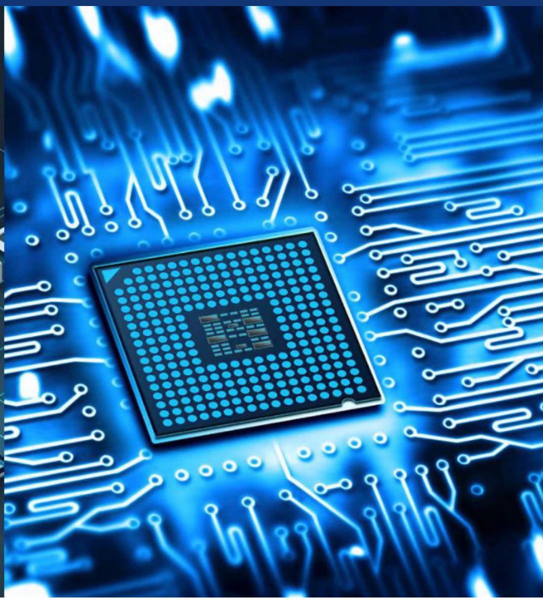
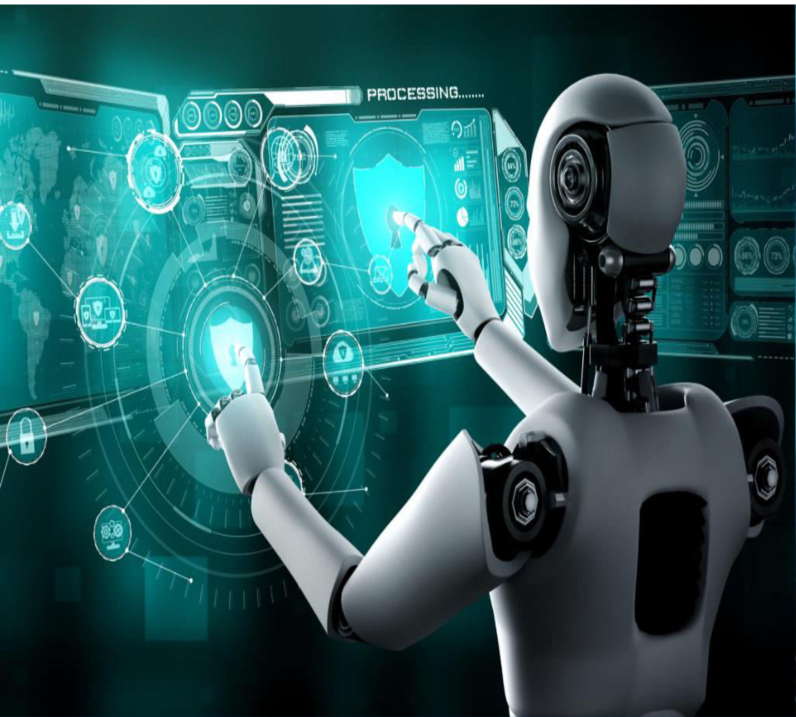
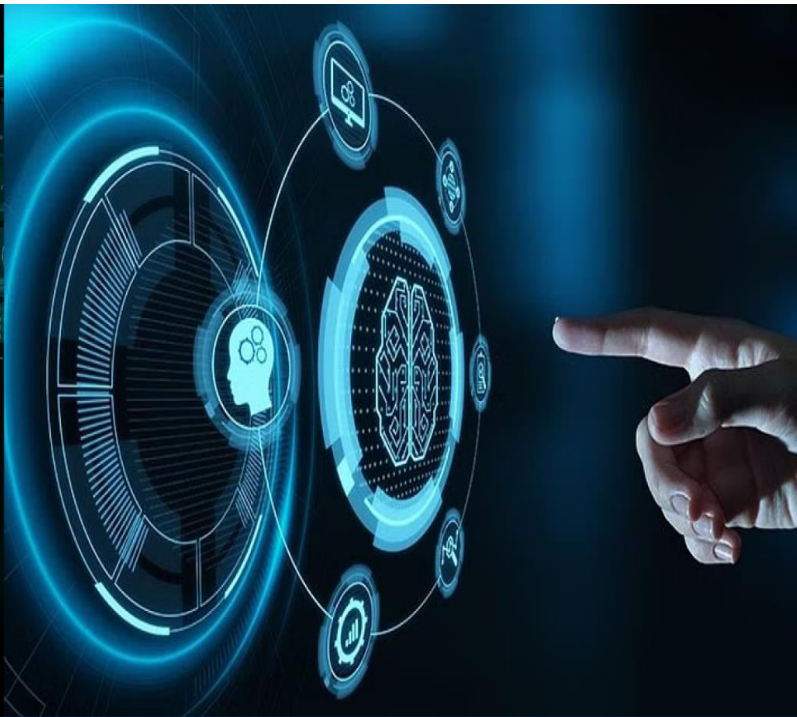
ISSN(O): 2320-9801
ISSN(P): 2320-9798


International Journal of Innovative Research in Computer and Communication Engineering

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)





Impact Factor: 8.771

Volume 13, Issue 4, April 2025

www.ijircce.com | e-ISSN: 2320-9801, p-ISSN: 2320-9798| Impact Factor: 8.771| ESTD Year: 2013|

International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCE)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

Green City: Tree Plantation and Monitoring System

Priyadharshini. S, Preethika. T, Dr. S. Maheshwari

III B.Sc., Department of Computer Science, Dr. N.G.P. Arts and Science College, Coimbatore, India

Assistant Professor, Department of Computer Science, Dr. N.G.P. Arts and Science College, Coimbatore, India

ABSTRACT: Cities are densely populated zones of human civilization, and the conflict between urban growth and resources and environment has become more pronounced. The ineffective utilization of energy and land resources, scarcity of water resources, and environmental degradation are endangering the healthy advancement of cities. Given the rapid population growth, accelerated urban development, and shifts in the environment, robust management of trees and vegetation is essential now more than ever. We introduce an Internet of Things (IoT)-based intelligent tree management framework for urban areas that can monitor multiple attributes of a particular tree, such as air quality, sunlight exposure, noise pollution levels, and other crucial factors for effective urban planning, afforestation strategies, and enhanced agricultural yield. We categorize the solution into three parts: The Sensor Node, The Cloud Integration, and User Experience. It created a functioning prototype using an Arduino along with a mobile application featuring an intuitive user interface that allows users and farmers to access details about a specific tree and receive its updates and notifications. Low-power wide-area network modules are employed for connecting various sensors to the cloud. A prototype of a green intelligent tree management system leveraging the Internet of Things.

KEYWORDS: Plantation, Sensor, Arduino, Afforestation, Urbanization.

I. INTRODUCTION

Plants are an intricate component of the ecological cycle and contribute to the establishment of a food chain pyramid. Therefore, proper inspection of the plant has to be done on a regular basis to ensure the health and growth. Consequently, an automated and IoT focused intelligent plant monitoring system is being developed to improve the monitoring system for plant life. The centres of this around some feature such as real-time based soil moisture smart decision making.

The IoT based computerized irrigation system framework is practical and economical for plantation (set of plants) irrigation water management. The implementation of the automated irrigation system can serve as proof that for different plantation purposes (set of plants), the use of water can be greatly reduced. The constructed system has a wireless network of soil moisture content sensors with the plant root zone temperature and humidity sensors as well as an ultrasonic water tank level monitoring sensor. The sensors output data to the web server (cloud) for analysis and storage.

II. LITERATURE REVIEW

IoT technology is based on a variety of sensors, and these sensor terminals will obtain. The significance of data lies not only in the data itself, but also in the deep value rules discovered after data analysis and processing. The construction of a green city depends on the sensor network of the Internet of Things, which will inevitably obtain a large amount of monitoring data [2]. This research tried to fill the gap in monitoring environmental conditions for urban trees plantation and growth. It focuses collecting information from the field. Environmental factors like temperature, humidity and soil moisture level plays a major role for the growth of planted trees [3]. Soils are vital to the capacity of every single imaginable biological system and to nourishment and fibre generation [1]. An ignored part of soils is their capability to moderate ozone-depleting substance discharges. Albeit demonstrated practices exist, the usage of soil-based ozone harming substance alleviation exercises is at a beginning time and precisely evaluating discharges.

The soil moisture sensor is a sensor connected to an irrigation system controller that measures soil moisture content in the active root before each irrigation event and bypasses the cycle if soil moisture is above user defined set point [4]. Soil moisture sensors are optimally positioned to provide precise data, while raindrop modules suspend irrigation

© 2025 IJIRCCE | Volume 13, Issue 4, April 2025| DOI: 10.15680/IJIRCCE.2025.1304035
www.ijircce.com | e-ISSN: 2320-9801, p-ISSN: 2320-9798| Impact Factor: 8.771| ESTD Year: 2013|
International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCE)
(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

activity when it is raining. With the additional incorporation of ESP8266 microcontrollers, these tasks can be automated, eliminating the need for expensive IoT hardware, thereby enabling remote irrigation and monitoring. The system uses the temperature and humidity sensor (DHT11) for temperature and humidity monitoring, and a soil moisture sensor to detect the level of soil moisture [5]. Such changes enhance accessibility and scalability, enabling the system to be adopted on a large scale by cities without sacrificing effectiveness. The DHT11 sensor is used under low-cost digital temperature and humidity sensor. It measures the surrounding air and splits out a digital signal on the data pin [6].

This system centres on technology, but it also demonstrates an existing focus on environmental sustainability. The system accomplishes its objectives of enhancing air quality and assisting in the development of urban biodiversity economically through sensor data and automated irrigation while still actively promoting low expenses. A focus on these modules also enables additional improvements, such as the use of AI analytics or higher levels of digital engagement with the community.

III METHODOLOGY

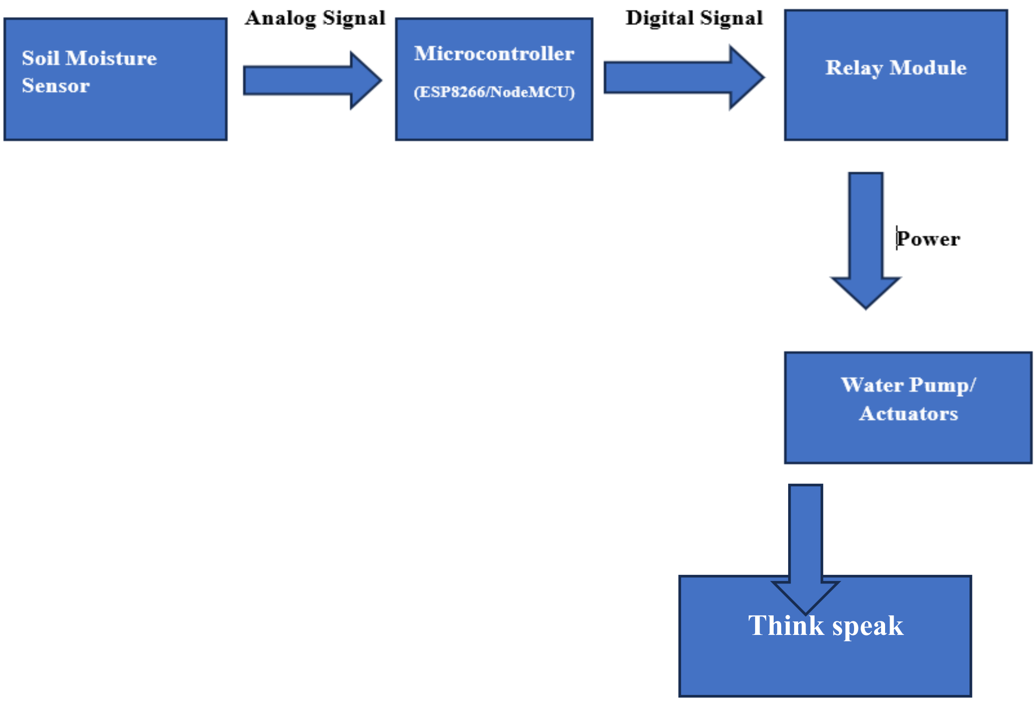


Fig.A.1. Block Diagram

1. **Soil Moisture Sensor**
This sensor measures the moisture in the soil. It generates an analog signal, which corresponds to the moisture level detected.
2. **Microcontroller (ESP8266)**
The microcontroller takes the analog signal from the soil moisture sensor and converts it into a digital signal. This digital signal determines whether the soil is dry enough to need irrigation.
3. **Relay Module**
The relay module receives the signal from the microcontroller. If the soil is dry, the relay module will activate the water pump.

www.ijircce.com | e-ISSN: 2320-9801, p-ISSN: 2320-9798| Impact Factor: 8.771| ESTD Year: 2013|

International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCE)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

4. Water Pump or Actuators

When the relay module activates, it powers the water pump or actuators, which then irrigate the soil. The process stops once the desired moisture level is reached, as determined by the sensor.

5. Think Speak

ThingSpeak is an IoT analytics platform that enables to gather, store, evaluate, and display data from sensors and devices in real-time. It is frequently utilized for remote monitoring and automated systems.

CIRCUIT DIAGRAM

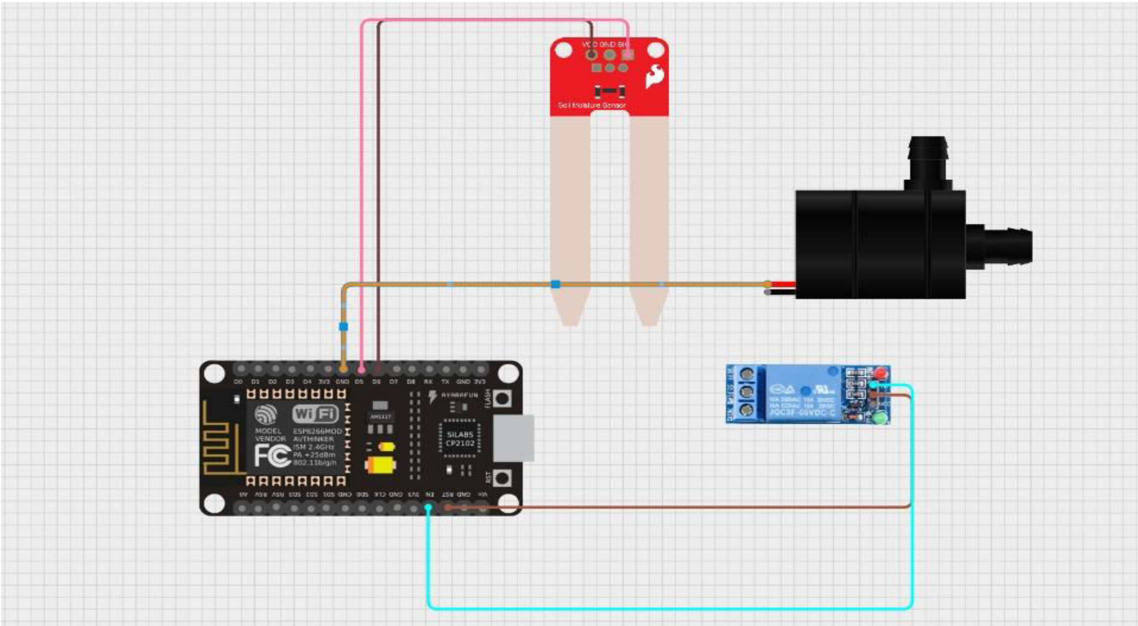


Fig.A.2 Circuit Diagram

1. Soil Moisture Sensor: -

The sensor is work is to measure moisture levels in the soil. It comes with three pins VCC which is used for power supply, GND which is the ground and A0 which serves as an analog output. The sensor indicates through analog signal the estimated value of its moisture content. When moisture is low, it shows a specific signal which triggers some action.

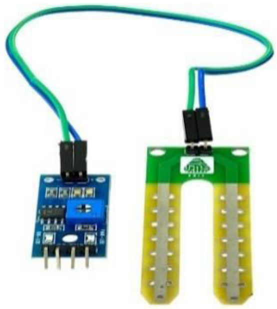


Fig.A.3 Soil Moisture Sensor

www.ijircce.com | e-ISSN: 2320-9801, p-ISSN: 2320-9798| Impact Factor: 8.771| ESTD Year: 2013|

International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCE)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

2. ESP8266 Microcontroller:
The microcontroller receives the signal from the soil moisture sensor via the A0 pin. It has the ability to autonomously identify whether a particular threshold of being "dry enough" exists in the soil. Following this, the microcontroller transmits a command through its D1 pin to activate the relay module.

Fig.A.4 Microcontroller

3. Relay Module:
The relay is used to switch a load on and off. The Relay has 3 pins VCC, GND, IN, and IN. While the IN pin connects to the ESP8266 pin. It closes or opens a switch and allows the power water pump to operate or not.

Fig.A.5 Relay Module

4. Water Pump:
The pump is connected to the relay module and one wire is joined to the NO terminal while the other is connected to the COM terminal. The relay will switch on when the soil is dry and the relay will turn the pump on to Water the soil

Fig.A.6 Water Pump

IV. IMPLEMENTATION

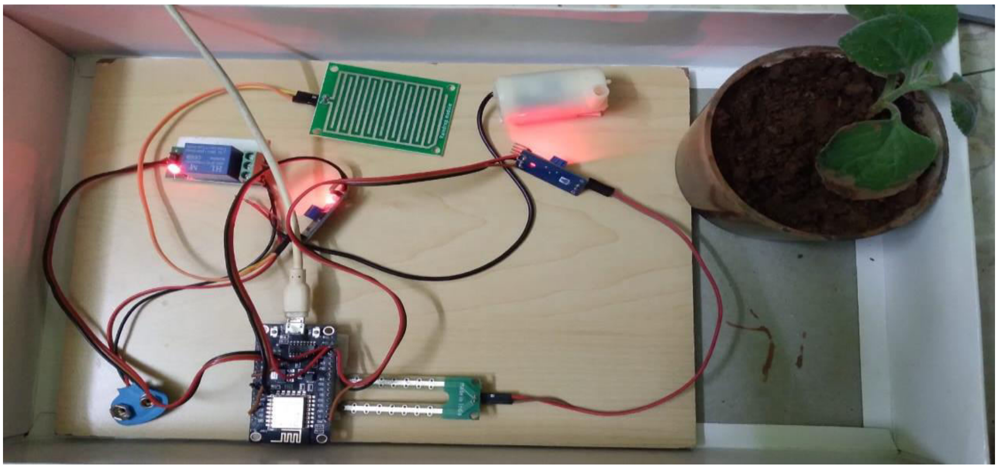


Fig.A.7 Soil Moisture Sensor and Raindrop Module

1. Soil Moisture Sensor- It monitors from the plant through the soil
2. Raindrop Module – It checks whether there is rain found or not through the water Droplet.
3. Microcontroller – It receives through the pin and convert and sent the signal.

V. RESULT AND DISCUSSION

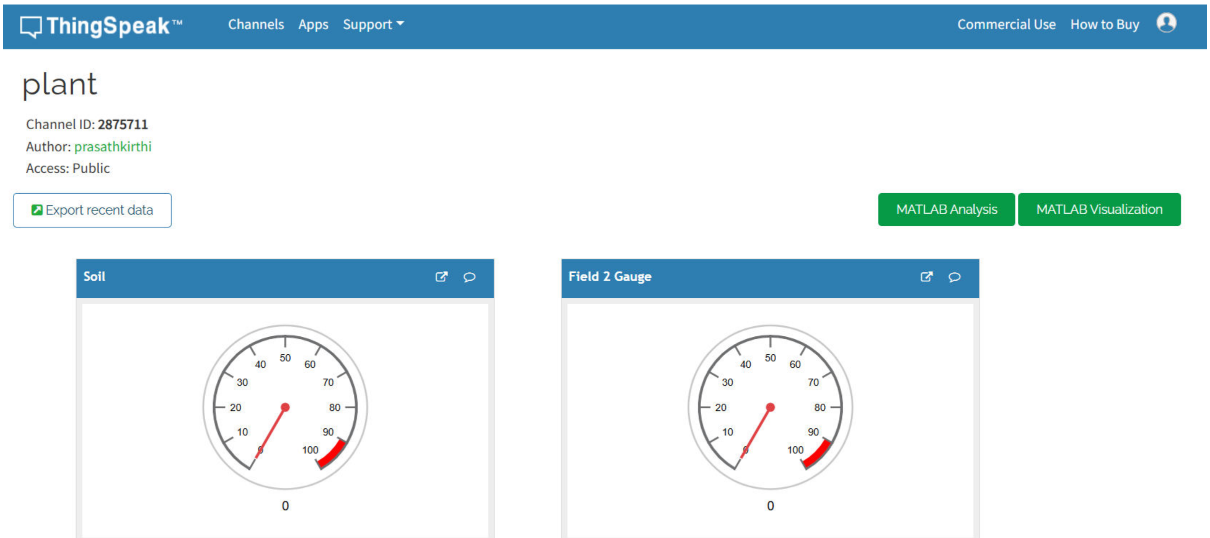


Fig.A.8 The Output Screen

This is the entire view of the Project through this we can see the moisture level and the Raindrop Module.

www.ijircce.com | e-ISSN: 2320-9801, p-ISSN: 2320-9798| Impact Factor: 8.771| ESTD Year: 2013|

International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCE)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

1. SOIL MOISTURE SENSOR

Fig.A.9 Soil moisture is measured through the Sensor

Take any plant with the water content. Keep the Soil Moisture sensor in the plant.

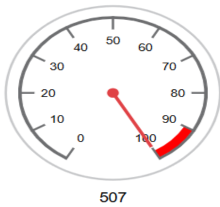


Fig.A.10 The soil moisture level

After placing the sensor in the plant when we see through the Thinkspeak we can see the soil moisture level.

- If moisture level is 100-300 then it is Low moisture level.
- If moisture level is 300-700 then it is moderate level
- If moisture level is 700-1040 then it is highest level

So, This is Moderate level.

2. RAINDROP MODULE

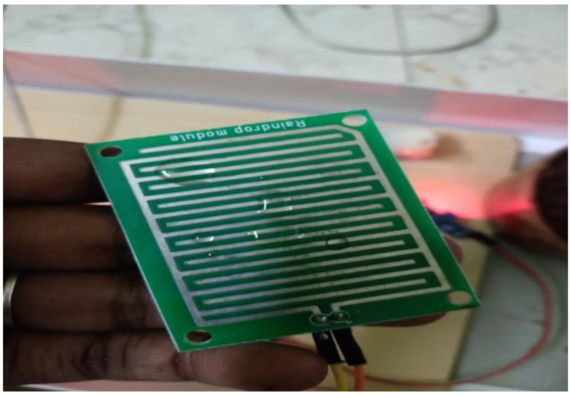


Fig.A.11 The Raindrop Module

www.ijircce.com | e-ISSN: 2320-9801, p-ISSN: 2320-9798| Impact Factor: 8.771| ESTD Year: 2013|

International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCE)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

In the Raindrop Module , when we drop some water on it, it shows the result in binary state value like 0`s or 1's .

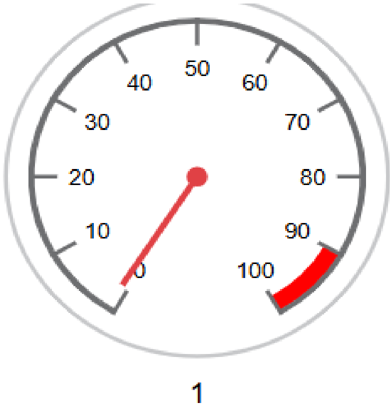


Fig.A.12 The Raindrop is Found

Here, In the Raindrop module there is a water droplet,
So it shows the result as Raindrop found.

VI. CONCLUSION

Green city: Tree Plantation and monitoring system integrates the most modern technologies like AI, IoT devices and other innovations for optimal monitoring of tree plantation throughout the urban city. This system helps to ensure optimal care along with resource management. The tree plantation monitoring system is built to promote environmental conservation and sustain urban development. The project aims at minimal dependency on human precision while maximizing accuracy and affordability in managing green resources of the urban city.

VII. FUTURE ENHANCEMENT

Green City: Tree Plantation and Monitoring Systems can integrate various innovative options to enhance its sustainability and impact. One enhancement might be the inclusion of AI-driven predictive analytics to assess weather patterns and soil moisture levels. This would enable smart irrigation scheduling that aids in water conservation. The addition of air quality, temperature, and humidity sensors would significantly deepen the understanding of the plantation as an ecosystem and boost interaction with the surrounding environment.

REFERENCES

1. **Madara, S. R. (2019).** IoT-Based Smart Tree Management Solution for Green Cities. Springer Nature Singapore (Internet of Things and Analytics for Agriculture, Volume 2, Studies in Big Data 67).
2. **Zhang, X., Song, Y., Yu, S., & Zhang, X. (2023).** Green City Environmental Monitoring and Landscape Planning and Design Based on Communication Technology and IoT. Journal of Combinatorial Mathematics and Combinatorial Computing, 118: 65–77.
3. **Wakjira, G. G. (2020).** Monitoring Environmental Conditions for Urban Trees Plantation and Growth Using IoT: The Case of Green Legacy Program. St. Mary's University, Addis Ababa, Ethiopia.
4. **Lakshmi, C., & Venkatesh, R. (2014).** Automatic irrigation system using soil moisture sensor and temperature sensor. International Journal of Engineering and Technology (IJET), 6(1), 1–7.
5. **Singh, R., & Singh, Y. (2020).** IoT-based soil moisture monitoring system for smart agriculture. International Journal of Recent Technology and Engineering (IJRTE), 9(1), 347–351.
6. **Kaur, R., & Kaur, S. (2016).** Smart irrigation system based on soil moisture using IoT. International Journal of Computer Applications, 179(41), 6–9.

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

9940 572 462 6381 907 438 ijircce@gmail.com

www.ijircce.com

Scan to save the contact details