# IoT based Medicinal Plant Farming using Wireless Sensor Network

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***Abstract***: **Implementation of IoT based medicinal plant farming technique which increases the nutrition and growth of the plant is discussed in this paper. For different plants/herbs the temperature and other environmental requirements are very important so in this paper we are using WSN technology like GSM and IoT to develop a system which helps us to grow the nutritious herbs. Renesas microcontroller and Android application are used for processing and retrieval of required data.**

***Keywords***: **Medicinal plants, temperature, WSN technology, IoT, Renesas, Android.**

## 1. Introduction

Almost from medieval times, medicinal plants are revered with at most reverence, Ayurveda is an alternative medicine system of Indian subcontinent. The word ayurveda is from Sanskrit which means knowledge of life and longevity. Ayurveda therapies have varied and evolved over more than two millennia. The therapies include herbal medicines, special diets, meditation, yoga, massage, laxatives and medical oils. The herbal plant benefits have been moderated by the modern world. The geographical location and other factors like soil moisture, temperature play an important role in the growth of nutritious medicinal plants which can be used to extract most necessary medicinal properties in order to prepare many medicines using tulasi, mint and turmeric. This paper focuses on the growth of these medicinal plants using wireless sensor network and IOT. In today's world, due to pollution and other environmental factors people are suffering from many diseases. The use of allopathy is there everywhere but the side effects associated with these medicines are more. So, we might choose alternatives like ayurveda which might give us a slower relief but a complete one. Nowadays pharmaceutical industries have understood the value of ayurveda and have started preparing cough syrups by using tulasi.

Few medicinal plants are available in many inner regions of western ghats which are very beneficial and yet to be discovered. From ancient times the use of medicinal herbs is given more importance so we need to understand the value of these plants and use it for our own benefits. In India we have ayurveda society which tells us that ayurveda is still there and important. For humans to reach certain hilly regions it's not possible so we are not able to get benefits of many plants.

A wireless sensor network is a network which contains a distributed independent sensor that are meant to monitor physical or environmental conditions. A WSN consists of a set of connected tiny sensor nodes, which communicate with each other and exchange information and data. These nodes obtain information on the environment such as temperature, moisture, sunlight or the levels of water, and send this information to base station in this case application. And because of their low cost the wireless sensor network gives us a great benefit. Early sensory units were expensive and lacked the computational and communicational capabilities of current smart sensor nodes, which can now sense, process, store, and forward data, all being powered by a battery. In this paper we are using WSN to grow the herbal plants.
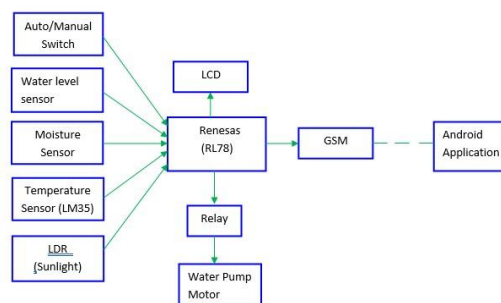
## 2. Methodology



Fig. 1. Block diagram

The setup consists of Renesas microcontroller connected to android through GSM. The sensors like temperature, moisture, LDR, LCD, Relay are connected to Renesas. Temperature sensor is used to sense surrounding temperature. Soil moisture sensor is used to check the moisture content in soil.

LDR is used to give updates regarding sunlight. The information from the above sensors is checked and if the threshold values are not reached the relay is turned on which turns on water pump.

The data from above sensors are sent to the ADC in Renesas and the obtained digital values are displayed on the 16*2 alphanumeric LCD. The GSM is used to send all the updates to application The threshold values preset according to the plant requirements. Water level sensor is used to check the water

level in the container and irrespective of the moisture condition when the test code is checked the water pump will switched on hence the small amount of water gets pumped. After this initial condition the moisture level is checked if the moisture content is below preset threshold value the water pump will turn on and pumps the water until it reaches the threshold value. Along with these other conditions like temperature, sunlight values are updated on the LCD screen and application simultaneously.

## 3. Implementation

### A. Hardware Specifications

- Renesas Microcontroller RL78
- Temperature Sensor   LM35
- Soil Moisture Sensor   LM393
- LDR
- LCD
- GSM Module
- Relay
- Water Pump

### B. Software Specifications

- Cubesuite+
- Renesas Flash Programmer
- Android SD

### C. Renesas Microcontroller

Renesas microcontroller of board RL78 with chip of R5F100LEA which provide us more features than its own family of 8051 microcontroller. some of the features of Renesas microcontroller are, it provides us the ROM  64KB, RAM 4KB and Data Flash 4KB, it has High speed on-chip oscillator, Self-reprogrammable under software control, 58 GPIO's, 3 UART's, Simplified I2C, 10-bit resolution ADC, 28 Interrupt Sources, ISP programming support etc. Here the microcontroller acts as the heart of this project by controlling the whole system.

### D. Android

Android is a mobile operating system based on a modified version of Linux kernel and other open-source software, designed primarily for touchscreen mobile devices such as smartphones and tablets.

### E. GSM

Global System Mobile Communication is a standard developed by the European Telecommunications Standards Institute to describe the protocols for second-generation digital cellular networks used by mobile devices such as mobile phones and tablets.

## 4. Results

A technique to grow nutritious plants is implemented successfully, by providing suitable temperature and moisture conditions. The data updates like temperature, moisture, sunlight are sent to the applications through the GSM, and the received data can be stored and old compared data can also be

deleted if it is not required. The Figure below shows the data stored in application.
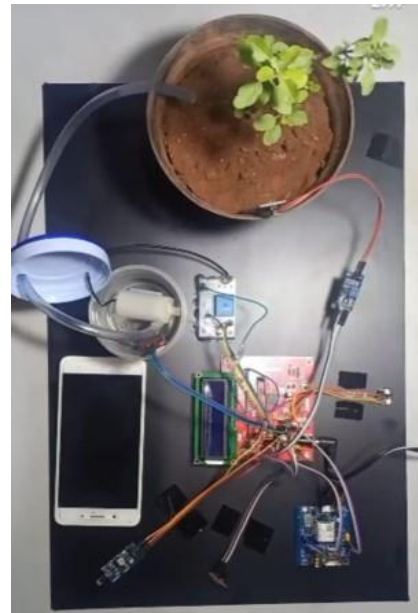

Fig. 2.  System setup


Fig. 3.  Application

| perat | Moisture | Sunlight | WaterLevel | Pump | Control | Dates | Times | Action |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | 338 | 499 | 0 | 0 | 0 | 17/5/2022 | 16:07:19 | DELET |
| | 335 | 499 | 0 | 0 | 0 | 17/5/2022 | 16:09:35 | DELET |
| | 334 | 499 | 0 | 0 | 0 | 17/5/2022 | 16:09:40 | DELET |
| | 336 | 499 | 1 | 0 | 0 | 30/5/2022 | 19:17:23 | DELET |
| | 327 | 499 | 0 | 0 | 0 | 30/5/2022 | 19:19:09 | DELET |

Fig. 4.  Stored information in the application

## 5. Conclusion and Future Scope

In this research paper, we are proposing a method to grow plants by providing proper weather conditions like temperature and sunlight with required amount of water supply, and this data

can be displayed by using LCD and simultaneously we get the data updates in application through GMS for further comparison. We can use digital image processing and other related technologies to identify the decaying, drying or dead leaves, so that we can grow a healthy and nutritious plants/herb.

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