Arduino IDE is an official software that is introduced by the Arduino.cc company. The main usage of the software is to write, compile and upload the code in the Arduino device. This software is compatible to support all modules of Arduino since it is an open-source software. The software is always in a readily available state to easy installation. Anyone can start compiling the code on the go after installation.

The Arduino IDE software is open-source software, where we can have the example codes for the beginners. In the Present world there are lot of versions in the Arduino IDE in which present usage is Version1.0.5. It is very easy to connect the PC with Arduino Board.

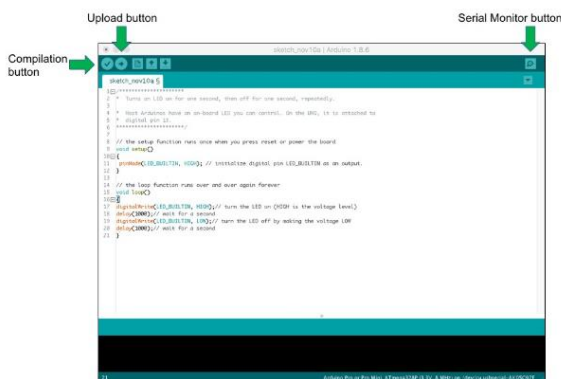


Fig13 : Arduino IDE Window

Python:

Python is an interpreter, high level, interactive and general purpose programming language. It was developed by Guido van Rossum during 1985 – 1990. The source code is available under general public License. Python is named after a TV Show ‘Monty Python’s Flying Circus’ and not after Python-the snake. It supports Object Oriented programming approach for developing applications.

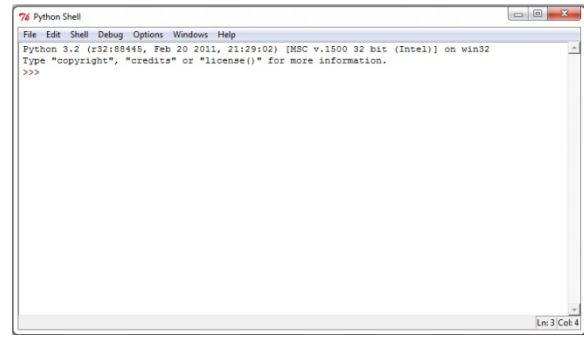


Fig 14: Python shell window

ADVANTAGES

- Cost effective
- Practical and affordable
- Reduces human resource and provides security
- Enhance performance and life of the lamps
- Smart usage

APPLICATIONS

- Parking, malls, industries
- Home power control system
- Hospitals, Institutions/ Organization
- Automatic Switching of Street light
- Road Security

RESULTS

The IoT graphs obtained from ThingSpeak with the help of sensors deployed at each streetlight are shown below



Fig 15: LDR Sensor Monitoring

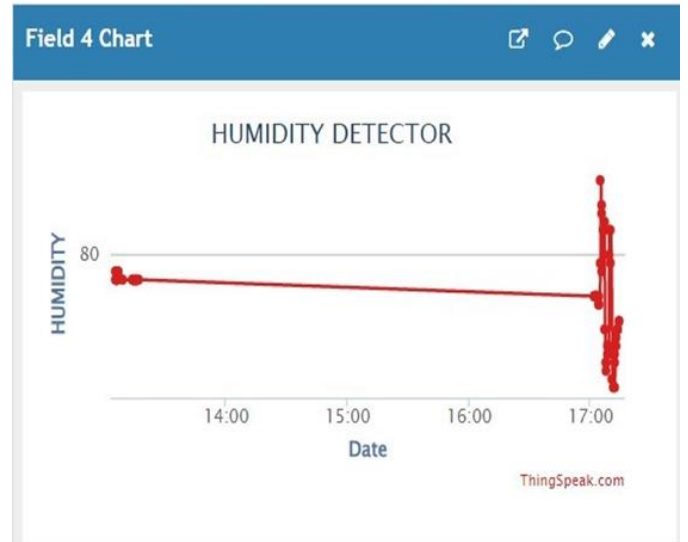


Fig 18: Humidity Monitoring

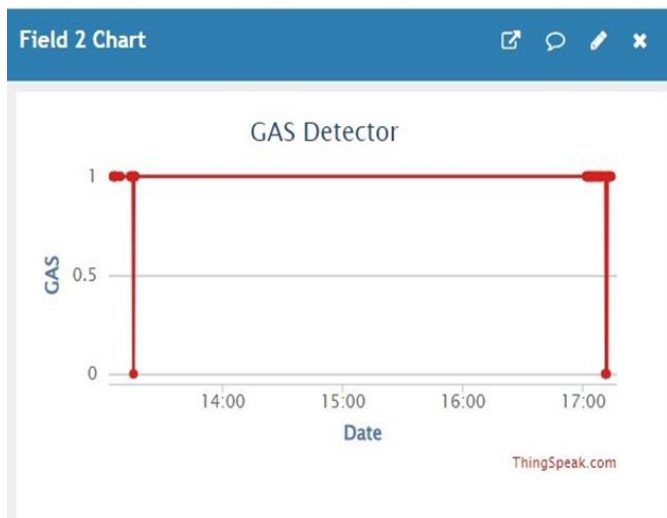


Fig 16: GAS Sensor Monitoring

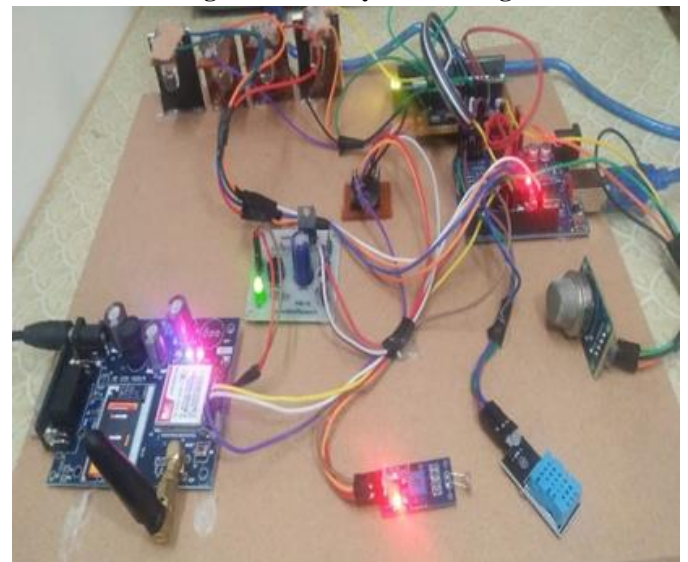


Fig 19: Status of LED streetlights when OFF during daytime

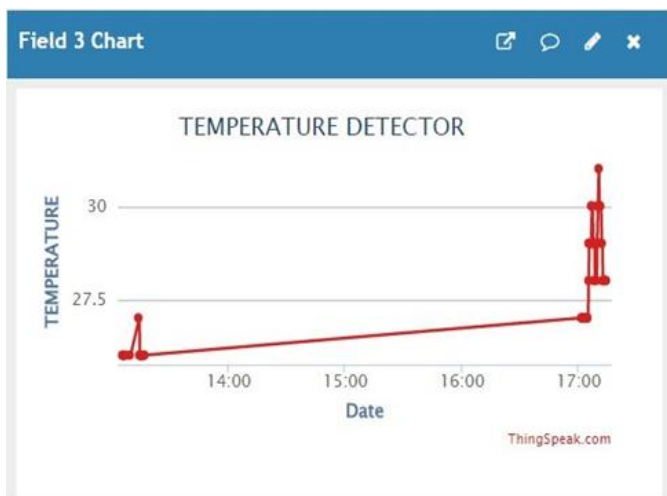


Fig 17: Temperature Monitoring



Fig 20: Status of LED streetlights when ON during Nighttime

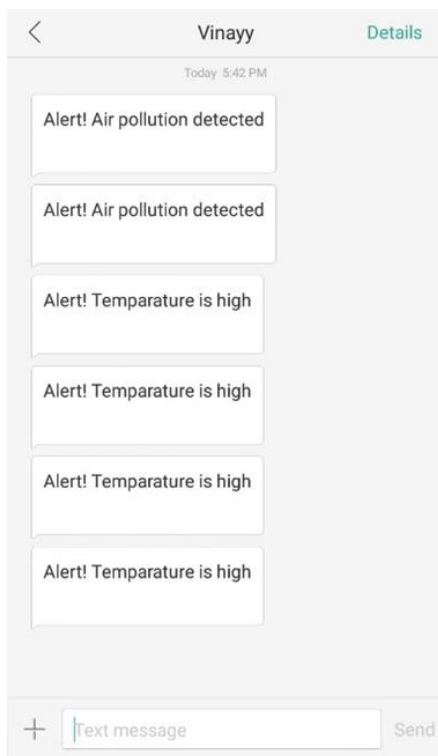


Fig 21: Message sent through GSM after detecting air pollution and when the temperature exceeds the threshold value

Given below images shows the status of LED streetlighting during daytime and nighttime.

IV. CONCLUSION

In this paper I have discussed about the minimal expense, secure, available IOT based street light optimization based on light intensity and furthermore I examined the air pollution monitoring system. GSM controls everything the cycle to the web and screen is utilized to show all the pages over the web. The framework can transfer the deliberate temperature, humidity and Air Quality information on a site in view of IOT. This framework could be utilized to incorporate LED's control based on intensity. For microcontroller containing the entire framework should be introduced at the observing site. The device to monitor the toxicity in the air environment is designed using Arduino, IOT technology is implemented to control the air quality in high traffic areas. The utilization of MQ2 sensor

faculties different risky gases, programmed lighting framework, GSM and Arduino is the core of this application, which controls the entire process.

V. REFERENCES

- [1]. Akshay Balachandran, Murali Siva, V. Parthasarathi, Surya and Shriram K. Vasudevan, "An Innovation in the Field of Street Lighting System With Cost and Energy Efficiency," Indian Journal of Science and Technology, Vol 8(17), DOI: 10.17485/ijst/2015/v8i17/61261, August 2015
- [2]. Biswajit Biswas, Sujoy Mukherjee, Aritra Ghosh, "Conservation of Energy: a Case Study on Energy Conservation in Campus Lighting in an Institution," International Journal of Modern Engineering Research (IJMER), Vol.3, Issue.4, Jul - Aug. 2013 pp-1939-1941
- [3]. NehaPatil,A.C.Wani, "Review on Energy Efficient Intelligent Lighting System", International Conference on Global Trends in Engineering, Technology and Management (ICGTETM-2016)
- [4]. SatwinderSingh, "Review of an energy efficient Smart Street Lighting System," International Journal of Research (IJR) Vol-1, Issue-5, June 2014 ISSN 2348-6848
- [5]. KajalRamchandraMandave,SnehalPraka h Mane, DhananjayVinayak Govande and AmolAnnapaKempwade, "Automatic Street Light Control", International Journal for Research in Emerging Science And Technology, Vol-3, Issue-4, Apr-2016

Cite this article as :

Ch. Sushminna, Dr. J. Ravindranadh, "IOT Based Energy Efficient Smart Street Lighting Technique with Air Quality Monitoring", International Journal of Scientific Research in Science and Technology (IJSRST), Online ISSN : 2395-602X, Print ISSN : 2395-6011, Volume 9 Issue 6, pp. 01-07, November-December 2022.

Journal URL : <https://ijsrst.com/IJSRST2295102>