



Zagazig University

Faculty of Computers and Informatics

Smart Lighting Poles Using IOT

Team member:

- Amr Rada
- Sohaila nasser
- Eslam Saber
- Amal fatouh
- Ahamed Abdelrahamen
- Mohamed abdelwaheed

□ ABSTRACT

Energy is an important source in human life and it is the cornerstone of achieving comprehensive development in all fields. All countries of the world seek to secure their needs from various sources of energy. Many problems can be appeared in any electricity system Such as electrical fires, electrical devices damage, excessive energy use, difficulties in detecting faults (damaged LEDs), In addition, there are much amount of electricity used by Searchlights in electrical poles and controlling the amount of electricity used by pole lightening system.

So we aims to make an integrated system that can monitor the network of electricity distribution poles that detects problems and takes a suitable action. The proposed system is based on small modules embedded with new technology of **Internet of Thing (IOT)**. These modules contain micro-controller in addition to a range of intelligent sensors and solar cells. The introduced system benefits from the Internet of things technology in connecting the lighting poles with a central computer. The central computer helps in the management of the electricity network in many areas, enabling energy saving and identification and analysis of the breakdown and faults. We seek to make rationalization of electricity consumption by using solar panels and solve most of the problems that can be caused by electricity such as fire outbreak, damage of electrical devicesetc.

□ INTRODUCTION

Our current world is witnessing many advances in all fields of life. From here, we seek to keep up with the times and use technology to solve the problems facing us. We have done an integrated system to connect the lighting poles through a network of Internet of things (IOT) that contain small Micro-controller In addition to a collection of intelligent sensors and solar panels.

The Internet of Things (IOT) is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. All the things that are being connected to the internet can be put into three categories:

- 1- Things that collect information and then send it.
- 2- Things that receive information and then act on it.
- 3- Things that do both.

The project aims to benefit from the technology of Internet of things in connecting the poles of lighting to a central computer (server) to assist the electricity company to monitor the network of Light poles, enable energy saving and identify and analyze faults.

First, for lighting: In many cases, its lighting is controlled by the people, which leads to forget it lit in the day or not lit at night. And to overcome this problem the project provide a solution by connecting the lighting control centrally through the server located on a distribution network electricity, which can be programmed automatically to control lighting times. These units can be used to reduce the intensity of light in peak conditions instead of extinguishing columns. The proposed units can detect damaged lamps and inform the company of their location and are considered

This feature is very important for highway lighting poles. Use solar energy for street lighting to save energy.

Second, for breakdowns: Many faults occur without consumers feeling like Low voltage or fuse, which over time lead to damage to electrical equipment and sometimes fires erupt. And by continuous measurement of the voltage of each light column the transmission of this information to the electrical control network can identify fault locations repair them before problems occur.

Thirdly, for the distribution of loads: the electricity network provides three power supply lines that are distributed electricity consumption of homes through which must be taken into account that the electrical loads are almost equal and not orphaned Load the line more than the other until there is a problem of low or high voltage. It is through measurement Voltage and current consumption per line and the transmission of this information to the electricity grid can be made decisions Suitable for redistributing loads correctly. It will also help identify the least font to be used to supply electricity to new homes.

Fourthly, regarding the reading of electricity meters: This is a problem that many citizens complain about.



METHODS

We have to go along several steps while building our system to achieve our system requirements which are:

- 1- **prevent electrical fires**
- 2- **energy saving**
- 3- **prevent electrical devices damage**
- 4- **detect problems source**
- 5- **detect if there are lose in electricity (electricity theft)**

- 6- control poles light
- 7- Measure the temperature, humidity, wind speed, pressure and other sensors that can help to detect traffic intensity
- 8- camera to secure the system
- 9- the system would be fast, cheap and secure

To achieve this requirements we use the ESP32 module that is the core of our system which has been programmed to make a connection between the poles. Each module is installed on the pole. Each module can work into two modes (access point/station). On system startup all of modules at the mode of access point. Each module have a collection of sensors that collect information about the pole. This network of modules take commands from the server and control the poles light and send data which are collected back to the server.



MATERIALS

- | | |
|-----------------------|------------------|
| 1- ESP32 Wi-Fi module | 7- LED |
| 2- Bread Boards | 8- wires |
| 3- Server | 9- potentiometer |
| 4- Acid Battery | 10- SENSORS |
| 5- Solar panel | 11- RESISTERS |
| 6- Solar charger | 12- Computer |

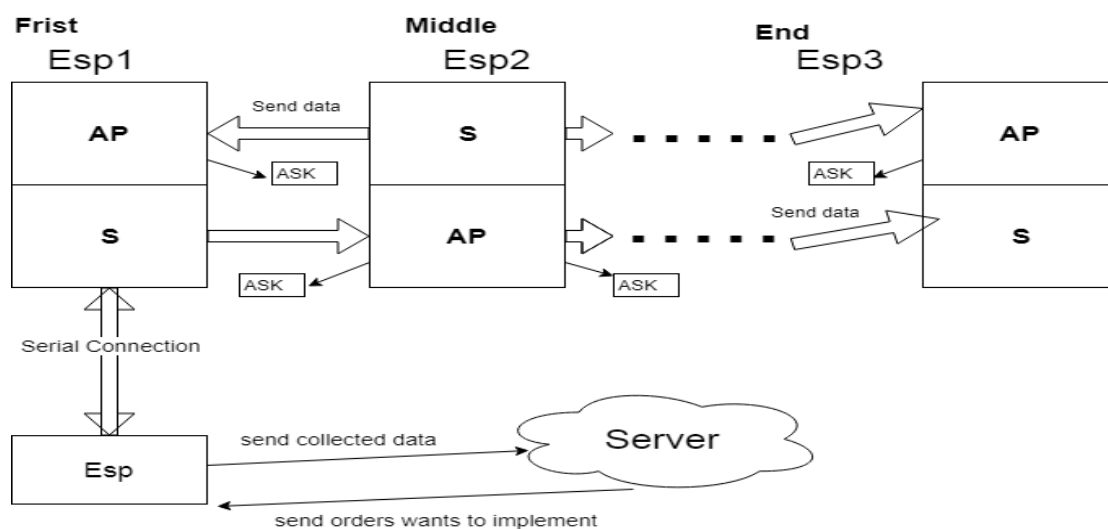


Figure 1: the connection between the network of poles

The first pole have two modules connected serially one of them operate as other module (access point /station) the second is connected to the server through GSM

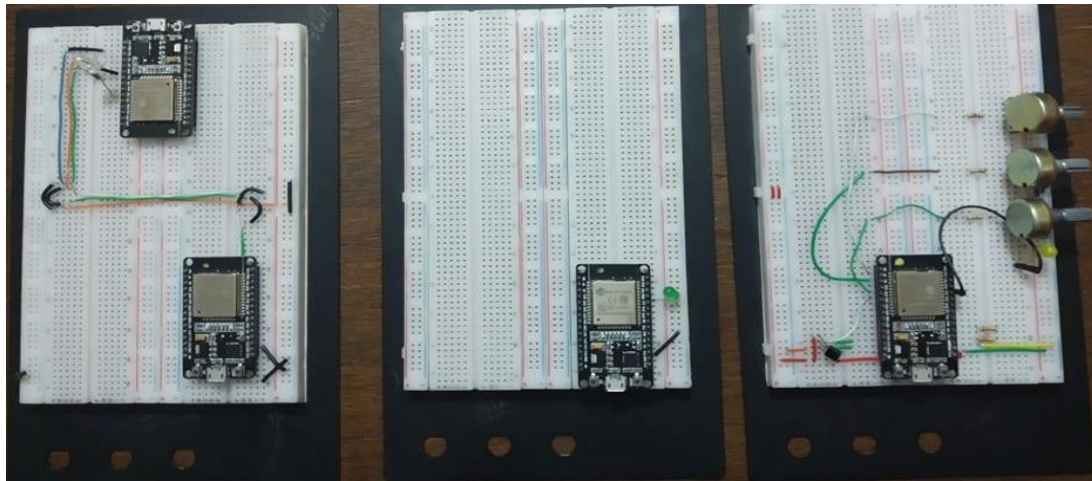


Figure 2: The first model that will be placed in the first pole (consists esp32 connect serially).

❑ **Method of work:** It depends on dividing the project into four consecutive stages

1- The first stage will be the construction of an initial model for the proposed unit and design. The protocols connect to a group of 5 unit of Internet of things and collect data in a module Centralized through the use (of Access Point / Station) Studying the efficiency of the connection in terms of the maximum distance of the link and ways to prevent penetration.

2- The second phase will include the addition of voltage and current sensors and the identification of the rest the sensors needed for the project and completion of the process of delivery and programming with the construction of a server program Simple to ensure that the reading process is completed correctly for five controllers.

3- The third stage will be where the main server program will be built to connect all modules Central (unit for each residential distribution area / street) with the addition of algorithms to control the Lighting and fault detection.

4- The fourth stage where you will add meter reading units and connect them to the nearest unit Lighting and adding the algorithms needed to compile these readings centrally.

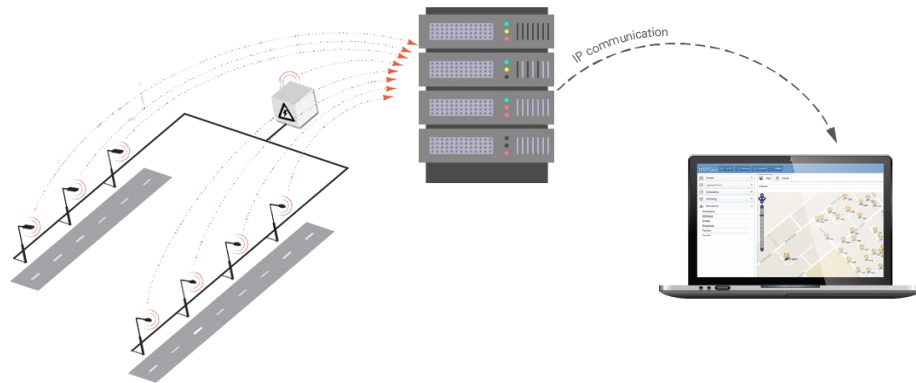


Figure 3: the technology of Internet of things in connecting the poles of lighting to a central computer (server) to monitor the network of Light poles, enable energy saving and identify and analyze faults.

The Web Site is built and programmed by php and contains 6 main pages : 1- Login 2- Map 3- Control

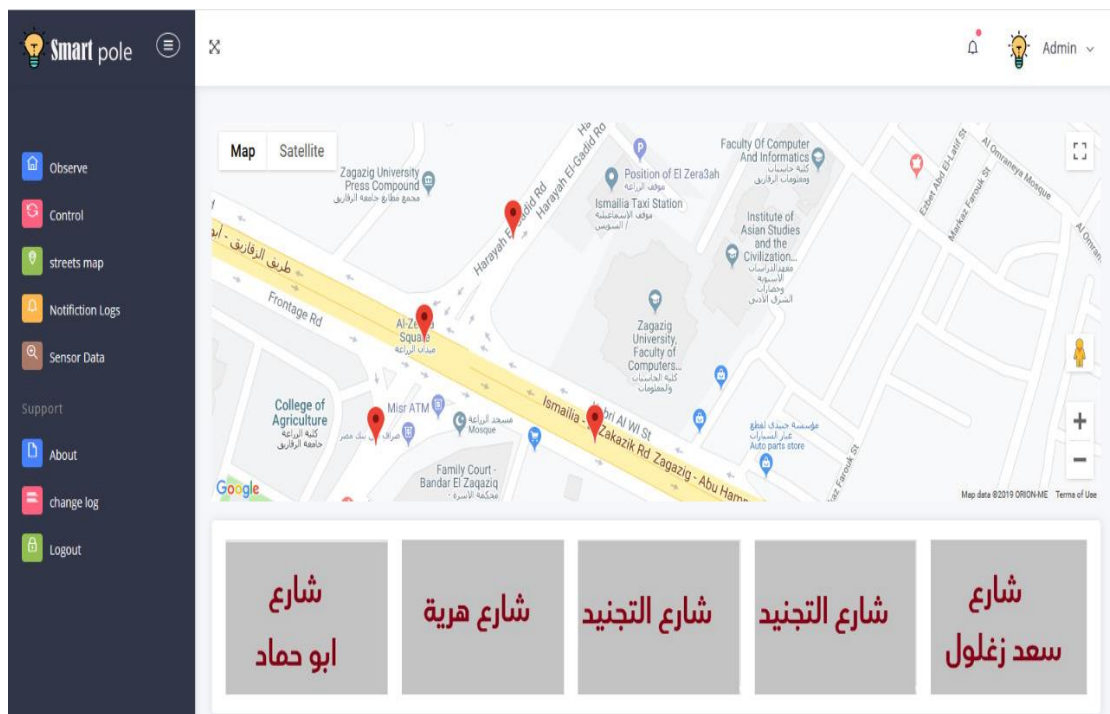


Figure 4: Map Page To Select Area

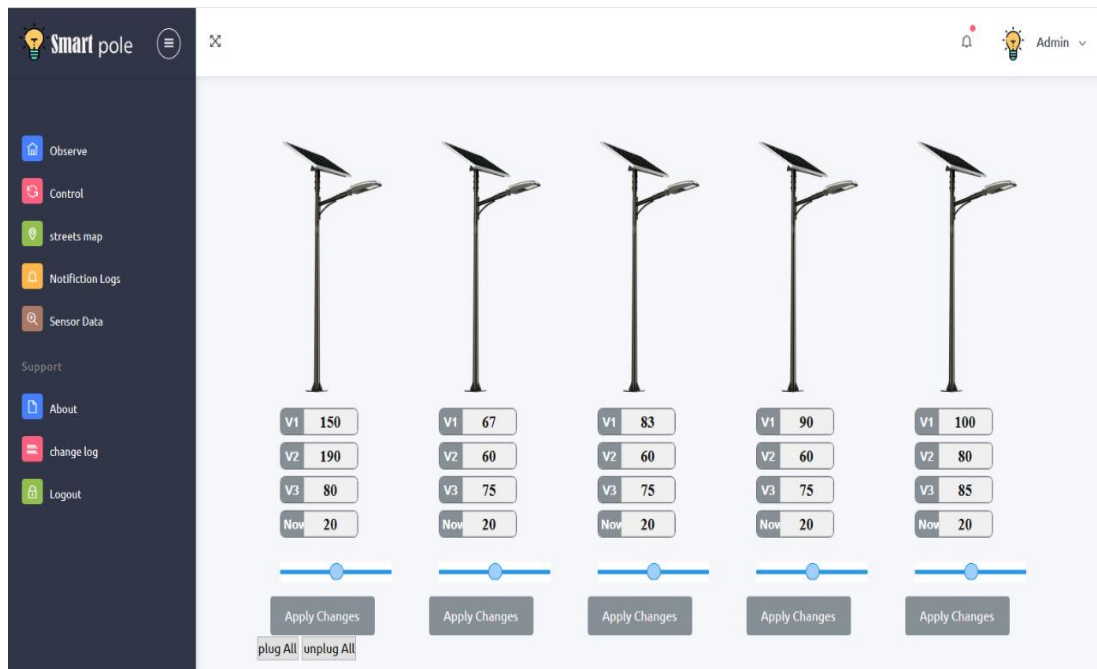


Figure 5: Control Page

The control page display the information about each poles in terms of the three voltage . and Through this information you can control each pole and take the action.

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