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Application of IoT for energy conservation

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ABSTRACT

Nowadays IoT plays a vital role in controlling and monitoring applications. This proposal deals with conservation of electrical energy by means of avoiding wastage of current flow in the commercial buildings such as classrooms, hotels, auberges etc. We make use of contactless voltage detector for detecting current flow. For communication flow, we use the IoT device (ESP8266), microcontroller, sensors and relays

Keywords: *Contactless voltage detector – IoT Device (ESP8266) – ATmega 328P- PIR sensor – relay.*

1. INTRODUCTION

The Internet of Things (IoT) is the technology makes us easy to interact with the sensors anywhere in the world. IoT has evolved from the convergence of wireless technologies, micro-electro mechanical systems, nano services and the internet. The assemble has helped tear down the silo walls between operational technology (OT) and information technology (IT), allowing disorganized machine-generated data to be analyzed for insights that will drive developments. India's First Intelligent Water Heater. Vera is an IOT-enabled, high efficiency, smartphone-compatible water heater with cloud computing-based functionality. That's science-talk for a ferociously smart water heater that can be switched on/off, scheduled and check from anywhere in the world, on your smartphone! Experts estimate that will Internet of Things consists of almost 50 billion of article by 2020. An IoT-enabled intelligent system of such cases was proposed in 2001 and later complete in 2014 by the National Science Foundation Industry/University collective Research Center for Intelligent evolution Systems (IMS) at the University of Cincinnati on a band saw the machine in IMTS Chicago.

2. IMPORTANCE OF ENERGY CONSERVATION

Energy conservation plays a very important role because utilization of non-renewable resources also impacts our environment. The usage of fossil fuels makes air and water to be polluted such as carbon dioxide is produced when oil, coal, and gas combust in power stations, heating systems, and engines of the car. It helps the replacement of non-renewable resources with renewable energy. Since we have limited quantity of non-renewable energy resources available on earth, it is very important to preserve energy from our current supply or to utilize renewable resources so that it is also available to our future generations.

3. EXISTING SYSTEM

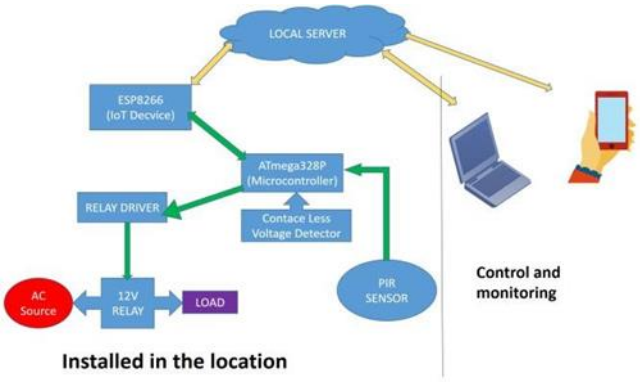
The existing system consists of GSM technology for the control of the switching relays and for control and monitor of the sensors in the remote location. Recent days of development of the technology implements the new technology known as IoT. Internet of Things needs a computer at the terminals for getting communication via the internet. Nowadays Raspberry Pi is used to configure IoT. It makes the system expansive and more complex to implement. The overall size of the system is larger on implementing IoT using the raspberry pi and other microprocessors and microcontrollers. This project deals with implementation of IoT technology by configuring ESP8266 as a server.

Drawbacks of Existing System

The various drawbacks of the existing system used for controlling the loads are,

- Not user-friendly,
- More Expensive,
- Operational Cost is more,
- Need for high-level microcontroller,
- Nonreliable,
- Needs internet connections,
- No frequent updates and responses,
- Not suitable for the local servers,

These flaws can be overcome by configuring IoT device as a server.

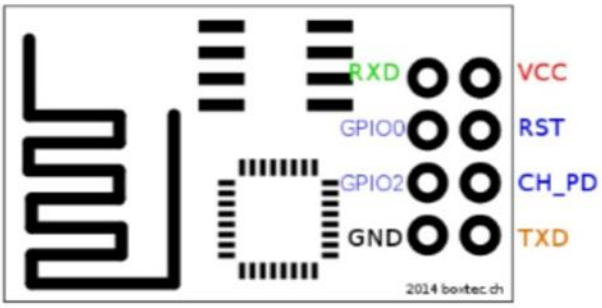


BLOCK DIAGRAM

4. COMPONENTS USED

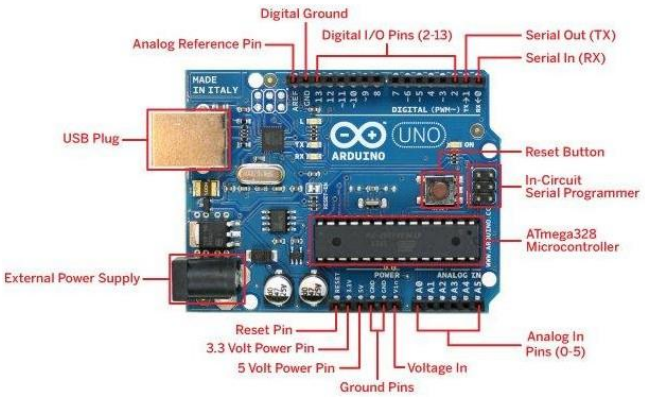
ESP8266, ARDUINO, CONTACT LESS VOLTAGE DETECTOR, POWER SUPPLY UNIT, PIR SENSOR.

A. ESP8266



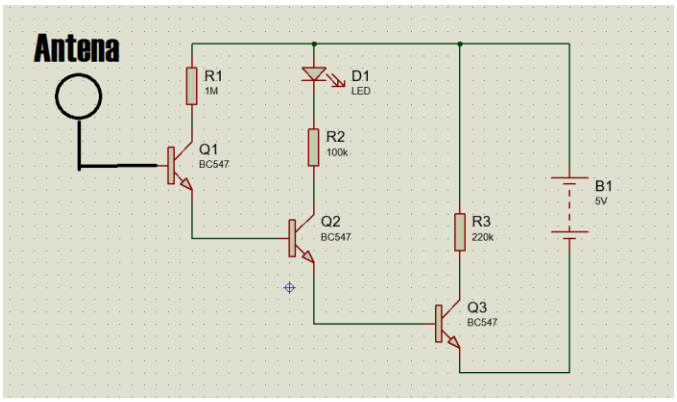
- RXD- Receiver pin,
- VCC- 3.3-3.6V supply voltage,
- GPIO 0- General Purpose I/O pin 0,
- GPIO 1- General Purpose I/O pin 1,
- CH_PD- Chip Power Down,
- RST- Reset pin,
- GND- Ground pin,
- TXD- Transmitter pin.

B. ARDUINO



The Atmel® picoPower® ATmega328/P is a low-power CMOS 8-bit microcontroller based on the AVR® enhanced RISC architecture. Execution of powerful instructions in a single clock cycle, the ATmega328/P achieves throughputs close to 1MIPS per MHz. This empowers system designer to optimize the device for power consumption versus processing.

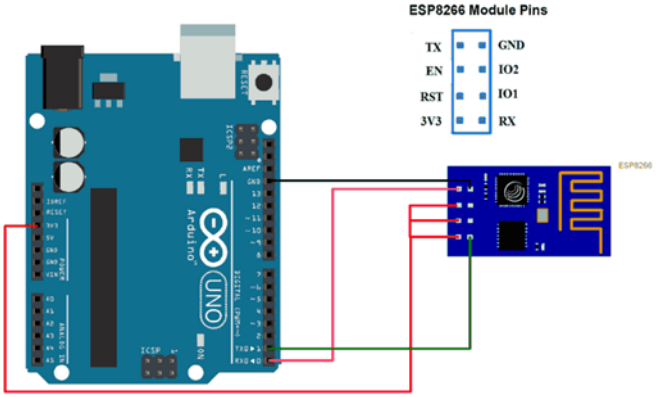
C. Contactless Voltage Detector



It consists of three cascaded BC547 transistors with led, battery and antenna arrangement as shown in the figure. It will sense the flow of electrical voltage as a result of self-induction of the coil which is mentioned as an antenna in this circuit diagram.

D. PIR - Proximity IR Sensor

5. CIRCUIT DIAGRAM



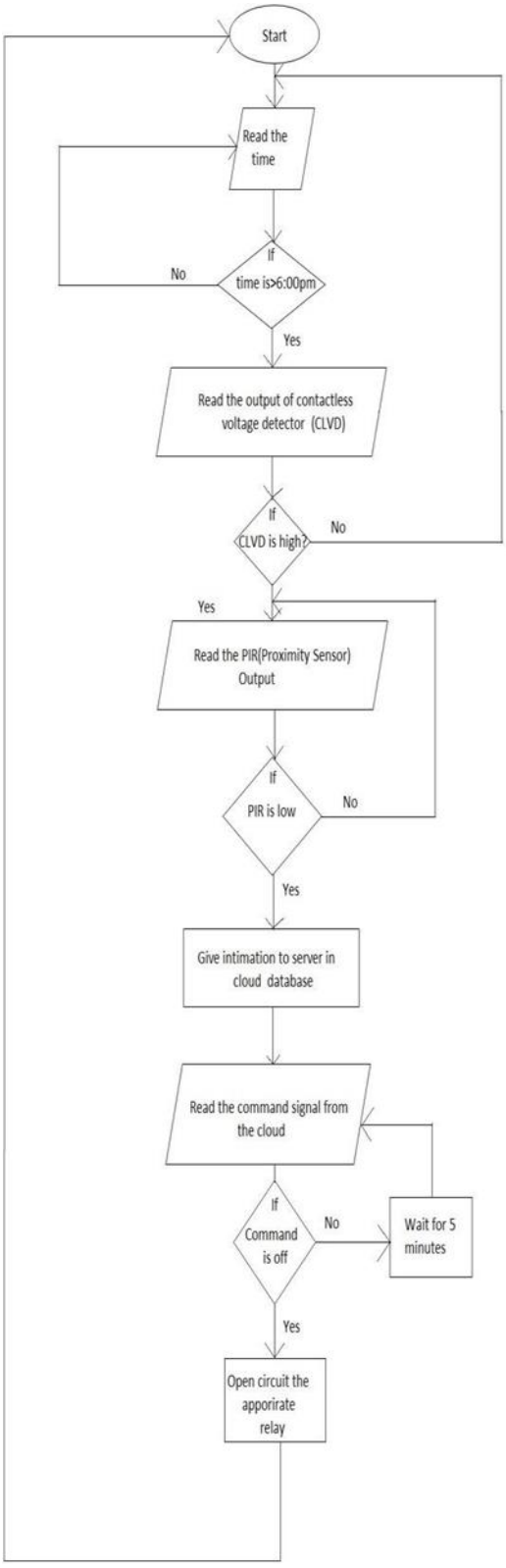
If the reset pin of Arduino is grounded, then the Arduino board acts as an SPI protocol mode to burn the developed program to the ESP8266 module. After done uploading then the GPIO0 pin is removed from the ground terminal to toggle ESP to the execution mode.

The Arduino is configured as slave mode in I2C communication protocol between the ESP and ATmega328P.
Since there are only two pins are available for the general purpose I/O in ESP, we need to make use of master-slave communication protocol in the system in-order to integrate more sensors and actuators in future requirement.
Software Tools Used:

- Proteus 8, Simulation Software
- DipTrace, PCB Designing Software
- Arduino IDE, Firmware Development Software
- xampp. Server Development Software

A. Flowchart and description

Start the process and read the time from cloud server system. Check the time if the time not exceeds the 6:00PM wait ideally and check the time again and again. If the time exceeds 6:00PM read the contactless voltage detector reading. If the CLVD value is low go to start, else if the CLVD value is high check the proximity sensor reading. If the PIR (proximity) sensor value is low, then give an intimation to the cloud server database. Read the command signals given in the cloud by the user from the control side. If the command is OFF, then open circuit the appropriate relay and go to the time reading stage. Else wait for 5 minutes and again ask the user for the command.



B. Working

ESP8266 is configured as a local server in this project because there is no need of internet for controlling the devices i.e. loads in the commercial buildings such as class rooms, hostels, and hotels etc., this ESP8266 server is connected with the WiFi network available in an organization. The ESP8266 is made to communicate with the ATmega328P microcontroller. The commands given to the server in the webpage is translated to the microcontroller simultaneously. By receiving the commands from the ESP8266 device the microcontroller reacted in the unique way given to it by the uno coding. The microcontroller will make a decision from relating themessage from ESP8266 and sensor data. It will activate or deactivate appropriate relay which is defined to the controller on the time of programming. Hence the appropriate unwanted loads can be disconnected from the supply. So, the wastage of energy can be saved by the application of this technology.

C. Merits

- No need of the internet connection for controlling and monitoring hence there by reducing the operational cost,
- The overall cost of the system is getting reduced since there is no need of high-level microcontrollers for IoT configuration,
- The configuration of ESP8266 as a server makes the overall system compact and cheaper,
- The system is more user-friendly since no need of an android application for controlling and monitoring the status of the loads in the installed location.

D. Future Scope

Since it is installed in class rooms, Students attendance register database and the faculty in charge details can be uploaded to this server which is more useful for ease of accessing in this digital world. It reduces the time and man work on doing the traditional method of taking the attendance on following pen and paper works. In the biomedical field, the heartbeat rate can be monitored frequently and is getting reported to the cloud database regularly. In case of any abnormal situations such as accidents, heart attacks, and any unwanted circumstances the heartbeat will go out of the threshold and maximum level. In that case, this IoT technology will make a call to the ambulance which is located nearer to the spot with the GPS location details. Hence many lives can be saved due to the proper and quick sharing of information via the internet.

6. CONCLUSION

Intranet of things can be implemented by configuring ESP8266 as a local server and is linked to the common wifi network in the organization. By using the IP generated in the device the connected relays and devices can be easily controlled without the need of internet. This makes ease of controlling and switching off unwanted power wastage in the commercial buildings. This system does not need internet connectivity hence the overall cost of the system is greatly reduced. This makes the system cheaper and more compact. In this digital world, this will play a major role in the field of automation.

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