"Bodh", BPIT's International Journal of Technology & Management
ISSN: 2454-8421, Volume 2, 2016, Page 28-32

Android Based Irrigation Application Home Genie

Pooja Mudgil [1], Prakhar Agarwal [2], Preksha Singla [3]
CSE/IT Department, BPIT,GGSIPU,
Rohini, Delhi, India
{engineer.pooja90@gmail.com [1], prakharagarwal76@gmail.com [2], prekshasingla@gmail.com [3]}

***Abstract*— The advancement in Automation Systems is making life simpler and easier. Everyday more and more people are getting connected to internet and hence there is a huge demand of internet based technology solutions. IoT (Internet of Things) is latest emerging technology trend that can share information and complete tasks when you are busy with other activities. Home Automation System (HAS) is a system that uses computers or mobile devices to control basic home functions through internet from anywhere in the world without user's own presence. It thus saves user's time and energy.In this paper we present a Home Automation System(HAS) that is used for watering the plants and gardens at home without user's involvement. The system is controlled by user through mobile application which is connected to internet and communicates through the server stored on cloud.**

***Keywords*—** Home Automation System (HAS), Internet of Things (IoT), Wi-Fi network, ESP8266 Micro-controller.

I. INTRODUCTION

Home Genie is an automatic irrigation system which switches the pump motor ON/OFF on receiving the signal from the user through android application. The advantage of using this method is to reduce human intervention and still ensure proper irrigation. This system is based on IoT. According to Global Standards Initiative on Internet of Things (IoT-GSI) IoT is global infrastructure for the information society that enables advanced services by interconnecting physical and virtual things together[7].

The application uses internet to send commands to irrigation system installed at home and hence can be controlled from anywhere in the world. Hence it greatly pull out the worries of plant lovers of not able to water their plants while they are somewhere else.

Application uses a master control feature that can be used at any time to switch water pump ON/OFF. This is very useful to users as they can operate the water pump at any time as per their need.

People in todays world have less time and are too busy in earning their livelihoods and hence have a tendency to forget things. Thus they want to manage their time efficiently by planning. Home Genie gives users this flexibility of managing their future watering by pre-setting Date and Timings for automatic irrigation. The application will automatically trigger the water pump at specified date and time and will notify the user for same.

Irrigation on a rainy day will not only result in wastage of water resource but can also lead to death of plants due to over irrigation. Keeping that in mind Home Genie uses smart weather feature that automatically cancels the preset watering if there is a prediction of good amount of rainfall and will notify user in case user himself starts the irrigation using master control.

II. RELATED WORK

The paper [1] provides a comparison between various Home Automation Systems and proposes the features for an ideal Home Automation System. The proposed system should be available to the user 24*7 and thus requires an internet connection. System should be easy to install and should have a web application and a mobile application. Adding new devices should be easy. All the above features will help establish the system commercially.

The system proposed in [2] uses various sensors like motion sensor,fire and smoke sensor, light sensor. It switches ON/ OFF devices based on the results from these sensors. The system uses cloud to store information about sensors for future analysis.

The system [3] is designed to assist handicapped and old aged people. It control various home appliances using Android device. The system has two main parts (home automation application and Arduino Mega ADK). User can send control signal to the Arduino from the application.

The smart home system proposed in this paper [4] uses technologies like wireless sensors, biometric, etc. Biometric is used as a key at the entrance, this provides increased security. .This system can be used as automation system in offices, clinics, and other places.

The system in [5] uses bluetooth technology to control the devices at home. The PC connected to bluetooth via the bluetooth module behaves as the client. It also ha sensors attached to it like light sensor. Light sensor can turn ON/OFF light based on the value it receives. It can detect other bluetooth devices in range and can check if these devices are working properly or not. The drawback of this system is low bluetooth range.

III. III. PROPOSED WORK

This paper proposes a model for home automation (specifically smart garden) that uses an application to control the ESP8266 to switch ON/OFF the pump located at a remote location. The system requires 24*7 internet connection and will help user keep check on their garden while they are away. The system will use an android application, a server and an ESP to perform the task. App uses the phone's internet connection (4G/3G/2G/EDGE or Wi-Fi, as available) to control the devices at home from anywhere, anytime. The app has preset options for setting time for future automatic watering and notifies when it automatically starts the pump. It also displays present weather conditions of specified location and has decision making capabilities as it can decide whether to switch ON the pump or not based on the weather conditions. It will send update signal to the server to switch ON/OFF the pump. ESP that is connected to Wi- Fi at home is checking the server periodically, will switch ON/OFF the pump connected to its I/O pins depending upon change in signal value received from the server. The system is intended to control devices at house garden with relatively low cost design, user-friendly interface and ease of installation. It is designed to assist and provide support to the user.

A. Features of Proposed System

- MASTER CONTROL- Allows to switch ONN and OFF motor.Overrides all other control requests
- PRESER TIMINGS- Allows pre-setting watering timings, the app will automatically switch ON and OFF the motor on specified times.
- WEATHER- The application provides weather information for specified location.
- SMART CONTROL-The app automatically uses the weather information to control the preset options, i.e., the app will not switch ON the motor if there is heavy rain in specified area.
- SERVER- The server relays information between the devices at home and the android application.

IV. IV RESULTS
V.

The proposed model in shown in figure 1 where there are mainly three components connected together through internet. These include an android application, ESP micro controller and cloud server. The Application is running on mobile phone and will be available to users. Second is the ESP micro-controller which is installed in the homes. This micro- controller circuit will connect to internet through wireless router and will continuously listen to signal from server. Lastly there is a database implemented on server stored on cloud. This database is queried through application by the user.

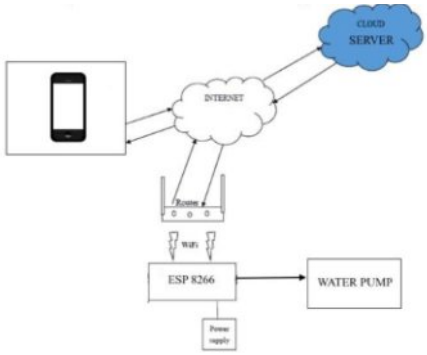

Figure 1. Proposed System Overview

A. Android Application

Figure 2 Home Genie Android Application

An android application made using Android Studio IDE. This application connects to internet and send signal to query the database which is saved on cloud. The signal sent is either 0 or 1 to switch OFF and ON the ESP respectively. Application offers features such as maser control that is used to trigger the water pump any time and overrides all other requests. It gives an option to add preset timings for automatically querying the database at set Date and Time saved by user. It will push notifications to notify user at such an event. Application also presents weather forecast with precipitation value for that day and will automatically cancel any preset watering if good amount of rainfall is detected.

B. ESP 8266 Circuit

The ESP8266 is a low-cost Wi-Fi module that provides MCU capability and full TCP/IP stack.

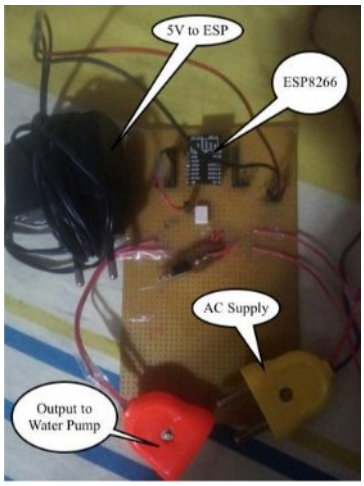

Figure 3. ESP Circuit Setup

ESP circuit is set up as shown in figure 3. This ESP is connected to internet through wireless router and continuously listens for signal from the server. A signal 1 turns ON the LED on ESP and sends a signal high to its GPIO5 pin which then completes the AC circuit of water pump made using a TRIAC and hence the water pump starts. On the other hand a signal 0 from server tells ESP to give a signal LOW on GPIO5 pin that in turn opens the circuit of water pump. ESP is provided a 5V AC supply which is regulated by a voltage regulator to regulate it within a range of 3.5 V.

C. Database on Server

A database is created on the server which stores value 0 or 1. This database is queried through the application by providing the url of script files written in PHP which are used to manipulate data on database. Two script files in PHP are implemented for data querying, one to update value on database when queried by application and other to get the current value (0 or 1) from the database to be used by ESP.

On startup the application shows the current status of water pump by querying the server. The water pump can be switched ON/OFF anytime through this master control option.

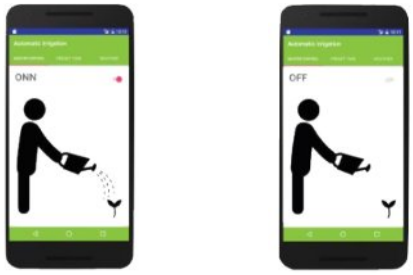

Figure 4 Master Control Feature

Application provides a feature to add preset timings where user can set date and time and application will automatically turn ON/OFF the water pump at that time. These set timings can be set on and off just like an alarm system.

Fig 5. Preset Time Feature

Application provides weather information for the current day so that user can decide weather to irrigate or not. Application also has a smart decision feature that will automatically cancels the watering in case any preset timing is saved for a day when there is good amount of rainfall.

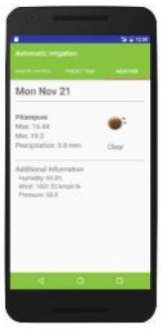

Figure 6 Weather Forecast Feature

VI. VI. CONCLUSION AND FUTURE SCOPE
VII.

A. Conclusion

The system for home automation (specifically smart garden) is designed. The system has been experimentally proven to work satisfactorily. It uses an android application to control the ESP8266 that switches ON/OFF the pump located at a remote location through internet. The designed system not only controls the pump but also has decision making capabilities i.e., based on weather conditions it can decide whether to switch ON the pump or not (the preset option is influenced by the decisions).

B. Future Scope

In future, the system can be extended to Complete Home Automation and Security. The ESP Module can be used to trigger any device and this concept will be used to extend the project to Home Automation. We will also try to find a way to increase the number of outputs as the ESP Module provides 6 Input Output pins, we will have to interface it with some other micro controller to increase the number of outputs. Different types of sensors like light, fire, heat etc can also be added. These sensors will increase the decision making power of the system.

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