

# Controlling and Monitoring Ornamental plants by using IoT with GPRS

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## ABSTRACT:

Ornamental plants are the plants that are grown for decorative purpose in gardens and landscape design projects, as houseplants and specimen display. Android-based mobile app is developed that helps the user in maintaining ornamental plants remotely. This application can facilitate the users to control and monitor the treatment of their ornamental plants anytime and anywhere. Another function of this application is to give the user full control in doing treatment of plants remotely such as plants watering, water tank refill and turning on/off mode of the automation system. User can perform monitoring functions such as displaying information about environmental conditions around the ornamental plants and displaying the log history of plant care has been taken.

**Key words:** Mobile application, monitoring, weather services, low power design and IoT technology.

## INTRODUCTION:

Nowadays, a technology that we believe could play a pivotal role in creating a more advanced automation system is a smartphone. These devices have rapidly become the primary main computing device for many people all over the world because of its mobility. As every plant needs water and nutrition, an automatic watering system that uses humidity and moisture calculation is needed. RTC (Real-Time Clock) could be used for watering, but it is inefficient and dangerous for climate change. Alternatively, a water pump and moisture sensor can be used to compensate the watering problem, although it is still uncontrollable.

To overcome this problem, a mobile controlling system is one of the solutions to monitor and address the efficiency issues. Furthermore, a system that provides controllability can produce a system that runs automatically. However, it tends to be more

flexible, versatile for climatic change and rely on everyday devices.

### The fundamental of the system work:

Ornamental plants also play an important role in reducing air pollution which makes this kind of plants suitable to be grown in urban areas. The house yard is usually the most common place used as an alternative place to plant the ornamental plants. The owners' limitation in taking care of the ornamental plants can cause the ornamental plants to die since they are not treated properly. So, that is why technology is needed for controlling and monitoring plants remotely. Moreover, the environmental conditions which are affected by the climate are one of the issues in growing the ornamental plants.

In this project mainly two technologies are used. They are Internet of Things (IoT) and android mobile application. This application can facilitate the users to

control and monitor the treatment of their ornamental plants anytime and anywhere.

The function of this application is to give the user full control in doing treatment of plants remotely such as plants watering, water tank refill and turning on/off mode of the automation system. Android app is developed for control (hard-control & soft-control purpose) and monitor smart home environment with, simple GUI, low complexity program design, low cost, low bit stream data, efficient data communication, low power consumption and its testing with several schemes.

The remaining of the paper is discussed as mentioned below: Section II addresses about the related work, Section III addresses about the proposed system and block diagram, Section IV addresses about the system structure, Section V addresses about the system hardware, Section VI addresses about the system software, Section VII addresses about the implementation and results whereas Section VII address about the conclusion.

## II. RELATED WORKS:

### Short Messaging Services (SMS)

It sends a text that contains certain characters representing a command to the receiver. The GSM receiver receives the message, decodes the transmitted character then sends the extracted command to the microcontroller which attached various actuators to immediately execute the command. Some drawbacks by using this system are: operating costs, time delay.

### Bluetooth

In this technology, range is the main disadvantages. The maximum range of Bluetooth is 100 meters which means the user

can only perform the controlling and monitoring treatment of the ornamental plants if the user is at home or in a distance < 100 meters. This is not effective for urban citizens who are often miles away from their plants.

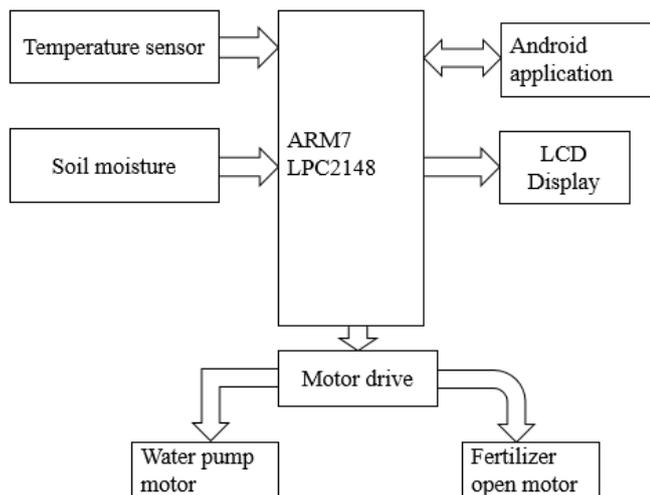
## III. PROPOSED SYSTEM:

In this system the user's command will be transmitted through android app and monitoring through IoT, so the user can send plants care command remotely anytime and anywhere. it uses some hardware components which includes ARM7 LPC2148, LCD, Motor pump, relays, sensors.

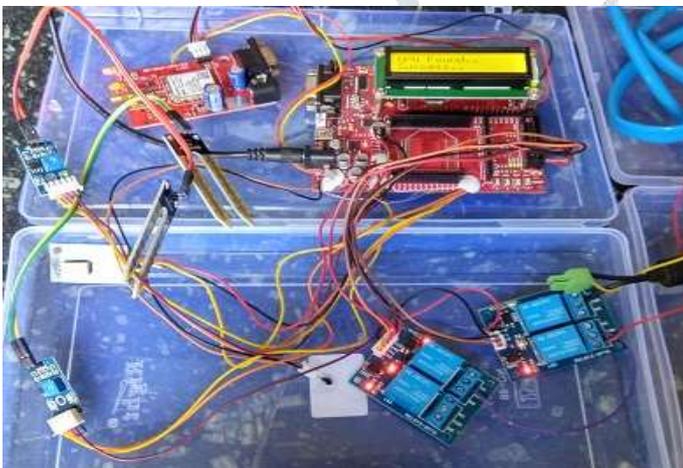
The system includes more advanced feature such as giving the user flexibility to arrange the plant care setting as he preferred or the ability to provide list of options that user can freely choose before doing manual control. From the side of the system, the previous research related to plants automation system does not involve fertilizing, whereas fertilizing the plants is as important as watering the plants.

The mobile application is integrated with the automation system and the created service-side. Any command that the user instructs through the application is then stored in the database. Internet of Things (IoT) platform used is Things peak. This serves to store the sensor readings that is attached to microcontroller and uploaded by the Wi-Fi module, results of these sensor readings will then be displayed on the Android applications. Advantage of using this communication system design is mobile application users are not bothered by the obligation to know the IP address of the Wi-Fi module that can dynamically change because it is already handled by the web service API. Both the microcontroller device and the user smartphone must be connected to the Internet.

## Block Diagram:



## IV. System architecture Design:



## V. SYSTEM HARDWARE REQUIREMENTS

In this project hardware components which includes ARM7 LPC2148, LCD, Motor drive, relays, sensors.

### ARM7LPC2148

ARM is computer processor based RISC architecture. A RISC-based method implies that in the design ARM processors need few transistors than normal processors in

ordinary computers. This approach reduces heat, costs and power utilization. The power utilization of arm is low which made them extremely famous. The ARM architecture (32-bit) is the most broadly used design in mobile phones, and most 32-bit one in embedded frameworks.

The LPC2148 microcontroller has ARMv4T architecture and ARM7TDMI CPU.512KB of the flash program and 32KB of static RAM are available. Due to their low power utilization and little size, LPC2148 is used in many embedded applications.

### LCD:

LCD full name is Liquid Crystal Display. It is used as a flat display in digital watches, cameras and interfacing into the portable computers. In this project and 16x2 LCD display is used. An LCD of 16x2 can display 2 line with 16 characters on each line. It is used to display the received data from ARM7. LCD can perform the some functions such as display characters, numbers, special characters and ASCII characters etc.

### RELAYS:

A relay is an electromagnetic device that acts as a switch. It is used to drive the load (solenoid valve) connected to the output of relay.

### SENSORS:

A sensor is a device that detects and responds to some type of input from the physical environment. The specific input could be light, heat, moisture or any one a great number of other environmental phenomena.

### Motor drive:

In motor drive 12 volt solenoid valve which acts as an actuator to open or close the

water/fertilizer pipeline. Microcontroller serves as the main unit of instruction processing used to run and execute the user-given instruction.

## VI. SYSTEM SOFTWARE:

This project uses software tools and languages. Software tools are Kiel UV Compiler, ORCAD, and Flash Magic. Keil UV compiler is used for ARM code development, converts the embedded C code into assembly code and then as HEX file. ORCAD for using schematic development and Flash Magic tool for using Firmware uploading or dumping (.hex file) into the ARM7 microcontroller.

### Languages:

The Embedded C is a set of language used for kit development and ARM processor coding. PHP and HTML language for creating internet websites.

## VII. IMPLEMENTATION AND RESULTS:

All the authorized information about the plants is stored in the data base in mobile application. This system consists of three levels. Each level can accommodate three ornamental plants. Each level has a dedicated pipeline above it with the purpose of water or fertilizer can flow to a certain level. This mobile app will display the environmental conditions parameter loaded from the user-selected Things peak channel ID which contains user's various sensor readings that are attached to the system. Users are able to check the environment condition effortlessly.

This developed program is successfully burnt into the arm7 board using USB programmer.

**Step1** The sensor senses the parameters and sends the analog signal to the microcontroller.

**Step2:** The MCU converts the analog signal to digital and process the parameters.

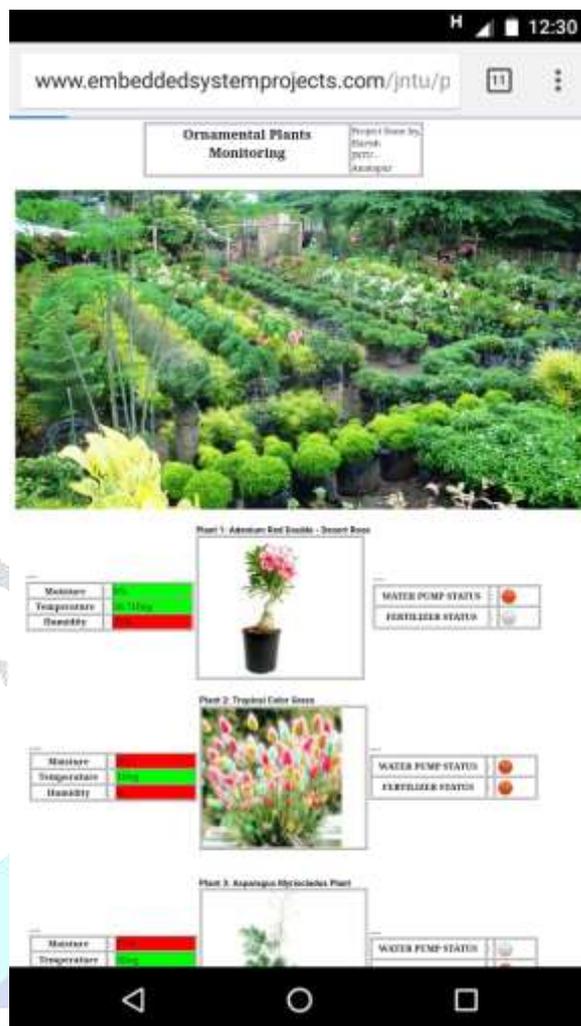
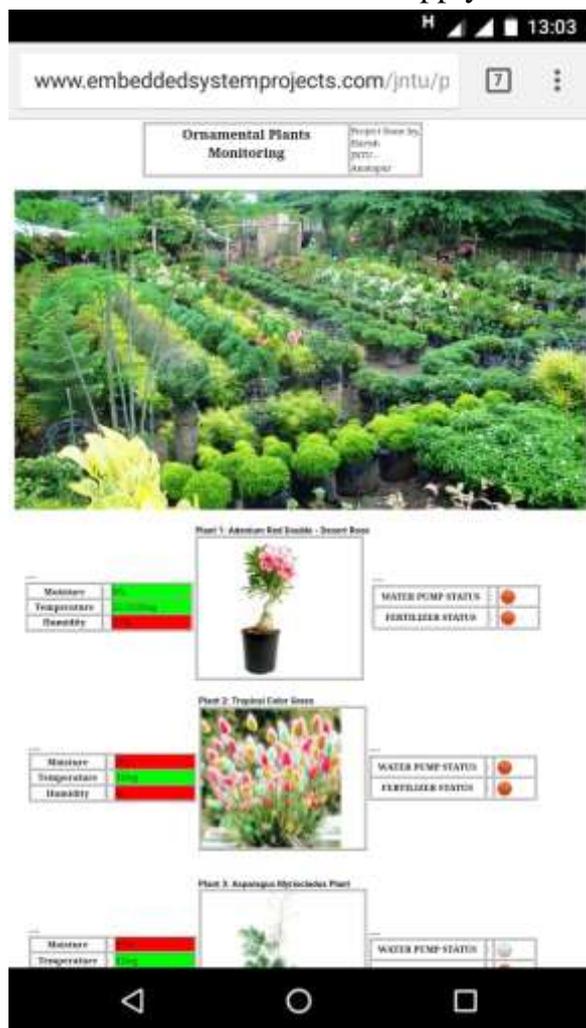


**Step3:** If temperature is more and soil moisture is low then the MCU switch ON the water motor.



**Step4:** Based on timely manner or remote control manner, MCU switch ON and OFF the

fertilizer motor to supply fertilizer.



**Step5:** All the information's of temperature, humidity, soil moisture, water ON/ OFF status; fertilizer supply status is send to the cloud.

**Step6:** From cloud all the parameters can be monitored by IOT and mobile app.

**VIII. CONCLUSION:**

This project implements Internet of Things (IoT) concept, users can control and monitor the system from anywhere and at any time using their smartphone through the internet. Depending on test Results, this application can run well, function according to its design and is able to help urban citizens who have limited land space and limited spare time for controlling and monitoring their ornamental plants remotely.

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