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Remote Device Automation Of Sprinklers

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Abstract: Internet of Things (IoT) conceptualizes the idea of remotely connecting and monitoring real world objects through the Internet. REMOTE DEVICE AUTOMATION automates specific devices like light and sprinklers, to reduce manual efforts. This IoT project focuses on building a smart wireless sprinkling system helping in monitoring the output of these devices based on external conditions. Regulating the amount of water dispersal by sensing the pressure of water supply. Using light sensors to regulate the light intensity of lights in the campus. This project specifically focuses on conserving energy and water resources by smartly monitoring the specific parameters like by scheduling the running time for sprinklers from wherever you want to control it with the help of application and also light intensity, soil moisture and Humidity in environment with the help of sensors and Node MCU-Esp8266 1266.

Keywords: IOT, Sprinklers, Automation, Node MCU.

I. INTRODUCTION

IOT or internet of things is an upcoming technology that makes use of internet to control/monitor electronic/mechanical devices, automobiles and other physical devices connected to the internet. IOT gives user the ability to control more than digital things easily through a comfortable GUI over the internet. Our research focuses on the use of IOT for home/industry automation and monitoring various physical parameters over the internet. This internet of things project have been proposed on existing system improvements and new innovative solutions to different problems. IoT is all about many physical devices interacting with each other. IoT will help the user to approach various applications in a smarter way which might be a smart home, smart agriculture, smart industries. The user can check the status of any resources in the network. Home automation is a technique to use computer or smart phone in controlling and monitoring Home appliances and Home features. It is not only about remotely controlling and monitoring the devices but directly controlling and staying connected with the home systems used every day via a mobile device would significantly enhance quality of life. A smart home can offer all of these comfort, convenience, monetary savings, and safety. We intend to develop this concept of home automation of devices by including automation of sprinklers as well. Our system consists of a distributed wireless network of LDR, moisture sensor, temperature sensor and ultrasonic sensor. These sensors send their data to the Node MCU-Esp8266 1266 to analyze. Main purpose of this project is to save the water and energy by controlling and monitoring the functioning of sprinklers and street lights on the campus.

A. Aim and Objective

- The objective of this project is to automate appliance such as sprinklers on campus.
- Our project aims at monitoring and controlling of concerning devices without physical presence or interventions, thus reducing manual efforts.
- Regulating the amount of water dispersal by sensing the moisture and humidity level.
- Using light sensors to regulate the light intensity of lights in the campus.
- To build an application that runs on the Node MCU-Esp8266 1266 and acts as an intermediary between the mobile device and the machine's hardware.

B. Problem Statement

As the problem of operating the process of sprinklers and lights manually is very time consuming and tedious and also the increasing advantages of automated system now are at highest position thus many manual processes are automated.

Remote Device Automation is IOT based application that allows the user to monitor and control of concerning devices without physical presence or interventions, thus reducing manual efforts. Our application will help in regulating the intensity and output of system according to the parameters such as weather, humidity and light, this will help in conservation of electricity and water.

The main objective of Remote Device Automation is to:
1. Reduce the human effort and time required for the working of sprinklers.

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2. Allow users to obtain a quick status of sprinklers and lights. The proposed system has a great flexibility by using Wi-Fi Technology to interconnect its sensors to the remote device server. This will decrease the deployment cost and will increase the ability of upgrading and system reconfiguration.

3. It will provide the logs in graphical as well as in table format in hours, weeks, months mode. This will help the user to analyze the usage of sprinklers and its working.

C. Scope

Te scope of the proposed system is automated controlling and monitoring the working of sprinklers and street lights. It is a newer and better approach which involves controlling the appliances by being anywhere you want making it more attractive. Using this application the user will save time as well as there will be less usage of electricity. The proposed system will be mainly used by Schools and College Institutes for their grounds and campus. Along with the Schools and College Institutes it can also be used by local people or any sports association for the automation of sprinklers.

II. LITERATURE SURVEY

Before actually starting with the work we went through various research papers. These included research papers on comparison between various algorithms that can be used, different components that can be used and various implementation details about automation of devices.
Following are some of the reference papers that we studied during literature survey. Table 1 shows the features and implementation details of studied published papers.

Table 1: Inferences from Literature Surveyed

Sr. no	Features	Advantages
[1]	• Controlling and monitoring appliances with Wi-Fi as communication aid. • Detecting appropriate time of water supply (sensing moisture level). • Communication of user with the system (SMS, Email).	• The paper presents a Home Automation System based on Raspberry Pi 3 and android device using Wi-Fi. • System consists of Raspberry Pi 3, camera, IR sensor, temperature sensor, gas sensor, LDR, relay circuit, android application and home devices.
[2]	• Uses computer and mobile devices to control home appliances through internet. • Employs the integration of the cloud networking, wireless communication. • Low cost & expandable.	• Connection through Intel Galileo to internet. • Analyzing data possible anywhere any time. • Use of sensors for automation. • Required data stored in cloud.
[3]	• Home automation system that interfaces with android mobile devices. • Simple and comfortable GUI.	• Operated with the help of Arduino. • System consists: a.Android application. b. Arduino UNO. c. Wi-Fi module d. Relays
[4]	• Detailed explanation about various methods that can be used for automation. • Comparison of all the systems that can be used. • Gives information about advantages & drawbacks	• Systems explained: a. GSM based home automation system. b. Bluetooth based home automation. c. Phone based home automation. d. Zig Bee based home automation. e. Wireless control systems.

III. PROPOSED SYSTEM

The proposed system of Remote Device automation is based on Node MCU-Esp8266 1266 and web application using Wi-Fi router. The main objective this system is to reduce the human effort and time required for the working of sprinklers by controlling them remotely. The figure shows the system architecture which consists of application on devices like tablet or smart phone, Node MCU-Esp8266 1266, different types of sensors viz. LDR sensors, ultrasonic, soil moisture and temperature sensors.

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Components Required:

i. NODE MCU- ESP8266 1266.
ii. Accessible WIFI.
iii. Sensors.
iv. Relays for connecting sprinklers with web application and Node mcu.
v. Mobile Phone or Laptop.

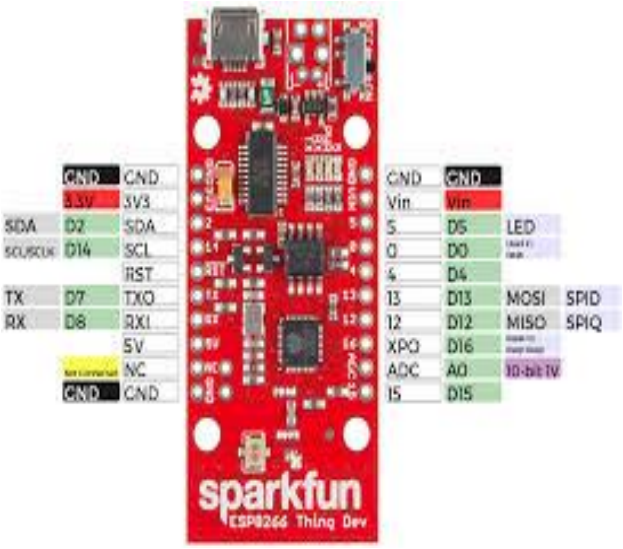

Figure 1. Node Mcu

IV. METHODOLOGY

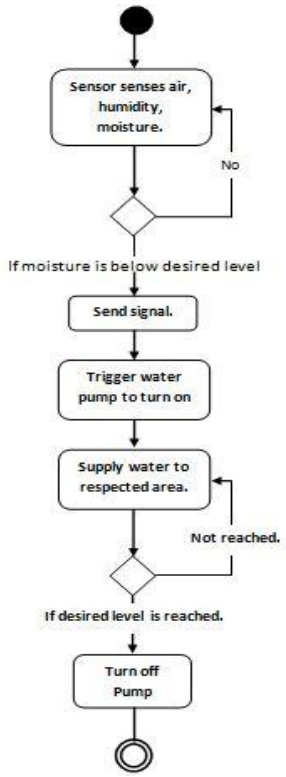

Figure 2 represents the working methodology

- Sensors senses air, humidity, moisture, if moisture is below desired level then node MCU-Esp8266 1266.
- Sent signal will trigger sprinkler to turn on.
- The water will be supplied to respected area, once the desired level is attained sprinklers will be switched off.

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ANALYSIS

Process Model Used:

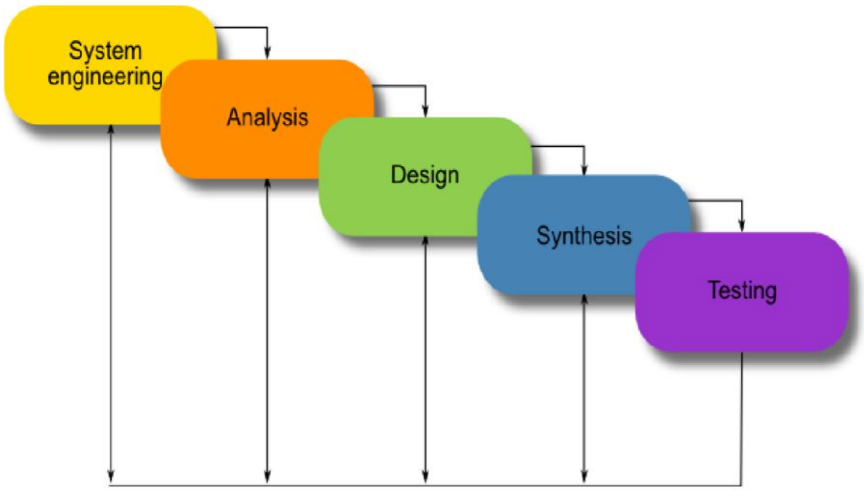

Figure 3. Waterfall Model.

1.System Engineering:

In the first phase of our project, we researched on the needs of a Remote Device Automation system. We established the functionality of the application. We clearly defined the scope of our application and the input and output of the system.

2. Analysis:

In this phase, we researched various papers and dissertations on the topic of Home Automation and Automation of sprinklers. We analyzed these papers and selected the processes and methodologies we would follow.

3. Design:

In the design phase we have defined the prime modules of the system and their functionalities. We definied how the system would be built and how the system will operate with particular emphasison hardware, software and user interface.

4. Implementation and testing:

Implementation is the most important phase of the project and also most time consuming. We developed each of the modules defined in the Design phase. We will also developed the User Interface for the application. Testing will be carried out in parallel to development.

5. Maintenance:

In this phase we will try to improve the software for a wider range of inputs and also extend the scope of the system.

II. WORKING PROTOTYPE

The system contains a built-in web page server that can be used to configure and monitor the system status from anywhere. Suppose the user turns ON the system, then the user must configure the settings by entering the Weather API key, zip code, web port, seasonal adjust according to user requirements. After this, the user has to schedule the timings of sprinklers on which days of week he requires to run the sprinklers and give the timings for each zone you have setup. If the user wants to run the sprinklers according weather conditions, then he has to turn ON the Weather Adjust. We can also manually control as well as quickly schedule of a particular zone of sprinkler. This system supports expansion zone board up to 15 named zones and enable them according to user requirement. In Logs, we can analyze the historic logs as well as current logs of running of sprinklers in Graph and Table versions. In Graph, we can analyze the working in hours, weeks and month mode. In Table, we can view the details of the scheduled time the user had set, actual time of sprinkler it ran, on which day the particular schedule was working of a particular zone. Automatic adjustment of intervals based on weather conditions (weather underground API). Weather conditions can be pulled from individual personal weather stations or from general weather data based on zip code.

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Working Output:

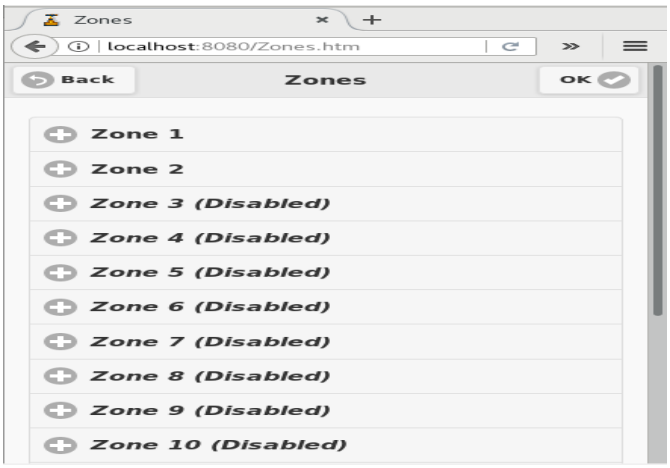

Figure 4. Distributed Zones

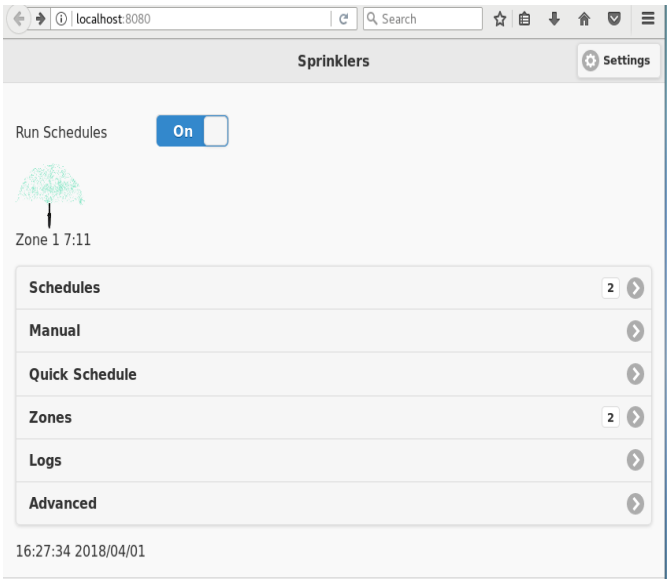

Figure 5. Manual

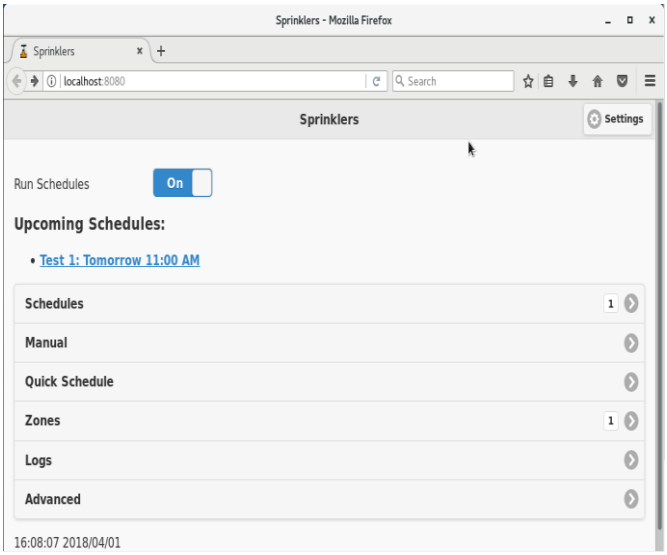

Figure 6. Schedules

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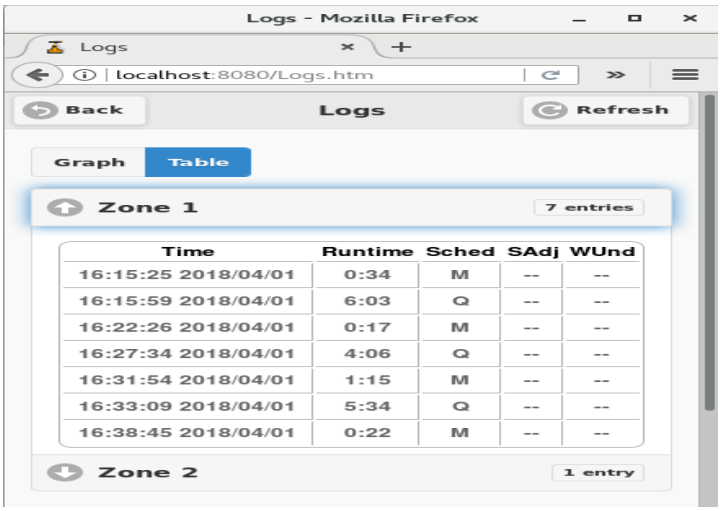

Figure 7. Zone Details

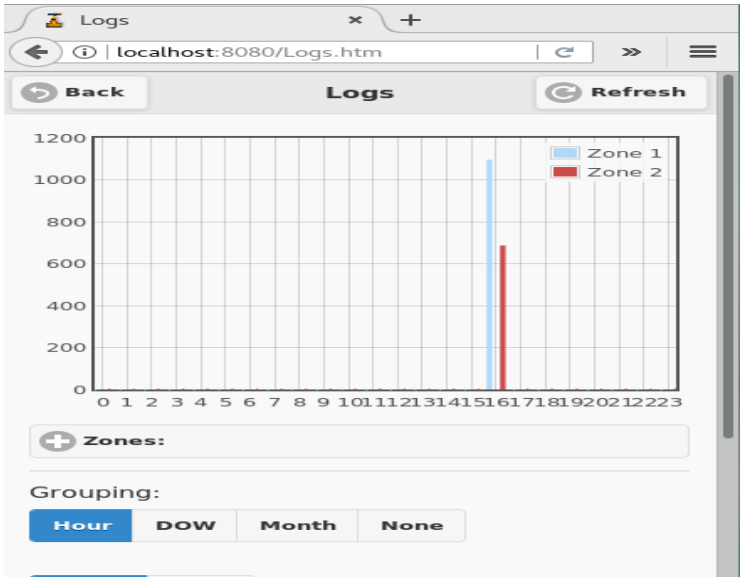

Figure 8. Logs in Graph mode (Hrs)

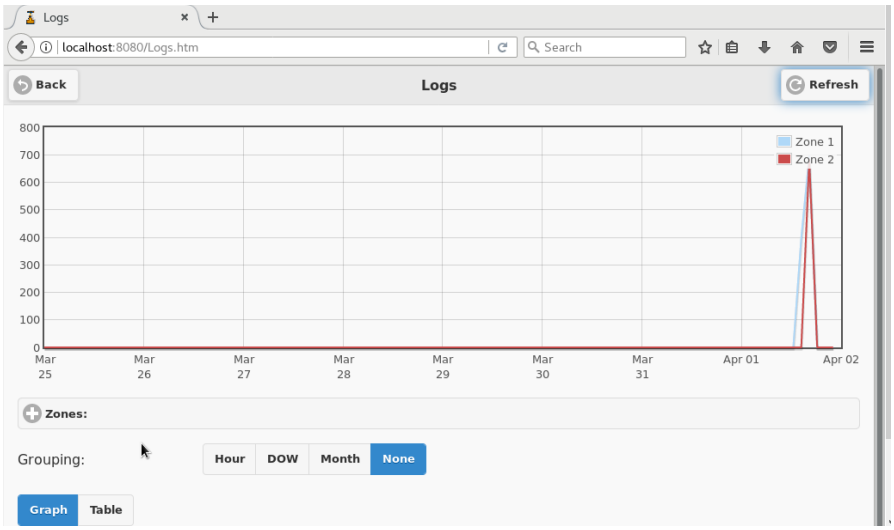

Figure 9. Logs in Graph mode

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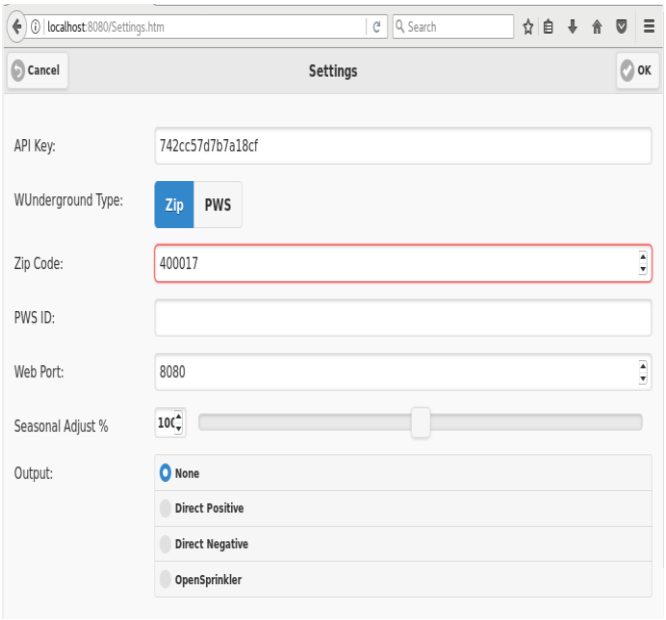

Figure 3. Settings Page

III. CONCLUSION

This project overcomes the drawbacks of traditional water sprinklers by increasing the efficiency of the sprinklers and reducing the manual efforts and water wastage.It can display full graphical feature of historic logs and has a very simple instalation. It can be used to provide scheduled control and operation. It alos has Seasonal adjustment and different distributed sprinkler zones.

VII. FUTURE SCOPE

As the system is dependent on the user's discretion and judge ability of the situation the use of a camera connected to the microcontroller might help in checking the working of sprinklers whether they are working properly or not. The captured picture of the intruder after face detection, can be mailed to the user. The user can further forward the same photograph to the police station if he wishes. Further the system may be made more synchronized by integrating the voice call feature within the same application through which the user can even control his sprinklers without any voice call being triggered to his phone. Also, the system can be further extended in controlling the various appliances like lights and fans.

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