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IoT Based Smart Street Lighting System

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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 globalscale. Asthe 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. 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

KEYWORDS: ARDUINO,LCD,TRANSFORMER, BRIDGE CTIFIER,RELAY,PWM,WIFI,REGULATOR, MICROCONTROLLER**.**

I INTRODUCTION

The Internet of Things (IoT)is an assortment ofinterrelated preparing devices, mechanical or virtual machines, articles, animals and individuals that have fascinating identifiers (UIDs) and the ability to move information over a framework without expecting of human-to-human. In light of the joining of various progressions, real time assessment, AI, thing sensors, and installed frameworkswith systems, the possibility of the Internet of Things has progressed. Regular fields of introduced structures, remote sensor frameworks, control systems, automation (tallying home and building computerization) and others all add to the Internet of Things. The Internet of Things (IoT)is an assortment ofinterrelated preparing devices, mechanical or virtual machines, articles, animals and individuals that have fascinating identifiers (UIDs) and the ability to move information over a framework without expecting of human-to-human. In light of the joining of various progressions, real time assessment, AI, thing sensors, and installed frameworkswith systems, the possibility of the Internet of Things has progressed. Regular fields of introduced structures, remote sensor frameworks, control systems, automation (tallying home and building computerization) and others all add to the Internet of Things. IoT uses various progressions and shows to speak with devices subject to the necessities. The huge advancements and shows are remote, Wi-Fi-direct, RFID, NFC, radio shows and Wi-Fi-Direct. IoT applications are flourishing in general adventures and markets. The IoT has countless improvement over various organizations. The daily lighting system has limited to only two ON and OFF options, and is not effective, this type of operation results in power loss due to continued peak voltage. The diversion of electricity from street lights is therefore one of the obvious power losses, but with the use of automation, this results in many new energy and money savings methods. LDR is used as a sensor in this module. The aim is to provide an efficient & energy-saving lighting system by determining the present lighting condition and changing the lights accordingly. The circuit consists of an sensing component known as LDR, followed by Relay, The input is given from the direct supply and the relay convert them to a required voltage and then the switching on the lights takes place. Street lightening is an essential infrastructure for cities in order to assure the security of citizens and goods. This infrastructure has however a high economic and ecological cost. Thus, municipalities are looking for innovative solutions to master the costs of their streetlights, which represent up to 60% of their electricity expenditure.

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II.SYSTEM ANALYSIS

2.1 PROPOSED SYSTEM

Street Light Monitoring & control is an automated system designed to increase the efficiency and accuracy of an enterprise by automatically timed controlled switching of street lights. This project represents a new cost-effective solution for street light control systems. The control system consists of control circuitry, internet and electrical devices. The system also includes the client-server mechanism where a user can directly interact with the web-based application to monitor the Streetlight of any place from a single position. The base server will run a Java Web Application which will maintain whole street light of Country/State/City. When we have to switch ON/OFF any streetlight, the server will send a notification to that Street controller to take necessary action. Street light controller will receive that information, and it will decode and find the particular streetlight which will set using relay circuit, the notification came it will then decode and finds the appropriate streetlight which needs to put ON/OFF using relay circuit. The entire street light lamps are connected to relay driver circuit. The base server will run a Java application which will maintain Whole Street light record of the city. When we want to ON/OFF any particular streetlight, Notification message is send to adjust the pattern.

III BLOCK DIAGRAM

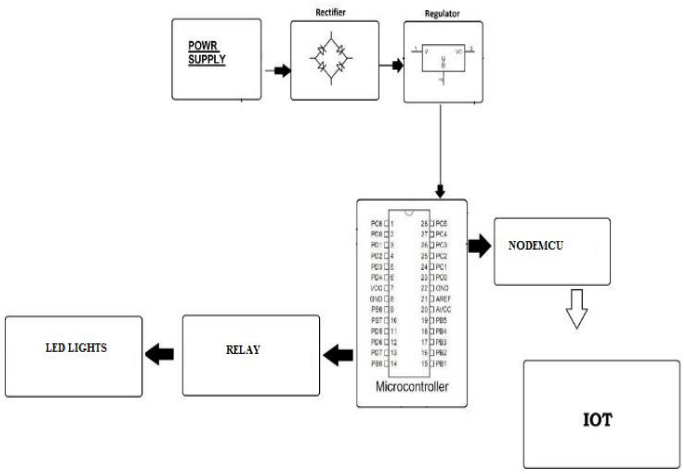

Figure 1 Block Diagram

WORKING

A relay is an **electrically operated switch**. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. The coil current can be on or off so relays have two switch positions and most have **double throw** (**changeover**) switch contacts as shown in the diagram.

Relays allow one circuit to switch a second circuit which can be completely separate from the first. For example a low voltage battery circuit can use a relay to switch a 230V AC mains circuit. There is no electrical connection inside the relay between the two circuits, the link is magnetic and mechanical.

The coil of a relay passes a relatively large current, typically 30mA for a 12V relay, but it can be as much as 100mA for relays designed to operate from lower voltages. Most ICs (chips) cannot provide this current and a transistor is usually used to amplify the small IC current to the larger value required for the relay coil. The maximum output current for the popular 555 timer IC is 200mA so these devices can supply relay coils directly without amplification.

Relays are usuallly SPDT or DPDT but they can have many more sets of switch contacts, for example relays with 4 sets of changeover contacts are readily available. For further information about switch contacts and the terms used to describe them please see the page on switches.

Most relays are designed for PCB mounting but you can solder wires directly to the pins providing you take care to avoid melting the plastic case of the relay.

The supplier's catalogue should show you the relay's connections. The coil will be obvious and it may be connected either way round. Relay coils produce brief high voltage 'spikes' when they are switched off and this can destroy transistors and ICs in the circuit. To prevent damage you must connect a protection diode across the relay coil.

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The animated picture shows a working relay with its coil and switch contacts. You can see a lever on the left being attracted by magnetism when the coil is switched on. This lever moves the switch contacts. There is one set of contacts (SPDT) in the foreground and another behind them, making the relay DPDT.

ULN2009

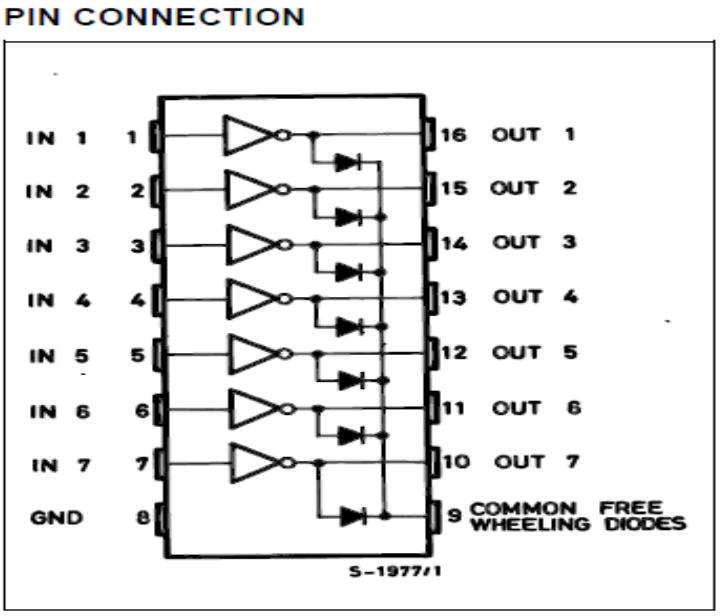

Fig 2 RELAY PIN DIAGRAM

DESCRIPTION

The ULN2003 is a monolithic high voltage and high current Darlington transistor arrays. It consists of seven NPN darlington pairs that features high-voltage outputs with common-cathodeclamp diode for switching inductive loads. The collector-current rating of a single darlington pair is 500mA.

The darlington pairs may be parrlleled for higher current capability. Applications includerelay drivers,hammer drivers, lampdrivers,display drivers(LED gasdischarge),line drivers, and logic buffers.The ULN2003 has a 2.7kW series base resistor for eachdarlington pair for operation directly with TTL or 5V CMOSdevices.

Relay application considerations

Fig 3 RELAY APPLICATION

A large relay with two coils and many sets of contacts, used in an old telephone switching system.

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Fig 4 RELAY APPLICATION

Several 30-contact relays in "Connector" circuits in mid 20th century 1XB switch and 5XB switch telephone exchanges; cover removed on one

MCU Definition

MCU stands for MicroController Unit - which really means it is a computer on a single chip. A microcontroller contains one or more CPUs (processor cores) along with memory and programmable input/output peripherals. They are used to automate automobile engine control, implantable medical devices, remote controls, office machines, appliances, power tools, toys etc.

In September 2018 support for a Lua Flash Store (LFS) was introduced. LFS allows Lua code and its associated constant data to be executed directly out of flash-memory; just as the firmware itself is executed. This now enables NodeMCU developers to create Lua applications with up to 256Kb Lua code and read-only constants executing out of flash. All of the RAM is available for read-write data!

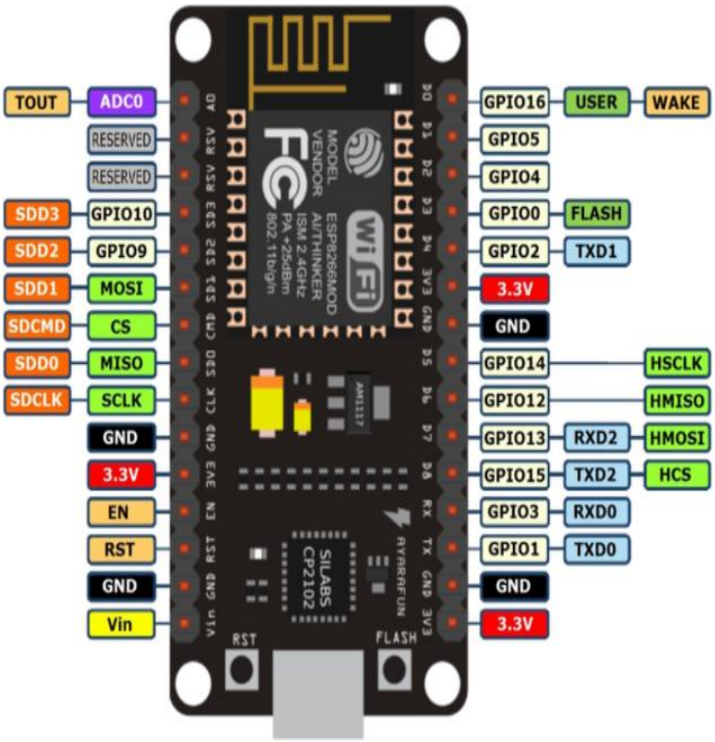

Fig 5 MCU

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IV DESING AND DRAWINGS

PCB DESINING

PRINTED CIRCUIT BOARD

A printed circuit board, or PCB, is used to mechanically support and electrically connect electronic components using conductive pathways, tracks or signal traces etched from copper sheets laminated onto a non-conductive substrate. It is also referred to as printed wiring board (PWB) or etched wiring board. A PCB populated with electronic components is a printed circuit assembly (PCA), also known as a printed circuit board assembly or PCB Assembly (PCBA). Printed circuit boards are used in virtually all but the simplest commercially produced electronic devices.

PCBs are inexpensive, and can be highly reliable. They require much more layout effort and higher initial cost than either wire wrap or point-to-point construction, but are much cheaper and faster for high-volume production; the production and soldering of PCBs can be done by automated equipment. Much of the electronics industry's PCB design, assembly, and quality control needs are set by standards that are published by the IPC organization.

DRILLING

Holes through a PCB are typically drilled with small-diameter drill bits made of solid coated tungsten carbide. Coated tungsten carbide is recommended since many board materials are very abrasive and drilling must be high RPM and high feed to be cost effective. Drill bits must also remain sharp to not mar or tear the traces.

Drilling with high-speed-steel is simply not feasible since the drill bits will dull quickly and thus tear the copper and ruin the boards. The drilling is performed by automated drilling machines with placement controlled by a drill tape or drill file. These computer-generated files are also called numerically controlled drill (NCD) files or "Excellon files". The drill file describes the location and size of each drilled hole. These holes are often filled with annular rings (hollow rivets) to create vias. Vias allow the electrical and thermal connection of conductors on opposite sides of the PCB.

When very small vias are required, drilling with mechanical bits is costly because of high rates of wear and breakage. In this case, the vias may be evaporated by lasers. Laser-drilled vias typically have an inferior surface finish inside the hole. These holes are called micro vias.

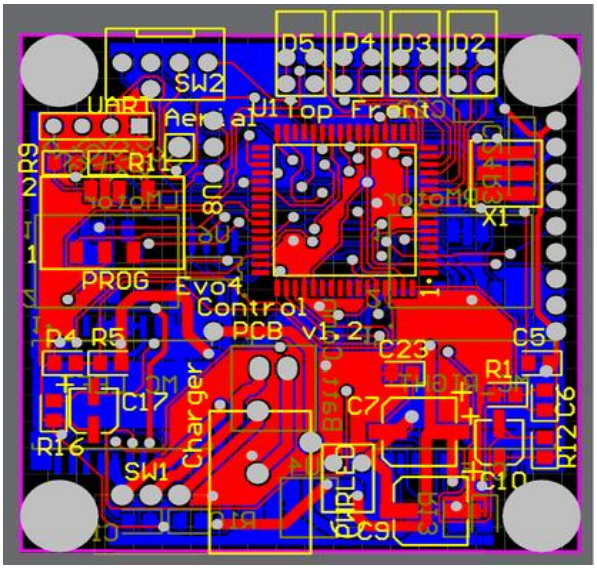

Fig 6 PCB DRILLING

It is also possible with controlled-depth drilling, laser drilling, or by pre-drilling the individual sheets of the PCB before lamination, to produce holes that connect only some of the copper layers, rather than passing through the entire board. These holes are called blind vias when they connect an internal copper layer to an outer layer, or buried vias when they connect two or more internal copper layers and no outer layers.

The walls of the holes, for boards with 2 or more layers, are made conductive then plated with copper to form plated-through holes that electrically connect the conducting layers of the PCB. For multilayer boards, those with 4 layers or more, drilling typically produces a smear of the high temperature decomposition products of bonding agent

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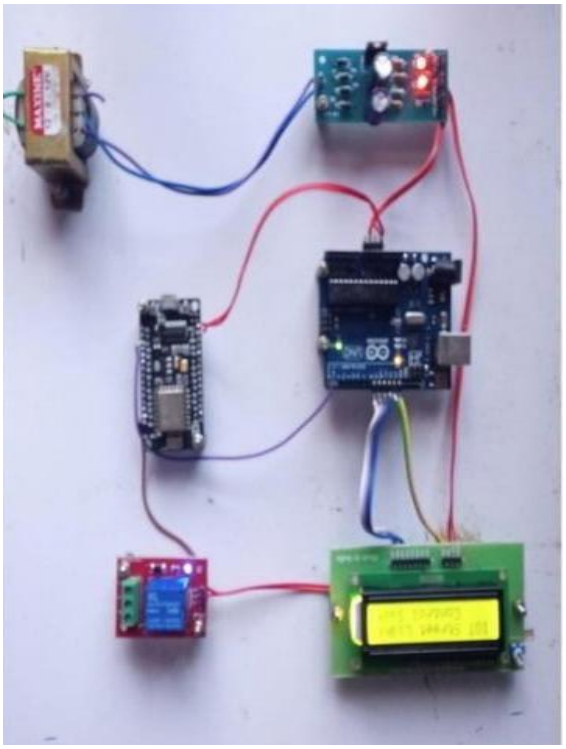
in the laminate system. Before the holes can be plated through, this smear must be removed by a chemical de-smear process, or by plasma-etch. Removing (etching back) the smear also reveals the interior conductors as well.

V HARDWARE COMPONENT



VI.CONCLUSION

Conserving the energy has been the huge task in our generation by converting the manual process into automation we can save enormous amount of energy. These also reduce manpower and prevent energy wastage. The efficiency of automated systems is more than the manual systems. We can reprogram these devices with respect to our needs.

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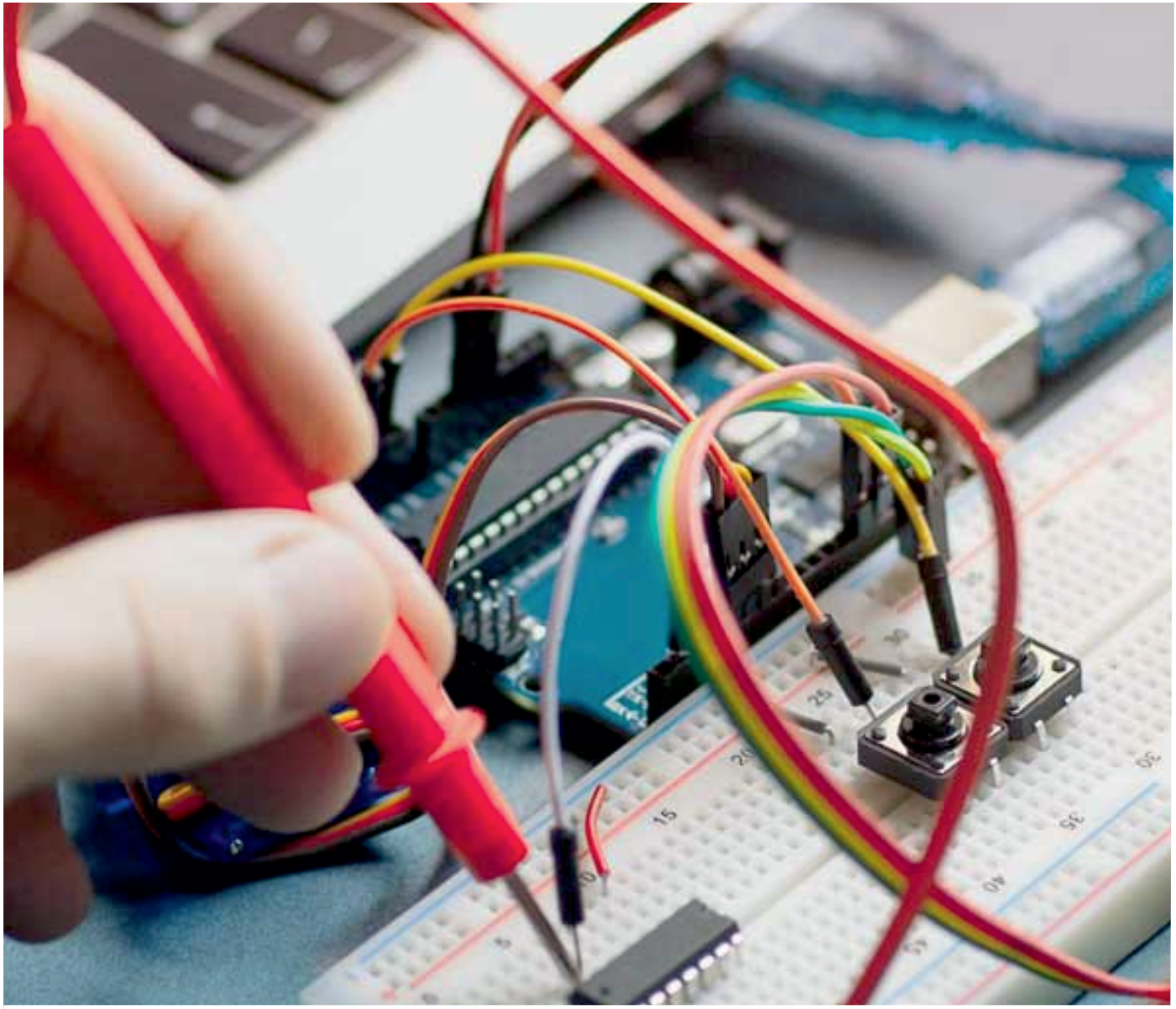

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