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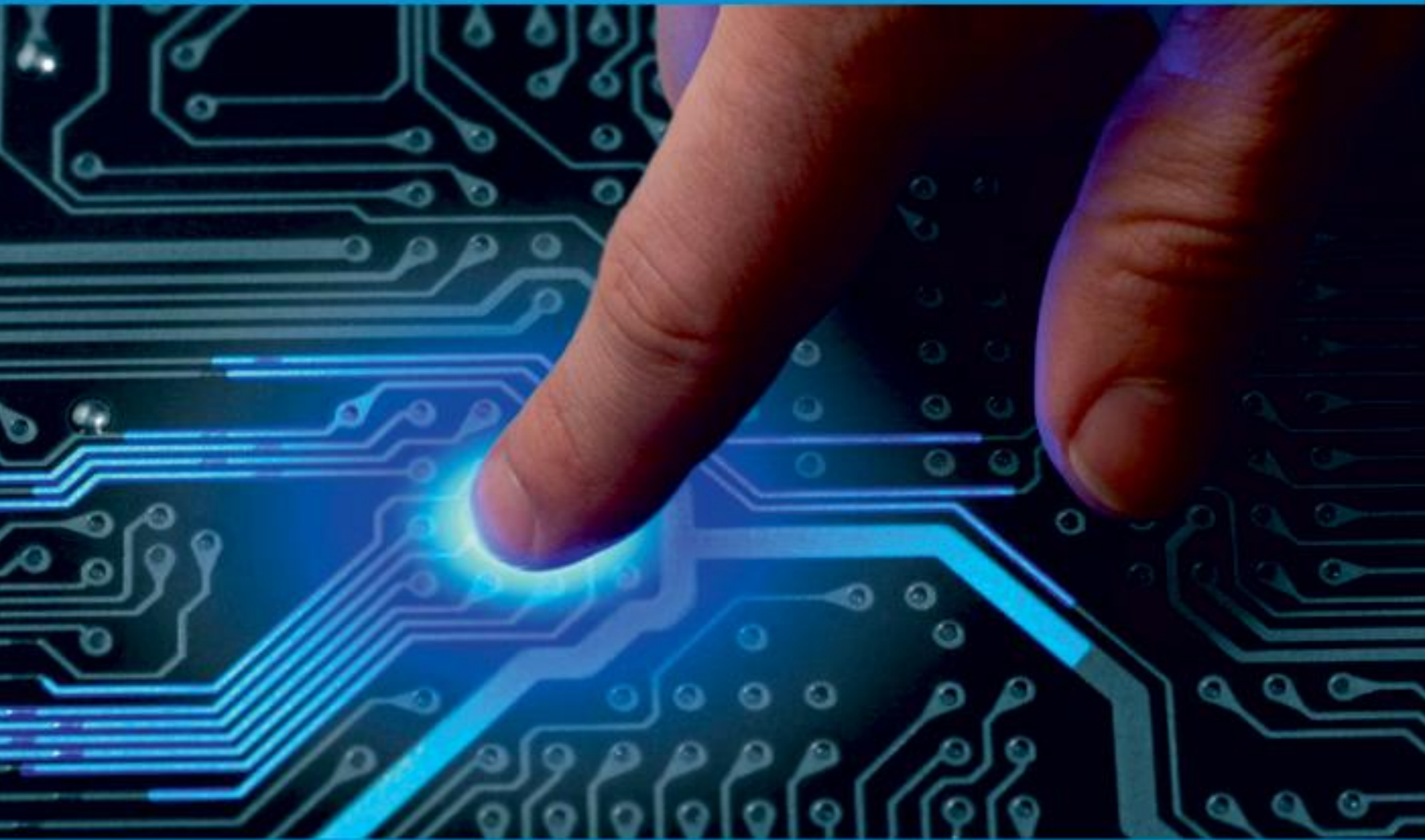

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Smart Flora Irrigation Monitoring System

Dr. S. Xavier Arockiaraj[1] , R. Abarna Lakshmi[2], B.Elfalin Shruthi[3], S.Janani[4], S. Keerthana Ambikai[5]

Associate Professor, Department of Electronics and Communication Engineering, Adhiyamaan College of Engineering, Krishnagiri District, Tamil Nadu, India [1],

U.G Scholars, Department of Electronics and Communication Engineering, Adhiyamaan College of Engineering, Krishnagiri District, Tamil Nadu, India. [2, 3, 4]

ABSTRACT: In recent times the agricultural field has come up with more innovative projects that modernize the farming and reduce the workload of farmers. *"SMART FLORA IRRIGATION MONITORING SYSTEM"* is one of project created using Internet of Things technology to assist farmers and also gardeners. Watering the whole farming area might be toughand it's a slow process.

In order to supply sufficient amount of water to the crops and also to reduce the wastage of water this Smart irrigation system provides better solution. In this smart irrigation system, a device which includes Arduino and sensors to detect thewater requirement of the plants. The sensors, senses the low moisture content in the soil, it sends signal to Arduino, the Arduino will process the data and transfer to relay, then the water supply is turned on. As soon as the soil gets the requiredamount of water, sensor intimates the Arduino to stop the process. Here the relay acts as an electrical switch, which is being controlled by the Arduino to turn on and off the circuit of water supply. By collecting the data (moisture, temperature) from the sensors we can calculate the amount of water spent and also it can predict the amount of water required for the particular crop.

KEYWORDS: - Arduino, soil moisture sensor, Internet of things, Water consumption, Temperature sensor

I. INTRODUCTION

The "SMART FLORA IRRIGATION MONITORING SYSTEM" is an innovative project designed to modernize agriculture and reduce the workload of farmers and gardeners. It leverages Internet of Things (IOT) technology to addressthe challenges associated with efficient and sustainable irrigation. In traditional farming practices, watering a large area can be a time-consuming and labour-intensive process. It's crucial to provide the right amount of water to crops, as both over-watering and under-watering can have negative effects. The Smart Flora Irrigation Monitoring System offers a solution to this problem. This system is composed of several components, including Arduino microcontroller and sensors.These sensors are responsible for monitoring the moisture content in the soil. When they detect that the soil is becoming too dry, they send a signal to the Arduino, which acts as the brain of the system. The Arduino processes this data and controls a relay, which serves as an electrical switch to regulate the water supply.

When the system determines that the soil requires moisture, it activates the water supply, ensuring that the crops receive the necessary hydration. Once the soil reaches the desired moisture level, the sensor communicates with the Arduino to stop the water supply. This process is automated and helps in conserving water while ensuring that the plants receive the appropriate care. The main objective of the proposed work is to help the farmers to utilize the limited amount of water ina cost-effective way.

The Project represents a significant step towards smarter and more sustainable agriculture. It offers a solution to theage-old challenge of providing consistent and precise irrigation while reducing the environmental impact and workload associated with traditional methods. With its innovative use of IOT technology, it stands to revolutionize the way we approach irrigation in agriculture and gardening, promoting responsible resource use and yielding healthier, more abundantcrops and green spaces. To provides uniform and required level of water for both plain and sloppy areas and avoids the water overflow at the sloppy areas and considering the current labour shortage situation, the smart irrigation system will be most appropriate. This project's primary goal is to create a smart irrigation system that can detect soil moisture and assistin determining when to turn on or off the water supply. The project's goal is to equip plants with an automated irrigation system that conserves water. This project's primary goals are to minimize human labour and protect the environment and water resources.

II. RELATED WORKS

A database is made available to SMCSIS that provides data on the irrigation requirements of each crop based on factors such type and growth stage, soil type, season, and Kc coefficient. The database's irrigation data is filled out in accordance with the agronomists' recommended agricultural practices. [1]. The major objective of an automated irrigationsystem using WSN and GPRS Module is to maximize the usage of water for agricultural crops. This system consists of a distributed wireless sensor network (WSN) that includes temperature and soil moisture sensors. Data from sensor units is managed by gateway units, which are also used to send commands to actuators for irrigation management. Algorithm formanaging water quantity according to requirements and field conditions [2].

The proposed automated plant watering system for the Internet of Things creates an IOT device that can start watering the plants automatically whenever the moisture content in the pot drops below a threshold value. This will help the plants grow more easily and reach their full potential while also saving water. [3]. Intelligent Energy Use and Intelligent Irrigation in Tunnel A database of a plant type's daily water requirements is maintained by farming, which determines howmuch water to provide for a certain plant type based on the soil's present moisture content, the humidity level, and the time of day. This strategy encourages wise energy consumption while simultaneously conserving precious water through efficient use. [4].

In this arrangement, the input ports of the Arduino microcontroller are connected to a number of sensors, such as pH, soil moisture, and DHT11. The LCD displays the values that the sensors have detected. If the measured value is greater than the threshold values set in the program, the relay circuit, which is coupled to the driver circuit and helps switch the voltage, will automatically turn the pump ON/OFF. The farmer will be informed of the current condition of the field through the Wi-Fi module, and the website will also be updated. Using this technology, the farmer has access to information about the condition of the land at any time and from any location. [5] When building this model, it gathers all the data that will be used with the microcontroller system for measuring and controlling the water. Where to set the pump threshold value will depend on environmental factors including soil moisture content, air temperature, and humidity. The pump will automatically turn on and off based on the amount of water required. Additionally, the field's actual water status will be explained, and updates will also be sent to the Internet and the URL of the mobile site. The ability for the user to remotelycheck on the crop and the condition of the field is the device's major advantage. [6]

It describes values for temperature, humidity, and soil moisture. The system learned the soil moisture, temperature, and humidity values with the aid of the sensor data. They continuously scan the area and use a transmitter to transfer the information to the web server. Data from the sensors is kept in a database. The purpose of the online application is to investigate the information obtained and to determine temperature and moisture values that are cutting edge. The decision-making process for irrigation automation is finished on the server. The motor is turned on if the soil moisture is less than the edge value or turned off if the soil moisture is more than the edge value. [7] Sensors, a microcontroller, Bluetooth, and an Android application can all be used to automate irrigation. Utilized are a low-cost soil moisture sensor, as well as a temperature and humidity sensor. They keep an eye on the scene constantly. The sensors are connected with the Arduino board. In order for the user to control irrigation, the sensor data are wireless communicated and delivered to him. The mobile application may be created so that it can analyse the data it receives and compare it to the temperature, humidity, and moisture thresholds. The choice can either be made manually by the application with user intervention or automaticallyby the program without user intervention. The motor is turned on if the soil moisture is less than the threshold value and off if it exceeds the threshold value. [8].

III. EXISTING METHOD

Smart irrigation systems use a variety of sensors (soil moisture, WL, soil temperature, pH of water and soil, and leaf wetness) .The sensors read at time t in the majority of smart irrigation systems serve as the basis for both the irrigation choice and the amount of water consumed. Rainfall following irrigation, however, causes crop withering as a result of over irrigation. As a result, in the current work, SMCSIS was created, which has the ability to prevent excessive irrigation in the event of precipitation in the near future. A database (multi-crop database) is provided to SMCSIS that includes data on the amount of water (irrigation information) required by each crop based on the crop's kind, age (growth stage), soil type, season, and Kc coefficient. The database's irrigation data is filled out in accordance with the agronomists' recommended agricultural practices. The application layer, the data processing and decision making layer, and the data collecting and control layer make up the bulk of the established SMCSIS model.

The application layer functions as a user-interface layer, providing user services concerning user log-in, user authentication, message passing between users, data processing, and a decision-making layer, in addition to maintaining privacy data by defining trustees and specifying the access control policies for them. The second layer is the data processing and decision-making layer, which manages irrigation operations based on attribute values (factors) entered by the user and irrigation records in the multi-crop database. This layer is situated in the cloud. The multi-crop database module, engine module, and audit log module make up the bulk of the data processing and decision-making layer. The database module saves information about several crops as well as each crop's irrigation needs, and authorized users can edit it.[1] The projectdevelops an IOT device that can start the watering of the plant system automatically whenever the moisture content in thepot drops below a threshold value, which will help the plants to grow easily and reach their full growth as well as conservewater.[3]

IV. PROPOSED SYSTEM

The smart flora irrigation monitoring system is a valuable tool for plant enthusiasts and gardeners who want to ensure that their plants receive the right amount of water, leading to healthier and more vibrant flora. In this proposed system, we will use the Arduino Uno microcontroller along with various components such as a resistive soil moisture sensor, pump, relay, LCD display, and more to create an efficient and automated irrigation system. The primary goal of this system is to automate the process of monitoring and controlling the irrigation of plants by continuously measuring the soil moisture level and triggering the water pump when needed. The system will also display relevant information on an LCD screen for easy user interaction. The heart of the system, the Arduino Uno, will control all the other components, readsensor data, and manage the irrigation process.

Resistive Soil Moisture Sensor embedded in the soil to monitor soil moisture levels. It works by measuring the resistance between its probes, which changes with the moisture content in the soil. The water pump is in charge of providingthe plants with water. It will be activated when the soil moisture falls below a certain threshold. The relay module is usedto control the water pump. The Arduino sends a signal to the relay, which then turns the pump on or off.

An LCD display is essential for providing real-time information to the user. It can show data such as soil moisturelevels, current status, and system settings. The water source is stored in reservoir. The pump will draw water from the reservoir and deliver it to the plants. Adequate power is crucial to run the system. The Arduino and pump may require different voltage levels, so a stable 5v battery is given as a power supply. The resistive soil moisture sensor is placed in thesoil. It regularly measures the moisture level. The data is sent to the Arduino for processing. The Arduino processes the data from the soil moisture sensor. It compares the current moisture level to a predefined threshold value.

Based on the comparison, the Arduino decides whether the plants need water. If the soil is too dry, it triggers therelay module to activate the water pump. The relay module, under the command of the Arduino, turns the water pump on.The pump draws water from the reservoir and delivers it to the plants. The LCD display shows the real-time soil moisture level, system status (whether watering is in progress or not), and any user-defined settings. The system can be user-configurable. Users can set the threshold moisture level at which watering should occur and adjust other parameters via the LCD interface. The system can be designed with safety features like an emergency shutoff in case of system malfunction,a water level sensor to monitor the reservoir's water level, and overheat protection for the pump.

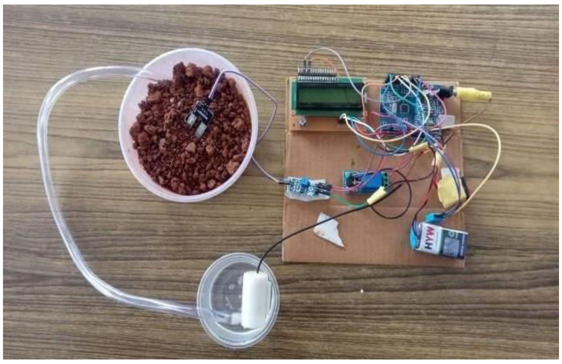

Fig 1:Experimental setup of Proposed system

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The process of data analysis involves gathering data from temperature and soil moisture sensors and have employed the
logistic regression algorithm to analyze these data.

LOGISTIC REGRESSION:

Logistic regression is a statistical model used for analyzing a dataset in which there are one or more independent variablesthat can be used to predict the outcome of a categorical dependent variable.

The sigmoid function is defined as:

(Y=1|X) = 1/ (1+e-(b0+b1X1+b2X2+...+bnXn))

P(Y=1) is the probability of the dependent variable being 1 given the input features X.

$b_0, b_1, b_2,…$ are the coefficient of the model.

$X_1, X_2, …$ are the independent variables.

The dependent variable, also known as the target variable or the outcome, is the variable that you are trying to predict or model. In binary logistic regression, this variable is categorical and binary, typically represented as 0 or 1, Yes or No, True or False.

The independent variables are the variables which is used to make predictions about the dependent variable. In the sigmoidfunction, these independent variables are represented as x1, x2, ..., xn.

The goal of logistic regression is to find the relationship between the independent variables and the probability of the binary outcome, allowing you to make predictions based on the values of the independent variables. The sigmoid function transforms the linear combination of these variables and their coefficients into a probability value between 0 and 1.

V. BLOCK DIAGRAM

The Arduino microcontroller receives data from the soil moisture sensor, which gauges the soil's moisture content. The Arduino, which serves as the system's central processing unit, gathers data from the soil moisture sensor. It analyses this information and decides what to do depending on the moisture content. A relay functions as an electrical switch and ismanaged by the Arduino. It is in charge of controlling the amount of water that the crops receive.

This part stands for the water supply and distribution system, which includes the pipelines, pumps, and valves that hydrate the crops. A power source, like a battery or power adapter, supplies the electricity required to run the system's parts. The system's operational status, such as whether it is actively watering the plants or in standby mode, can be indicatedvia an LED or display.

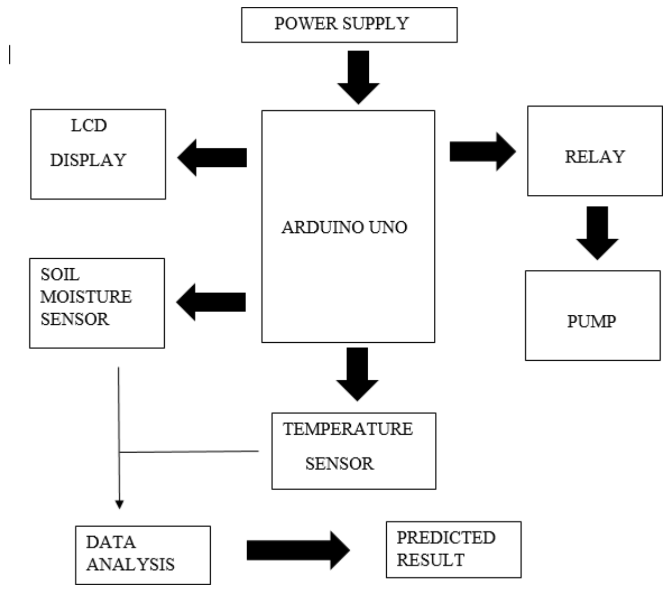

Fig 2: Block diagram for proposed model

VI. EXPERIMENTAL RESULTS

SIMULATED RESULTS:

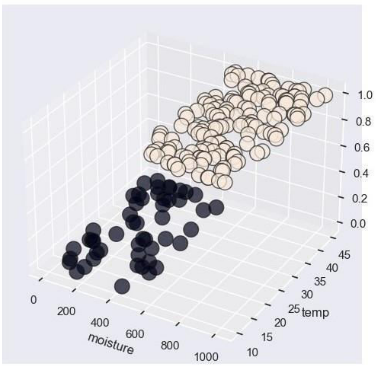

Fig3: Moisture Vs Temperature

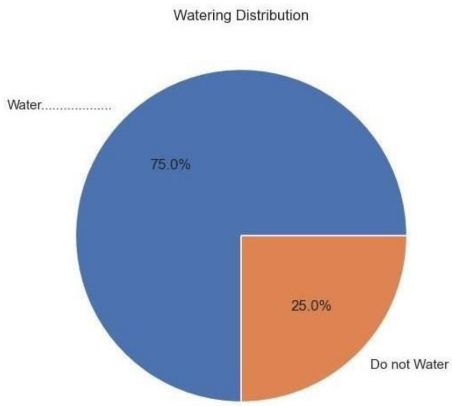

Fig4: Water distribution

When the temperature is high, meaning it's hot, so a higher percentage of water distribution is required, 75% in this case. Conversely, when the temperature is high, allocated a lower percentage for not watering, which is 25%.
This approach suggests that during hot conditions, more water is provided to the plants or soil to compensate for increased evaporation and moisture loss. Meanwhile, during cooler conditions, less water is allocated to prevent overwatering, as lower temperatures can lead to reduced evaporation.

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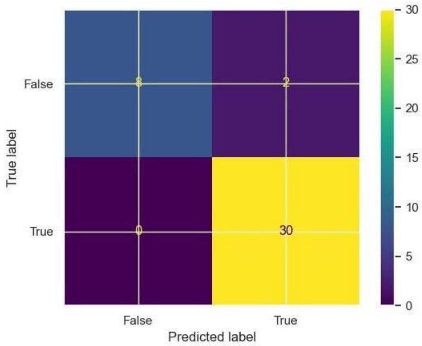

Fig5: Confusion matrix

The confusion matrix provides a detailed breakdown of the model's predictions compared to the actual ground truth withthe following parameters:

Accuracy: (TP + TN) / (TP + TN + FP + FN), which measures the overall correctness of predictions. Precision: TP / (TP + FP), which measures the model's ability to make positive predictions correctly.
Recall (Sensitivity or True Positive Rate): TP / (TP + FN), which measures the model's ability to identify all relevantinstances.
Specificity (True Negative Rate): TN / (TN

EXPERIMENTAL RESULT:

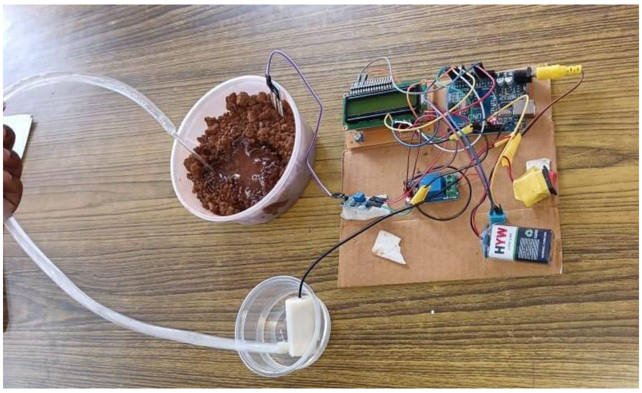

Fig 6: Experimental Result

The Arduino-based smart irrigation system employs sensors for temperature and moisture to determine the needs of the soil and crop. It will automatically send water to the target region as soon as it receives a signal indicating that the soil is devoid of both moisture content and temperature (depending on the parameters specified in the Arduino UNO code).

VII. FUTURE SCOPE

More farmers and gardeners will probably use comparable technologies as awareness of the advantages of smart irrigation systems rises. This could lead to increased adoption and commercial expansion by becoming a common practice in horticulture and agriculture. Future iterations of intelligent irrigation systems might include more sophisticated sensors, AI-driven judgment, and communication with other agricultural machinery. Efficiency and precision will be further improved by these advances. By minimizing water waste and encouraging prudent resource management, the adoption of

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such systems can have a beneficial effect on the environment. This is consistent with the rising emphasis on sustainability and conservation around the world. As more information is gathered from these systems, it may be analyzed and used to make decisions. Irrigation decisions can be made by farmers using data, resulting in improved crop growth and resource efficiency. The importance of teaching farmers and gardeners about the advantages of these systems and how to use them efficiently may be emphasized further. As a result, there may be a rise in the number of workers with the necessary skills to fully utilize these technologies. Smart irrigation systems could be used in nations with various climatic conditions and crop needs, opening up a global market for this technology.

VIII. CONCLUSION

The "SMART FLORA IRRIGATION MONITORING SYSTEM" is a ground-breaking initiative that best illustrates how technology and agriculture can work together. This creative technology has arisen as a beacon of change in the irrigation industry because to the rising demand for effective and sustainable farming practices. Long-established inefficiencies, water waste, and an inability to adjust to shifting environmental conditions plague traditional irrigation techniques. By incorporating IOT and automation into the irrigation process, our project immediately addresses these problems. This system offers a number of benefits by using sensors to monitor soil moisture levels and a central control unit to make decisions in real-time. By providing precision irrigation, it saves water resources, decreases labours and time needed for manual watering, and does it in an efficient, affordable, and user-friendly way. It is significant because it encourages environmental sustainability by maximizing water utilization and enhancing the health of plants and green areas. This project is a ray of hope for the agriculture and gardening sectors as we go towards an era where ethical resource management and sustainable farming methods are crucial. By streamlining the labour of farmers and gardeners and ensuring that our natural resources are used effectively, it creates healthier crops, more livable environments, and a future that is more promising and sustainable.

REFERENCES

[1]. Samawi,V.W. Smcsis: An IOT based secure multi-crop irrigation system for smart farming, International Journal ofInnovative Computing, Information and Control(2021)[1]

[2]. Dr.C K.Gomathy, Mr. A. Vamsikumar, Mr. B. Karthik, Mr. A. Purushothamreddy- The smart irrigation system usingiot.(2021)[7]

[3]. S. Velmurugan, V. Balaji, T.M. Bharathi, K. Saravanan -An IOT based Smart Irrigation System using Soil Moistureand Weather Prediction, International Journal of Engineering Research & Technology(2020)[2]

[4]. K. Shah, S. Pawar, G. Prajapati, S. Upadhyay, G. Hegde- Proposed Automated Plant Watering System Using IoTSSRN Electronic Journal (2019)[3]

[5].Anjali Dokhande ,Chetna Bomble , Rakshanda Patil, Puja Khandekar , Nayan Dhone-A Review Paper on IoT BasedSmart Irrigation System(2019)[5]

[6].M.Safdar Munir 1, Imran Sarwar Bajwa , M. Asif Naeem , Bushra Ramzan-Design and Implementation of an IoTSystem for Smart Energy Consumption and Smart Irrigation in Tunnel Farming(2018)[4]

[7].Bakkachenna Ranadeep Reddy,Chayank A,Karthikey Hegde,Isani Bhanu Chenna Reddy, Dr. V. Sivakumar - SmartDrip Irrigation System Using IOT[6]

[8].A Study on Smart Irrigation System Using IoT for Surveillance of Crop-Field by Ashwini B V(2018)[8]

BIOGRAPHY

Arokiaraj, Associate Professor,
Electronics and Communication
Engineering Department, Adhiyamaan
college of Engineering,

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Abarna Lakshmi. R,
Electronics and Communication
Engineering Department, Adhiyamaan
college of Engineering,
Hosur

Elfalin Shruthi. B,
Electronics and Communication
Engineering Department, Adhiyamaan
college of Engineering,
Hosur

Janani. S,
Electronics and CommunicationEngineer
Adhiyamaan college of Engineering,
Hosur

Keerthana Ambikai. S, Electronics and
CommunicationEngineering Department,
Adhiyamaan college of Engineering,
Hosur

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