

INGENIOUS STREET LIGHT SYSTEM

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ABSTRACT:

The controlling and monitoring of street lights is a strenuous task. Due to lack of manual efficiency and regular supervision, the street lights are sometimes found ON during the day which is quite unnecessary. The street lights are found turned OFF every so often. This creates a great hassle. It leads to loss of energy and frequent malfunctioning which in turn leads to reduced life time of the street lights. And hence there is a need to develop a smart street light system to lessen the electrical power wastage and reduce the burden of manually controlling the street lights. This ingenious street light system prototype enhances the operation of street light which uses solar panel, ESP-01 Wi-Fi module, ThingSpeak online server, LDR, Arduino nano, IR sensor etc.,

KEYWORDS:

ESP-01 Wi-Fi module, IR sensor, Arduino nano, ThingSpeak.

INTRODUCTION:

Every The ingenious street light system is an advanced system that uses new-fangled technologies like IOT. The other predominant components of the ingenious street light system prototype are Arduino nano, Solar panel, IR sensor, Battery, ESP-01Wi-Fi Module and Light dependent resistor. The Internet of things (IoT) is a technology that is used for communication and sharing the information between the systems that are interconnected with each other in a network. This prototype is used to operate the street lights in an efficient way i.e.,

it is made sure that the lights are off during the day and the lights are on in the night based on the intensity. At night the brightness of the light is altered based on the presence of any human existence. This way we can diminish the amount of electrical power consumption and minimize the glitches in the system.

LITERATURE SURVEY:

B. K. Subramanyam: He has worked on the concept of the "wireless street light monitoring and controlling system". This system is used to consolidate the latest technologies which offers ease of conservation of energy. It is possible to save some more electrical power by using the solar panel at the lamp post. By using the GUI application, the street lights can be controlled and monitored.

P. Nithya: She has worked on the concept of "design of wireless framework for energy efficient street light automation ". In this work, the proposed system can be able to manage the street lights in an intelligent way. This can be done by transmitting the data to a primary station by ZigBee wireless communication. This system provides efficient maintenance of the street lights.

Anila Devi Y: She has worked on the concept of "GSM based remote control system of high efficiency intelligent street lighting system using ZigBee network of devices and sensor". In this work, they used a highly efficient LED light. This leads to less consumption of energy.

Richu Sam Alex: He has worked on a ZigBee based street light system. This system can be able to lessen the consumption of power by the street light system about 20-35% than it consumes in a conventional design. All the performance criteria of the system can be easily analyzed as the system uses ZigBee network and it is fully automated.

Hariharan A: He has worked on a street light system using which the performance characteristics like throughput and time taken to transmit the power can be analyzed. It is inquired that if the transmission power is high, the neighbor channel interference increases and also the throughput decreases. This work makes us understand the importance of transmission of power in the street light system.

Zhixiong Ke, Chun Xiao: They have worked on the concept of "Intelligent street light system based on ZigBee". The remark they have given is that the system can get the parameters of the street light system. It can also realize the remote monitoring using the ZigBee and GPRS wireless communication.

Mohd. Saifuzzaman, Nazmun Nessa Moon, Fernaz Narin Nur: They have worked on the concept of "IOT based street lighting system and traffic management system". The whole idea of this work is to innovate an ingenious system which can be able to make decisions on controlling the luminosity i.e., on/off/dim by taking the light intensity into consideration.

Gul Shahzad, Heekwon Yang, Arbab Waheed Ahmad and Chankil Lee: They have worked on the concept of "Energy efficient intelligent street lighting system

using traffic-adaptive control". In this system, a light emitting diode which is electronically controlled was included. These lights are adaptable to illumination. Monitoring can be done easily.

EXISTING WORK:

Currently the existing street light system has a manual system by using which the street lights can be switched off in the evening before the sunsets and it can be turned off in the next morning when there is sufficient light. But we only need the street lights to be switched on when there is utter darkness. The disadvantages of the existed system are more manual work is needed, high maintenance is required and hence the expenditure is high.

Another existing system comprises components like Arduino UNO, LDR, proximity sensor, LED. This system does not contain any Wi-Fi module. The drawback of this system is that the switching status of the light is not known time to time. If there are any glitches or malfunctioning in the system, they can only be taken care of during the survey time.

PROPOSED WORK:

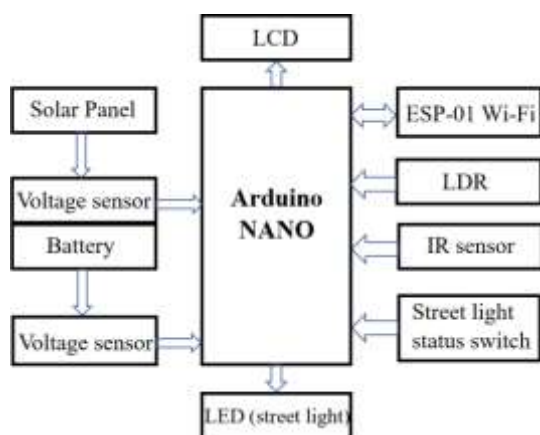
To overcome the snags in the existed system, we proposed an advanced system called **INGENIOUS STREET LIGHT SYSTEM**. This system improves the maintainability of the street lights.

The proposed system incorporates the components like Solar panel, Arduino nano, LDR, LED, IR sensor, battery, street light status switch, voltage sensors, mini-USB, ESP-01 Wi-Fi module, LCD. The solar panel, battery and the ESP-01 Wi-Fi module are the additional components in the proposed system. The solar panel is used to absorb the sunlight and it converts the light energy into electrical energy. This energy is stored in the battery for further use. This improves

the energy storing capacity of the street light system. The LDR determines the day and night. If it is day the light is kept off. If it is night, the IR sensor checks for the presence of human in its proximity and if there is human presence, the light glows with 100% brightness, otherwise the light glows with 10% brightness.

Initially, our prototype is connected to an online server called ThingSpeak using ESP-01 Wi-Fi module. The email ID which is registered in that server gets the status (i.e., at which time the sensor switch is off or on, the voltage in solar panel and battery) of the street light in the form of graphical representation. This data can be stored in the server itself. This data gets updated for every 30 seconds. So, if there is any impairment in the system, the authorized person can know it anytime and have it repaired.

BLOCK DIAGRAM:



SOLAR PANEL:

Solar panels are also known as PV panels. The solar panel absorbs the light energy from the sun and then it converts into electrical energy. The solar panel comprises many individual cells. Those cells compose of some layers of silicon and phosphorous that provide negative charge and layer of boron that gives the positive charge.

ARDUINO NANO:

The Arduino NANO is a board (microcontroller) which is based on the

ATmega328P. It is a breadboard friendly component. It is a low-cost and flexible device. It has 13 digital I/O pins and 8 analog input pins.

ESP-01 WI-FI MODULE:

It gives the wireless internet access to the system. It has the core processor ESP8266EX.

LDR:

LDR is abbreviated as Light Dependent Resistor. This works based on the light intensity. The resistance changes inversely to the light intensity of the surroundings.

IR SENSOR:

The IR sensor is abbreviated as Infrared sensor. It is used to measure and detect the infrared radiation in its surroundings. When an object comes close to the IR sensor, the LED turns on.

LED:

LED is abbreviated as Light Emitting Diode. It is a device made up of semiconductor material. The LED turns on if there is any current flowing through it.

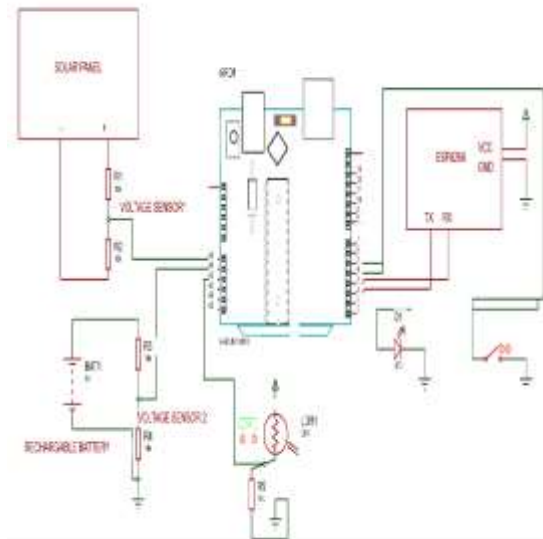
RECHARGEABLE BATTERY:

This battery can be charged using the solar panel. This battery ensures fast recharging. The battery we used has a capacity of storing 9v.

16*2 LCD:

LCD is abbreviated as Liquid Crystal Display. This displays some information which is required. This LCD is a display module that displays 16 characters in two lines.

CIRCUIT DIAGRAM:



OPERATION:

The operation of the ingenious street light system is simple yet effective. Initially the prototype is connected to the computer system through mini-USB. The sensor status switch is on. The prototype is connected to the online server “ThingSpeak” through the ESP-01 Wi-Fi module. The Solar panel absorbs the light energy from the sun during the day and converts it into electrical energy. This electrical energy is stored in the rechargeable battery. The solar panel we used in our prototype has a capacity of 6v. The capacity of the battery we used is 9v. Two voltage sensors are also used. One voltage sensor is used to sense the voltage in the solar panel and the other is used to sense the voltage in the rechargeable battery. These two parameters are displayed on the LCD.

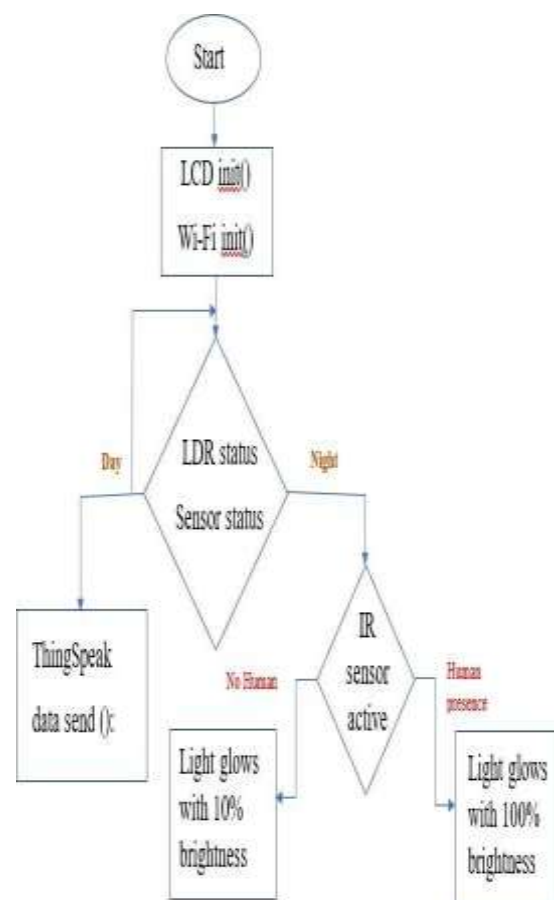
All the components are interfaced to the Arduino nano. The solar sensor is connected to the A1 pin of the Arduino nano, battery sensor to the A2 pin, LDR to A3 pin, LED to A5 pin, IR sensor to 12th pin and sensor status switch to the A4 pin. The Light dependent resistor checks the intensity of the surroundings and determines whether it is day or night. If it

is day, the LED is kept at off condition. If it is night, the control goes to the IR sensor and it checks for any human presence in its premises. If there is any human presence, the LED glows with 100% brightness otherwise, the LED glows with 10% brightness.

All the data regarding the status of the street light is saved in the Thingspeak online server. Whenever we login to the server with the registered mail ID, we can view the stored data in the form of graphical representation. There are three field charts which we can view and analyse. They are solar voltage, battery voltage and the sensor status. We can know the date and time whenever there are any glitches in the system. The data is updated for every 30 seconds.

This way, we can reduce the unnecessary power consumption and can operate the street lights efficiently.

FLOW CHART:



COMPARISON:

	Existed work: Automatic street light system using Arduino	Proposed work: Ingenious street light system
Components	Arduino uno micro controller, LDR, LED	Solar panel, Arduino NANO, IR sensor, ESP-01 Wi-Fi module, Rechargeable battery, LDR, LED, sensor status switch.
Working	The automatic street light system is only used to on and off the street lights automatically based on the intensity. There is no way to know the malfunctioning in the system. It is known only if there is any complaint placed which requires manual work.	The ingenious street light system is developed in such a way that the light is on during the night based on the light intensity of the surroundings. Whenever human presence is detected by the IR sensor, the light glows with 100% brightness. In the absence of humans, the light glows with only 10% brightness. This helps in reducing the power wastage. If there are any glitches in the system, the operator immediately gets to know it and faster restoring is ensured.

FUTURE SCOPE:

Adding more number of street lights with only one ingenious street light system will improve the credibility more. Within certain radius, all the street lights can be controlled and monitored simultaneously.

RESULTS:



Fig1. LCD displaying voltage in solar panel and battery.



Fig2. LED off during day

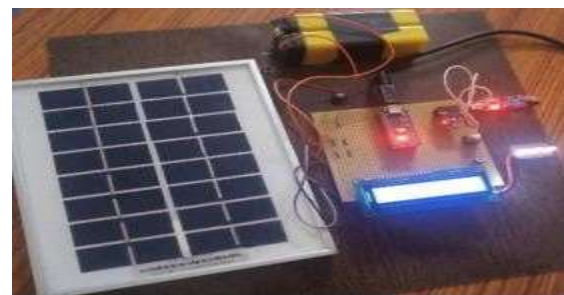


Fig3. LED glowing with 10% brightness during night



Fig4. LED glowing with 100% brightness during night



Fig5. Data stored in Thing speak server showing solar voltage and battery voltage charts with date & time.

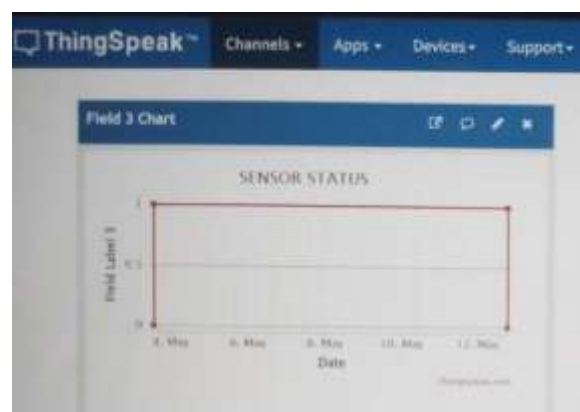


Fig6. Data stored in Thing speak server showing sensor status with date & time.

CONCLUSION:

This paper embellishes the designing and construction of the ingenious street light system. The ingenious street light system is an advanced street light system that operates based on the light intensity automatically. The solar panel is used for storing the electrical energy. The brightness of the light can be altered based on the light intensity of the surroundings. With the online server, the status of the street lights is stored and can be checked at any point of time. The data gets updated every 30 seconds. Thus, the manual power is minimized and the power consumption is diminished using this ingenious street light system prototype.

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