NOVEL AUTO INTENSITY CONTROLWITH SOLAR BASED LED STREET LIGHT WITH

B.GOPAL, G.KUMARASWAMY
Dept of EEE,
Priyadarshini Institute of Science and Technology for Women Khammam.

ABSTRACT:

The Word Smart is an acronym for the 5 elements of specific, measurable, achievable, relevant, and time-based. IOT describes the large and growing set of digital devices as now numbering in the billions which operate across networks of potentially global scale. As the world is growing a bit faster people are being attracted to this word smart. India is one of the fastest growing economies in the world taking this as a factor we are implementing a switch to smart technique - Namely Smart street light system. The manual streetlight system lights powered from sunset to sunrise with maximum intensity even when power is available. The Saved energy can be utilized in various purposes like residential, commercial etc. This is done by using the LDR sensor. Considering the intensity of light, we can turn a light on/off. The power supply to the system is the main supply and converting them using a Relay. Every city need to have street light system which is essential. In order to save the energy, we are using the project through an IOT module. As there is a tremendous change in the world everything is changing into automation. This is a smart control and intelligent decision making devices based on accurate real time field data.

DOI Number: 10.48047/nq.2018.16.11.1130 **NeuroQuantology 2018; 16(11):129-138**

I.INTRODUCTION

IOT meant to transmit data from the devices to master controller through gate ways & existing network structure. IOT market developments and analysis implies that unlicensed and licensed spectrums are essential. IOT system[1]operates with field sensors and data analyzing on the internet which can communicate them to share and transfer information using unique id assigned to every device. Automation plays an important role in the modern society and where IOT along with LoRa can help to fulfill the needs. For the Street lighting & Electrical systems due to the conventional on/off system there is a huge loss of electrical power noted and studies conducting in the area to minimize the power loss by various technology. Mobile based surveillance with web uses IOT cloud server used here for more energy conservation and early resolution in case of any fault detection. Lot of research is conducting in this field to minimize energy loss in remote locations by implementing user friendly applications. The main idea of this research is to develop an automated and controlled street light according to requirement the roads, pedestrians & Vehicles. A user friendly control system to monitor & control the lighting systems from remote locations with using IOT & LoRa can fulfill the requirements with minimal infrastructure cost by using the existing

networks & un licensed radio frequencies. From remote locations, Field Sensor data can be transmitted to the master control stations through LoRa gateways, after reaching gateways signals will be transferred to the User end through existing network server & vice versa. Every gateway forwards the received packet from the end-node to the cloudbased network server via some backhaul either cellular, Ethernet, satellite, or Wi-Fi. Hence the power consumption can be cut down by switching off the circuit when there is no requirement of lighting in particular area. Successful implementation of IOT & LoRa systems can bring lot of benefits in the fields of Home automation [2], Temperature Monitoring, patient health monitoring, Vehicle monitoring etc.

II.LITERATURE SURVEY

A public Street Lights & Electrical system in remote city locations consumes a lot of energy due to the unavailability of control devices due to the large setup cost. Presently most of street lamps turn on the street lights in night and turns off the street lights in day using LDR based control system [3]. Street lamp or Electrical systems still consumes a lot of electricity when there are few vehicles around or no people in the office due to the lack of monitoring and controlling based on the actual requirements [4]. For a wireless control monitoring system each street light must be equipped with different types of sensors that are connected to a microcontroller to monitor its environment with regards to its working needs like light intensity, current capacity, voltage load and temperature which are collected and transferred by the means of radio frequency communication

III.DESIGN OF HARDWARE

This chapter briefly explains about the Hardware. It discuss the circuit diagram of each module in detail.

ARDUINO UNO

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter. Uno board has a resistor pulling the 8U2 HWB line to ground, making it easier to put into DFU mode. Arduino board has the following new features:

- 1.0 pin out: added SDA and SCL pins that are near to the AREF pin and two other new pins placed near to the RESET pin, the IOREF that allow the shields to adapt to the voltage provided from the board. In future, shields will be compatible both with the board that use the AVR, which operate with 5V and with the Arduino Due that operate with 3.3V. The second one is a not connected pin, that is reserved for future purposes.
- Stronger RESET circuit.
- Atmega 16U2 replace the 8U2.

"Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform; for a comparison with previous versions, see the index of Arduino boards.

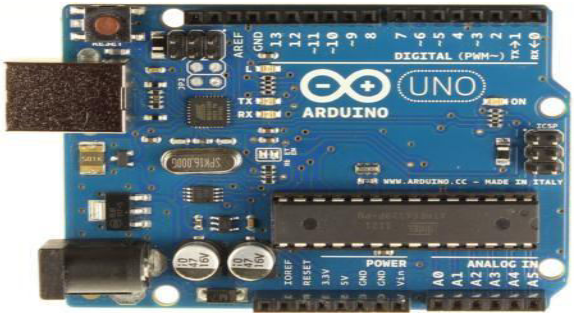


Fig: ARDUINO UNO

POWER SUPPLY:

The power supplies are designed to convert high voltage AC mains electricity to a suitable low voltage supply for electronic circuits and other devices. A power supply can by broken down into a series of blocks, each of which performs a particular function. A d.c power supply which maintains the output voltage constant irrespective of a.c mains fluctuations or load variations is known as "Regulated D.C Power Supply".

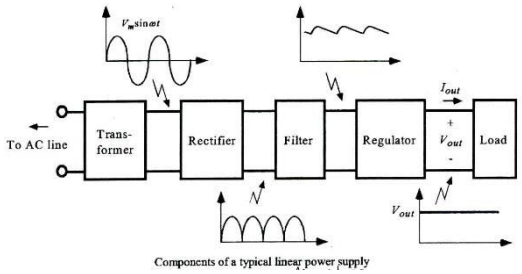


Fig: Block Diagram of Power Supply

LCD DISPLAY

A model described here is for its low price and great possibilities most frequently used in practice. It is based on the HD44780 microcontroller (Hitachi) and can display messages in two lines with 16 characters each. It displays all the alphabets, Greek letters, punctuation marks, mathematical symbols etc. In addition, it is possible to display symbols that user makes up on its own. Automatic shifting message on display (shift left and right), appearance of the pointer, backlight etc. are considered as useful characteristics.

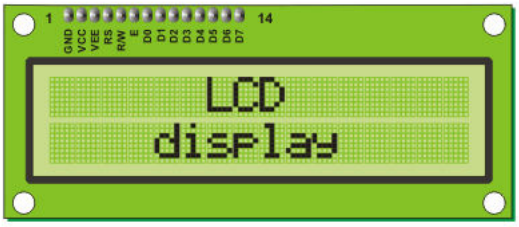
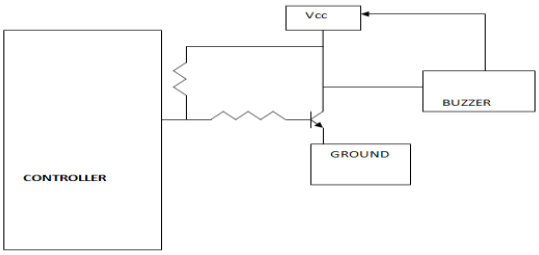


Fig: LCD

BUZZER

Digital systems and microcontroller pins lack sufficient current to drive the circuits like relays, buzzer circuits etc. While these circuits require around 10milli amps to be operated, the microcontroller's pin can provide a maximum of 1-2milli amps current. For this reason, a driver such as a power transistor is placed in between the microcontroller and the buzzer circuit.



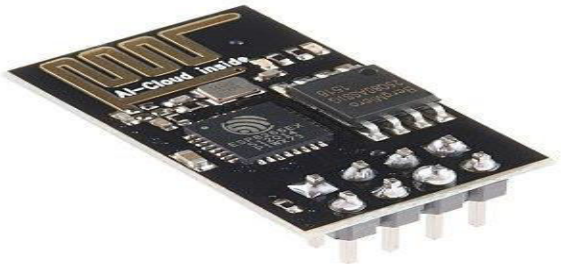
WIFI MODULE:

The **ESP8266** is a low-cost Wi-Fi microchip with full TCP/IP stack and microcontroller capability produced by Shanghai-based Chinese manufacturer, Espressif Systems.[1]

The chip first came to the attention of western makers in August 2014 with the **ESP-01** module, made by a third-party manufacturer, Ai-Thinker. This small module allows microcontrollers to connect to a Wi-Fi network and make simple TCP/IP connections using Hayes-style commands. However, at the time there was almost no English-language documentation on the chip and the commands it accepted.[2] The very low price and the fact that there were very few external components on the module which suggested that it could eventually be very inexpensive in volume, attracted many hackers to explore the module, chip, and the software on it, as well as to translate the Chinese documentation.[3]

The **ESP8285** is an ESP8266 with 1 MiB of built-in flash, allowing for single-chip devices capable of connecting to Wi-Fi.[4]

The successor to these microcontroller chips is the ESP32.



LED:

A light-emitting diode (LED) is a two-lead semiconductor light source. It is a p–n junction diode that emits light when activated.[5] When a suitable voltage is applied to the leads, electrons are able to recombine with electron holes within the device, releasing energy in the form of photons.

This effect is called electroluminescence, and the color of the light (corresponding to the energy of the photon) is determined by the energy band gap of the semiconductor. LEDs are typically small (less than 1 mm^2) and integrated optical components may be used to shape the radiation pattern.

Early LEDs were often used as indicator lamps for electronic devices, replacing small incandescent bulbs. They were soon packaged into numeric readouts in the form of seven-segment displays and were commonly seen in digital clocks. Recent developments have

produced LEDs suitable for environmental and task lighting. LEDs have led to new displays and sensors, while their high switching rates are useful in advanced communications technology.

LEDs have many advantages over incandescent light sources, including lower energy consumption, longer lifetime, improved physical robustness, smaller size, and faster switching. Light-emitting diodes are used in applications as diverse as aviation lighting, automotive headlamps, advertising, general lighting, traffic signals, camera flashes, and lighted wallpaper. They are also significantly more energy efficient and, arguably, have fewer environmental concerns linked to their disposal.

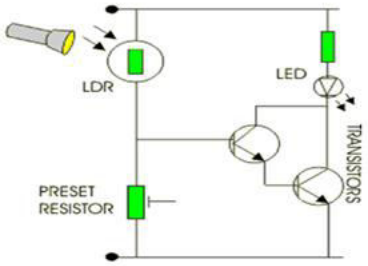
LIGHT DEPENDENT RESISTOR

A photo resistor or light dependent resistor (LDR) is a resistor whose resistance decreases with increasing incident light intensity; in other words, it exhibits photoconductivity. It can also be referred to as a photoconductor or CdS device, from "cadmium sulfide," which is the material from which the device is made and that actually exhibits the variation in resistance with light level. Note that CdS is not a semiconductor in the usual sense of the word (not doped silicon).

A photoresistor is made of a high resistance semiconductor. If light falling on the device is of high enough frequency, photons absorbed by the semiconductor give bound electrons enough energy to jump into the conduction band. The resulting free electron (and its hole partner) conduct electricity, thereby lowering resistance.

A photoelectric device can be either intrinsic or extrinsic. An intrinsic semiconductor has its own charge carriers and is not an efficient semiconductor, e.g. silicon. In intrinsic devices the only available electrons are in the valence band, and hence the photon must have enough energy to excite the electron across the entire bandgap. Extrinsic devices have impurities, also called dopants, added whose ground state energy is closer to the conduction band; since the electrons do not have as far to jump, lower energy photons (i.e., longer wavelengths and lower frequencies) are sufficient to trigger the device. If a sample of silicon has some of its atoms replaced by phosphorus atoms (impurities), there will be extra electrons available for conduction. This is an example of an extrinsic semiconductor. Photo resistors are basically photocells.

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 1000 000 ohms, but when they are illuminated with light resistance drops dramatically.



IR SENSOR

Infrared is a energy radiation with a frequency below our eyes sensitivity, so we cannot see it Even that we can not "see" sound frequencies, we know that it exist, we can listen them.

Even that we can not see or hear infrared, we can feel it at our skin temperature sensors. When you approach your hand to fire or warm element, you will "feel" the heat, but you can't see it. You can see the fire because it emits other types of radiation, visible to your eyes, but it also emits lots of infrared that you can only feel in your skin.

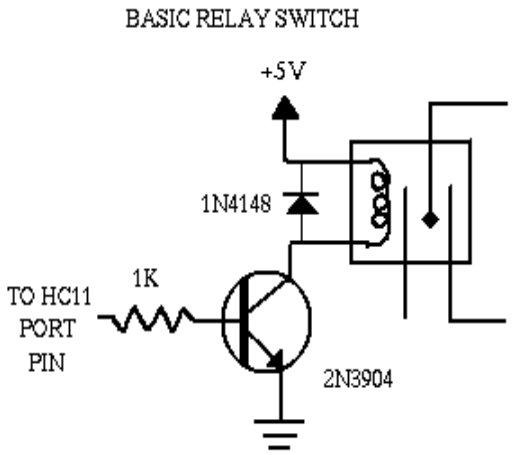
INFRARED IN ELECTRONICS

Infra-Red is interesting, because it is easily generated and doesn't suffer electromagnetic interference, so it is nicely used to communication and control, but it is not perfect, some other light emissions could contains infrared as well, and that can interfere in this communication. The sun is an example, since it emits a wide spectrum or radiation.

The adventure of using lots of infra-red in TV/VCR remote controls and other applications, brought infra-red diodes (emitter and receivers) at very low cost at the market.

From now on you should think as infrared as just a "red" light. This light can means something to the receiver, the "on or off" radiation can transmit different meanings.Lots of things can generate infrared, anything that radiate heat do it, including out body, lamps, stove, oven, friction your hands together, even the hot water at the faucet.

RELAY



The following schematic shows the basic circuit. A relay is an electrically operated switch. When you turn it on, it switches on way. When it is off, it switches the other way. You can use a relay to switch on and off a high current device. A relay has an electromagnet, called a coil, and a lightweight switch inside it. When you energize the coil, a piece of the switch is attracted by the coil's magnetic field, which switches the switch on or off.

Mechanical relay:

Typical Mechanical Relay connection pin

This is a very important section. The introduction to this electrical control switch, call a Relay. It is basically a device to activate a mechanical switch, by electrical means. This is unlike a switch which is activated manually. In another words it is a device that convert electrical signal to a mechanical energy back to electrical signal again. Similar to mechanical switch, they can be described as 2P2T, single pole double throw, etc...

How it works? A electrical voltage will be applied to activate a coil in the relay. The coil being powered up, will generate a magnetic force that will attract the lever. This lever will be pulled towards the magnetized coil, causing an action that will switch the mechanical contact.

Solar panel :

Solar panel refers either to a photovoltaic (PV) module, a solar hot water panel, or to a set of solar photo voltaic modules electrically connected and mounted on a supporting structure. A PV module is a packaged, connected assembly of solar cells. Solar panels can be used as a component of a larger photovoltaic system to generate and supply electricity in commercial and residential applications. Each module is rated by its DC output power under standard test conditions, and typically ranges from 100 to 320 watts. The efficiency of a module determines the area of a module given the same rated output – an 8% efficient 230 watt module will have twice the area of a 16% efficient 230 watt module. There are a few solar panels available that are exceeding 19% efficiency. A single solar module can produce only a limited amount of power; most installations contain multiple modules. A photovoltaic system typically includes a panel or an array of solar modules, an inverter, and sometimes a battery and/or solar tracker and interconnection wiring.

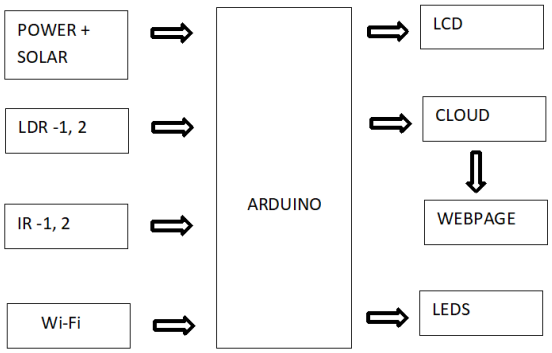
Solar modules use light energy (photons) from the sun to generate electricity through the photovoltaic effect. The majority of modules use wafer-based crystalline silicon cells or thin-film cells based on cadmium telluride or silicon. The structural (load carrying) member of a module can either be the top layer or the back layer. Cells must also be protected from mechanical damage and moisture. Most solar modules are rigid, but semi-flexible ones are available, based on thin-film cells. These

early solar modules were first used in space in 1958.

Electrical connections are made in series to achieve a desired output voltage and/or in parallel to provide a desired current capability. The conducting wires that take the current off the modules may contain silver, copper or other non-magnetic conductive transition metals. The cells must be connected electrically to one another and to the rest of the system. Externally, popular terrestrial usage photovoltaic modules use MC3(older) or MC4 connectors to facilitate easy weatherproof connections to the rest of the system.

Bypass diodes may be incorporated or used externally, in case of partial module shading, to maximize the output of module sections still illuminated.

BLOCK DIAGRAM:



V.CONCLUSION

This IOT based device surveillance and control system is exclusively used to keep surveillance on the electrical devices working condition and also to control the on/off functionality from a central remote location. The designed system works efficiently for both indoor and outdoor lighting. On the one hand it improves efficiency of the system by sending alert signal in case of any defect and on the other hand it drastically reduces the electric energy consumption by providing central control over the appliances. The graphical App based mobile controlling gives a user friendly and easily accessible platform to the user. This system can be installed as energy

REFERENCES:

1. S. Yi, C. Li, and Q. Li, "A Survey on Security and Privacy Issues in Internet-of-Things," IEEE Internet of Things Journal, vol. 1, no. 4, pp. 345–355, Aug. 2014.
2. A. S. H. M. A. Hoque and N. S. Amin, "IoT-Based Smart Home Automation and Security System Using Arduino and GSM," International Journal of Computer

Applications, vol. 131, no. 4, pp. 13–19, Dec. 2015.
3. K. J. Lee and Y. S. Lee, "Efficient Communication Protocols for IoT-Based Smart Home Systems," IEEE Transactions on Consumer Electronics, vol. 60, no. 2, pp. 276–282, May 2014.
4. A. K. Mishra, K. K. Tiwari, and R. S. Chandel, "Smart Home Automation Using IoT," Proceedings of the International Conference on Computing, Communication and Automation, pp. 646–649, 2015.
5. M. Z. Ahmad, S. T. Ali, and S. A. Anwar, "Integration of IoT and Cloud for Smart City Applications," IEEE International Conference on Cloud Computing Technology and Science, pp. 347–352, 2015.
6. R. S. S. Kumar and S. S. A. Kumar, "IoT-Based Smart Lighting System for Energy Efficiency," IEEE International Conference on Electronics and Communication Systems, pp. 1345–1349, Feb. 2014.
7. S. V. Raj and P. R. Prasad, "Smart Home Automation and Security System Using IoT," International Journal of Advanced Research in Computer Science and Software Engineering, vol. 5, no. 1, pp. 122–126, Jan. 2015.
8. A. M. Uddin and A. K. N. Ahmed, "GSM-Based Smart Home Automation System," IEEE International Conference on Electrical Engineering and Informatics, pp. 151–155, Jul. 2014.
9. M. M. M. W. Haron, R. N. N. Zain, and A. K. M. M. Rashid, "Wireless Communication Protocols for IoT-Based Smart Homes," International Conference on Electrical Engineering and Informatics, pp. 39–43, Jul. 2013.
10. H. R. A. Ali, R. K. S. Goh, and J. C. N. Lee, "Smart Street Lighting System Using IoT and GSM," IEEE International Conference on Power and Energy, pp. 153–158, Dec. 2014.
11. L. L. Li, J. J. Liu, and P. Z. Zhang, "Smart Home Monitoring System Based on IoT," IEEE International Conference on Computer and Communication Technology, pp. 20–24, Sep. 2013.
12. J. W. W. Tan and A. N. H. Lim, "Smart Home Control Using IoT and Cloud Computing," IEEE International Conference on Control and Automation, pp. 184–189, Jun. 2014.
13. K. Y. Kim, H. T. Jung, and H. R. Kim, "IoT-Based Energy Management for Smart Homes," International Conference on Smart Grid and Clean Energy Technologies, pp. 258–261, Dec. 2014.
14. P. A. D. Patel and V. K. Patel, "Design and Implementation of IoT-Based Smart Street Light System," IEEE International Conference on Communication Systems and Network Technologies, pp. 319–322, Apr. 2015.
15. A. S. S. B. Kumar and V. K. M. Singh, "IoT-Enabled Smart Home Security System Using Raspberry Pi," IEEE International Conference on Electrical, Electronics and Computer Engineering, pp. 212–217, Dec. 2015.
16. J. L. S. Lee and S. J. Choi, "Smart Home Automation Using IoT and GSM Technology," IEEE International Conference on Communications and Networking, pp. 129–134, Jun. 2014.
17. S. R. Ravi and M. K. Yadav, "IoT-Based Smart Lighting System Using Wireless Sensor Networks," International Conference on Smart Technologies for Smart Nation, pp. 61–65, Jul. 2016.
18. A. G. A. Martin and C. A. King, "Energy Efficient Smart Home Systems Using IoT Technologies," IEEE International Conference on Sustainable Energy Technologies, pp. 147–152, Nov. 2013.
19. M. S. M. Ibrahim, A. H. M. Tohid, and R. H. Alib, "Integration of IoT and Smart Grid Technologies for Efficient Energy Management," IEEE International Conference on Smart Grid Technology, pp. 32–37, Sep. 2014.
20. F. P. P. Silva and J. L. Almeida, "Smart City Applications with IoT and Cloud

Computing," IEEE International Conference on Internet of Things and Cloud Computing, pp. 104–109, Mar. 2015.
21.