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Smart Highway Street Light With Solar Tree using IOT

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Abstract: *Now a days with the growing population and energy demand we should take a renewable option of energy source and also we should keep in mind that energy should not cause pollution and other natural hazards. In this case the solar energy is the best option for us.*
India is a highly populated country, so we should take the advantage of such an energy which requires a very less space to produce energy efficiently. In this case solar tree could be the best one for us. We can also use the technique called —SPIRALLING PHYLLATAXY // to improve the efficiency of the plant. It can be applied in highway street lightening system, industrial power supply etc. It is much better than the traditional solar PV system in area point of view and also more efficient. So this will be a very good option and should be implemented.
Till now we are producing the electrical energy with the solar panels so far but all the two forms of these energies we are not using in same system. If we will do so then surely we can get the more efficient system than ever we had. So here in this paper we will demonstrate how an artificial tree will produce the electrical energy by using solar energy .For constructing the artificial tree the first step is to construct the nano leaves .The Nano leaf will consist of two transparent conducting layers one at the top and other one at the bottom .Between these two layers we are placing thin film photo voltaic layer to convert the sunlight into electrical energy and thin film thermo voltaic layer to convert the thermal radiation into electricity.

Keywords: Solar Energy; spiralling phyllataxy; Photo Voltaic Layer; Thermo Voltaic Layer

I. INTRODUCTION

In this project we mainly concentrate on to save the power in highway street lights. This controller will controls the all the highway street lights and all the processes. In our project we are doing automatic control of highway street lights by sensing the vehicles.Also we are using LDR sensor to indicate day and night conditions. Day time all the street light will off automatically, and night time turn on with more intensity, on condition where any vehicle is detected through IR sensor. WIFI based highway street light monitoring system is an automated system designed to increase the efficiency and accuracy of an industry by automatically timed controlled switching of street lights.WIFI based street light monitoring & control system consists of an Arduino microcontroller which on setting of time delays switches ON/OFF the street lights and sends the update through a phone. This is smart way of managing street lighting systems.

1.1 Problem Statement

The problem statement for "Smart Highway Street Light with Solar Tree using IoT" is that traditional street lighting systems are inefficient, costly, and often rely on non-renewable energy sources, leading to high energy consumption and maintenance costs. Moreover, traditional street lighting systems are not easily monitored or controlled, leading to delays in maintenance and repairs, as well as wasted energy due to unnecessary lighting. Therefore, there is a need for a more efficient and sustainable street lighting system that can be remotely monitored and controlled, while also utilizing renewable energy sources. The proposed solution, a Smart Highway Street Light with Solar Tree using IoT, addresses

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these issues by utilizing solar energy to power the street lighting system and implementing IoT technology for remote monitoring and control.

1.2 Proposed system

This system would allow for remote monitoring and control of the street lights, making it easy to identify any faults and fix them quickly. Wireless communication would be used to transmit data and control signals, making it easy to monitor and control the system. The system is designed to be simple to use and highly reliable. An IoT enabled solar tree can be introduced as a smart street light with air quality monitoring capability 1. This means that the solar tree can do more than just generate power; it can also be used for security, surveillance, pollution monitoring, and more

1.3 Objectives

Some objectives of this project could include:

- Energy efficiency: The project aims to reduce energy consumption and lower carbon emissions by using renewable energy sources like solar power. The objective could be to maximize the utilization of solar energy and minimize energy wastage by using efficient lighting technologies and implementing IoT-based controls.
- Cost reduction: The project could aim to reduce the maintenance and operating costs of traditional street lights by using smart and automated technologies. The objective could be to use IoT sensors and controllers to optimize the operation of street lights and reduce the need for manual maintenance.
- Safety and security: The project could aim to improve safety and security on highways by implementing smart lighting systems. The objective could be to use IoT sensors to detect traffic, pedestrians, and other hazards and adjust lighting accordingly to enhance visibility and safety.
- Environmental sustainability: The project could aim to promote environmental sustainability by using renewable energy sources, reducing carbon emissions, and improving energy efficiency. The objective could be to create a sustainable and eco-friendly infrastructure that contributes to a healthier and
- Smart city integration: The project could aim to integrate with existing smart city initiatives and infrastructure. The objective could be to create a connected and interoperable system that can be easily integrated with other smart city technologies like traffic management systems, public safety systems, and transportation systems.

V. SYSTEM REQUIREMENTS

5.1 Hardware Requirements

A. System Hardware: Solar Panels

Solar panels are those devices which are used to absorb the sun's rays and convert them into electricity or heat. Description: A solar panel is actually a collection of solar (or photovoltaic) cells, which can be used to generate electricity through photovoltaic effect.

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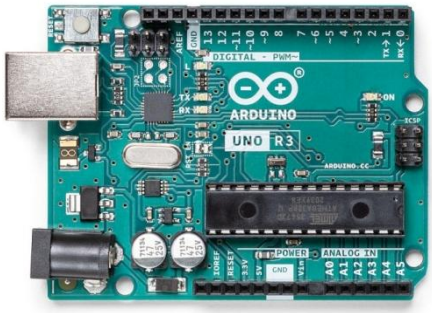
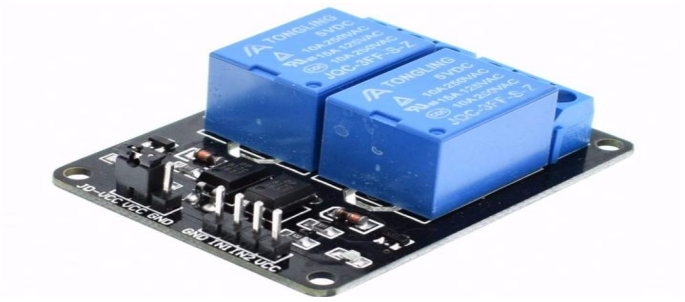
B. Arduino Uno Microcontroller



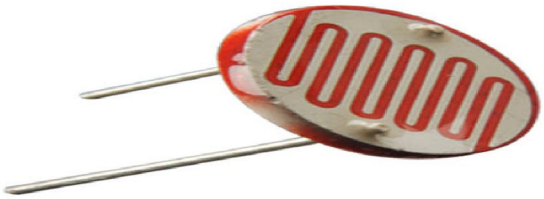
Arduino UNO is a low-cost, flexible, and easy-to-use programmable open-source microcontroller board that can be integrated into a variety of electronic projects.

C. Relay



Relay is an electrically operated switch. Many relays use an electromagnet to operate a switching mechanism mechanically. In this project HEJQC3FC relay with maximum current and voltage rating of 7.5A,14V is used, to supply +5V to multi charger connector when it receives enable signal from microcontroller.

D. LDR Sensor



LDRs or Light Dependent Resistors are very useful especially in light/dark sensor circuits. Normally the resistance of an LDR is very high, sometimes as high as 1000000 ohms, but when they are illuminated with light resistance drops dramatically. When the light level is low the resistance of the LDR is high.

E. IR Sensor

IR sensor is used for detecting an obstacle, there are some areas where valuable things are placed, an IR transmitter and receiver is placed there, an infrared path is established and if any person comes into that path the buzzer gets on which gives out a long beep Similarly a fire sensor is used to detect fire

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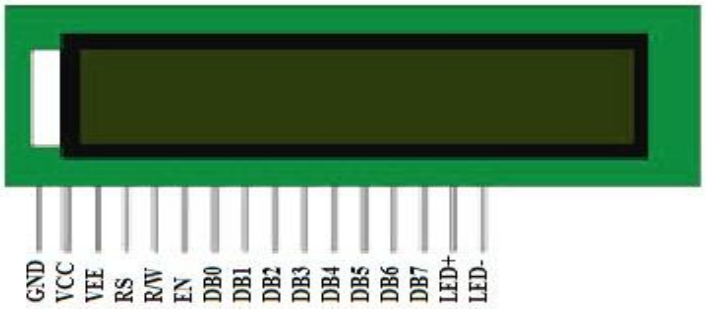
F. LED'S

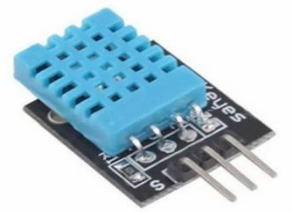
A light-emitting diode (LED) is a semiconductor light source. LEDs are used as indicator lamps in many devices and are increasingly used for other lighting. Appearing as practical electronic components in 1962, early LEDs emitted low-intensity red light, but modern versions are available across the visible, ultraviolet, and infrared wavelengths, with very high brightness.

G. LCD Display



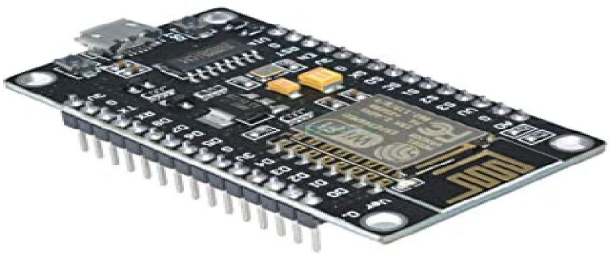
The Figure shows the pin diagram of 16X2 LCD display. In this LCD each character is displayed in 5X7 pixel matrix. While Vcc and GND(Vss) are connected to +5V and ground respectively, Vcc is used for controlling contrast. In this project LCD is used to display message for temperature,humidity,CO2 level, LDR value Light ON/OFF.

H. DHT-11 Sensor



The DHT11 is a basic, ultra low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air and spits out a digital signal on the data pin (no analog input pins needed).

I.WIFI Module(Node MCU)



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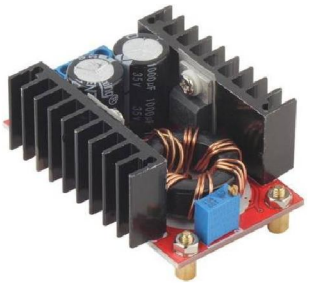
NodeMCU is an open-source LUA based firmware developed for the ESP8266 wifi chip. By exploring functionality with the ESP8266 chip, NodeMCU firmware comes with the ESP8266 Development board/kit i.e. NodeMCU Development board.

J. Power Supply



The board can operate on an external supply from 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may become unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

K. Gas Sensor

The CO2 Gas Sensor Module is designed to allow a microcontroller to determine when a preset Carbon Dioxide gas level has been reached or exceeded. Interfacing with this sensor is done through a 4-pin SIP header and requires two I/O pins from the host microcontroller. The sensor module is intended to provide a means of comparing gas sources and being able to set an alarm limit when the source becomes excessive.

L. Battery

The lead-acid battery consists of (in the charged state) electrodes of lead metal (Pb) and lead oxide (PbO_2) in an electrolyte of about 37% sulfuric acid (H_2SO_4). In the discharged state both electrodes turn into lead sulfate ($PbSO_4$) and the electrolyte loses its dissolved sulfuric acid and becomes primarily water.

5.2 Software Requirements

A. ADRUINO IDE

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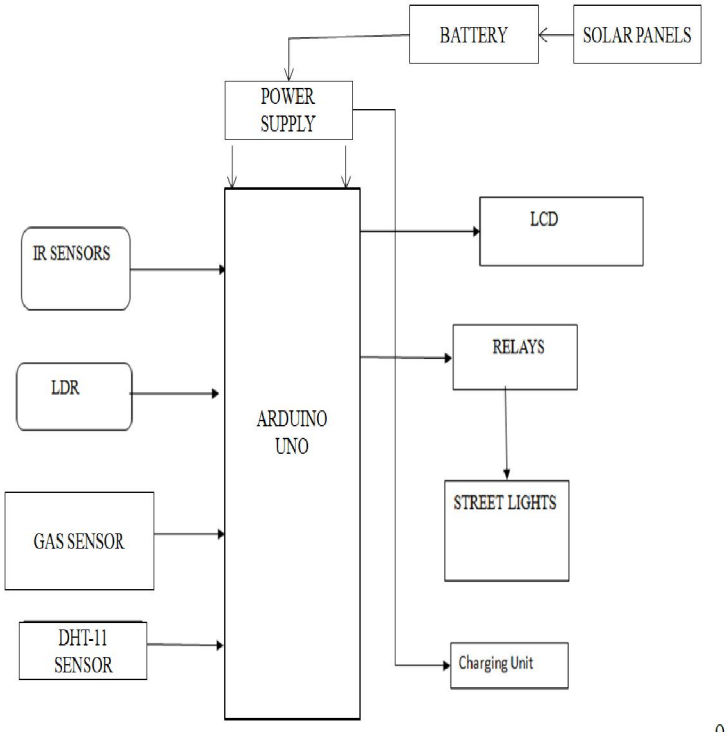
The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them

C. Software Tool
Embedded C

Embedded C is generally used to develop microcontroller-based applications. C is a high-level programming language. Embedded C is just the extension variant of the C language. This programming language is hardware independent.

VI. BLOCK DIAGRAM



VII. ADVANTAGES

- Wireless communication.
- Easy to monitor and control.
- High reliability.
- Land requirement is very less.
- Enables reliable communication.
- LEDs - reduce CO_2 emissions
- Increases power efficiency.

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VIII. DISADVANTAGES

- Cost is high
- May cause hazards to the birds and insects
- High Maintenance
- Dependence on technology

IX. CONCLUSION

In conclusion, the integration of smart highway street lights with solar tree using IOT technology offers a sustainable and innovative solution for modern-day infrastructure. By incorporating solar panels, energy can be generated and stored in the batteries during the day, providing a continuous source of energy for the street lights at night. The IOT technology allows for remote monitoring and control of the street lights, which can help optimize energy usage, reduce maintenance costs, and enhance safety for drivers and pedestrians. Overall, the smart highway street light with solar tree using IOT is an eco-friendly.

REFERENCES

[1]. Omkar Natu et.al / International Journal on Computer Science and Engineering (IJCSE) "GSM Based Smart Street Light Monitoring and Control System" Vol. 5 No. 03 Mar 2013.

[2]. Nuraishah Sarimin, Shereen Lina d/o Isaac2, Najmiah Radiah Mohamad "Zigbee based Smart Street Lighting System" International Journal of Computer Trends and Technology- volume4Issue4- 2013.

[3]. Mustafa Saad, Abdalhalim Farij, Ahamed Salah and Abdalroof Abdaljalil "Automatic Street Light Control System Using Microcontroller".

[4]. K.Santha Sheela , S.Padmadevi "Survey on Street Lighting System Based On Vehicle Movements" International Journal of Innovative Research in Science, Engineering and Technology Vol. 3, Issue 2, February 2014.

[5]. B. K. Subramanyam, K. Bhaskar Reddy, P. Ajay Kumar Reddy " Design and Development of Intelligent Wireless Street Light Control and Monitoring System Along With GUI "International Journal of Engineering Research and Applications , Vol. 3, Issue 4, Jul-Aug 2013.

[6]. Deepak Kapgate " Wireless Streetlight Control System "International Journal of Computer Applications, Volume 41– No.2, March 2012