K. E. Society’s

**Rajarambapu Institute of Technology, Rajaramnagar**

**(An Autonomous Institute)**

**Synopsis**

**Environmental Science Project**

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| **Program** | :CS&IT Engineering 2023-24 |
| **Course name** | :Environment Science Project(ESP) |
| **Class** | : S.Y. B. Tech ( Semester-III) |
| **Proposed Title** | : Multi-Purpose Water Sprinkler |

**Name of the students in project group:**

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**INTRODUCTION:**

As per recent statistics, crop cultivation land in India is shrinking at an unprecedented rate. The main causes of incoherent development are outdated irrigation methods and lack of water supplies. Moreover solar-powered technology developments for farming process automation can provide significant environmental benefits in India [1]. Several agricultural robots are developed in the late 1980s for development and research. The fruit growing robot developed by kawamura and his colleagues. The apple growing robot was created by grand and his co-workers. They were followed by a slew of various works. Agriculture has progressed from a traditional occupation to something like a rapidly industrializing sector that employs a wide variety of equipment and machinery over time. Agriculture entails a variety of operations that necessitate the handling of durable loads. For instance, farmers utilizing powerful plow equipment in hand plowing. Furthermore, farmers continue to use the conventional method of bringing massive water pipes to irrigate their crops. Such activities are boring, tedious, or involve the workers strength and abilities. A Robot is often a computer that could be configured and reconfigured to perform specific tasks. It usually comprises of the manipulator, such as with a hand or tool, claw, that is connected to a stationary body or a static base. Autonomous robots are regulated entirely by a computer algorithm. In order to navigate, they sometimes use sensors to collect data regarding the environment. Tele-driven robots are managed by corporations or computer algorithms. Human controls cellular modem robots using a controller like a joystick or even other hand-held gadget. The term “robot” is derived from the latin verb “robota”, that implies “forced labour” [2]. Since we all realize, water use has been one of the world’s most pressing concerns. Water management algorithms have been employed in variety of ways. Any area necessitates the use of water. Water is indeed an integral part of our daily lives. As a result water is defined as a fundamental human need. In the agricultural sector, a large amount of water is needed. Among the most serious issues in agriculture is water waste. This water waste occurs when the fields are given an excessive an amount of water [3]. Section II outlines the Literature Survey; Existing scheme is mentioned in Section III. The proposed framework is defined in Section IV. Section V of this research paper contains the methodology. The result interpretation and discussion are present in the VI segment. This research paper’s conclusion is found in section VII. Section VIII outlines the research paper’s future reach

1. **PROBLEM STATEMENT:**

**“Traditional irrigation methods can often be labor-intensive, inefficient, and imprecise, leading to over-watering, under-watering, or water wastage. There's an increasing need for an innovative, automated, and precise irrigation solution that can solve this problems. So we design Multipurpose Water Sprinkler Robot. ”**

1. **RELEVANCE:**

**Agriculture consumes a significant portion of freshwater resources, and inefficient irrigation methods can lead to wasted water, increased costs, and decreased crop yields. An automated water sprinkler robot not only promises a solution to these inefficiencies but also aligns with global sustainability goals.**

1. **LITERATURE REVIEW** :

S. M. Wange et al., [1] (2018) Presented the “Automatic Water Sprinkler System” is powered by solar energy. The solar energy is absorbed by the solar panel and the energy is stored as electricity in the battery. The battery gives power to the dc motor.

Constantinous Marios Angelopolos et al., [2] (2011) Presented the “A Smart System for Garden Watering Using Wireless Sensor Networks” this system is powered by EC-5 soil sensor shouldered on a Telos B mote. The sensor motes were programmed in Tiny OS.

Java Application is used for data collection for the system Devutt et al., [3] (2017) Presented the Plant Watering Robot “Plant O Bot” this robot is in manual operating system mode and finds any flower pot then its ultrasonic sensors help to find the height of flower pot and the robot adjusts the nozzle and gives 200-400ml of water depending upon the size of pot.

Hema N et al., [4] (2012) Presented the “Plant Watering Autonomous Mobile Robot” this fully automated watering system which uses wireless communication to communicate between the mobile robot and the sensing module. This gardening robot is completely portable and is equipped with Radio Frequency Identification module, a microcontroller, an on-board water reservoir and an attached water pump.

Saeid Jafari et al., [5] (2013) presented the “Towards an Automated Guided Vehicle (AGV) in Sprinkler” the study to propose and develop an automatic guide vehicle (AGV) with the capability to change sprinklers timely and on appropriate positions for sprinkler irrigation classic method. The designed AGV is simulated on computer environment and the results show acceptable outcomes.

Kevin Sikorski [6] “A Robotic Plant Care System” (2003) presented the project was created with the intention to demonstrate Combining robotics with ubiquitous computing. Whenever a plant’s condition, such as the moisture content of its soil, would fall out of an acceptable range, the computer could active a robot in the lab. This robot would then locate the plant, water it, and recharge the sensor. Then the robot would automatically return to its maintenance bay, where it would recharge itself, and refill its water supply.

Ayumi Kawakami et al., [7] (2014) “Potpet: Pet-like Flowerpot Robot” that helps users grow plants more effectively and enjoyably. Pot Pet acts autonomously like pets: it automatically moves to sunny places or approaches people when it requires water. Basically, Pot Pet consists of a “real” plant, several sensors to detect plant status, a robot with wheels for mobility, and a microcontroller to control the above devices.

1. **OBJECTIVES:**

• To reduce the cost of irrigation purposes.

• To avoid underground water leaks.

• To reduce the complicated pipe connections.

• To reduce the man power.

• To avoid large power consuming motors.

1. **METHODOLOGY:**

The methodology will be adopted as follow:

Project Formulation

Literature Survey

Design of the Model

Design Calculations

Analysis of the Design

Fabrication of the Model

Final Project

1. **Circuit Diagram**
2. **System requirements with justification**

Software requirements:-

1. Arduino IDE

Hardware requirements:-

1. Relay-

The 4 Channel Relay Module is a convenient board which can be used to control high voltage, high current load such as motor, solenoid valves, lamps and AC load. It is designed to interface with microcontroller such as Arduino, PIC and etc. The relays terminal (COM, NO and NC) is being brought out with screw terminal. It also comes with a LED to indicate the status of relay. The 4 Channel Relay Breakout is an easy way to use your Arduino, Raspberry Pi, or other microcontroller to switch high voltages and high current loads. The board is both 3.3V and 5V logic compatible and uses 4 digital outputs to control 4 individual relays.

1. DC Motor-

Permanent magnet DC motor responds to both voltage and current. The steady state voltage across a motor determines the motor’s running speed, and the current through its armature windings determines the torque. Apply a voltage and the motor will start running in one direction; reverse the polarity and the direction will be reversed.

1. Sprinkler-

An irrigation sprinkler (also known as a water sprinkler or simply a sprinkler) is a device used to irrigate agricultural crops, lawns, landscapes, golf courses, and other areas. They are also used for cooling and for the control of airborne dust. Sprinkler irrigation is the method of applying water in a controlled manner in way similar to rainfall. The water is distributed through a network that may consist of pumps, valves, pipes, and sprinklers. Irrigation sprinklers can be used for residential, industrial, and agricultural usage. It is useful on uneven land where sufficient water is not available as well as on sandy soil. The perpendicular pipes, having rotating nozzles on top, are joined to the main pipeline at regular intervals of time. When water is allowed to flow through the main pipe under pressure with the help of pump it, escapes from the rotating nozzles. It gets sprinkled on the crop. In sprinkler or overhead irrigation, water is piped to one more central locations within the field and distributed by overhead high pressure sprinklers or guns.

1. ESP-32-

Depending on the key pressed the controller will be transmitting the data. Here in this project we are using Arduino Uno microcontroller board. The controllers play a major role in the project, there by the following description mainly focuses about Micro controller and its architecture because it is treated as heart of the project work. Today, there is no such instrument that can function without Micro controller. Micro controllers have become an integral part of all instruments. Many tedious from simple to dedicated tasks are left over to the controller for solutions. The Microcontroller used in this project work is ATMEGA 328P, basically this IC belongs.

1. Jumper Wires-
2. RF Transmitter-

This project is divided into two modules i.e., the transmitter and the receiver (Agrobot). The transmitter i.e., the remote has been equipped with Keyboard and RF transmitter, which have been interfaced using microcontroller Atmega3268P.

1. RF Receiver-

A RF Receiver as explained in the block diagram the RF receiver will be demodulating the received signal. The demodulated output will be the actual data signal i.e., original signal that is transmitted from the transmitter. The RF receiver consists of 3 pins. First is ground, second is the output, which is connected to the micro controller and the third, is the Vcc.

1. Wheels-

Wheeland carrier, The Wheel of robots is located in Robot hell that has written upon it the name of every robot on earth. The robot Devil uses it to choose which robot will lose their hands to fry. Bender’s name is right next to the robot devil’s name. Wheeled robots are robots that navigate around the ground using motorized wheels to propel them. This design is simpler than using treads or legs and by using wheels they are easier to design, build, and program for movement in flat, notso-rugged terrain.

1. **Project Outcome**
2. **Enhanced Water Efficiency:** Reduced water wastage due to precision irrigation, ensuring that plants receive the exact amount of water they need.
3. **Increased Crop Yield:** Plants that are watered optimally tend to produce better yields compared to those that are over-watered or under-watered.
4. **Labor Cost Savings**: With automation handling irrigation, farmers can reduce the manpower required for this task, leading to cost savings.
5. **Time Savings for Farmers**: Farmers can focus on other critical tasks, as the need for manual irrigation is eliminated or significantly reduced.
6. **Reduction in Over-irrigation:** This can prevent issues like water logging, root diseases, and nutrient leaching.
7. **Energy Savings**: Precise irrigation can also reduce the energy required for water pumping, especially if the system is optimized to run during off-peak hours or when solar energy is available (if solar-powered).
8. **REFERENCES:**

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[5] En.wikipedia.org. 2021. H-bridge - Wikipedia. [online] Available at: [Accessed 17 sep 2023]

[6]Rana Johar.., Ahmed Bensenouci , “, IOT based Smart Watering System” 2018 15th IEEE Learning and Technology conference(L&T)

1. **APPROXIMATE EXPENSES:**

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| --- | --- |
| Components | Cost |
| ESP-32(Microcontroller) | 400 |
| Sprinkler | 100 |
| Dc motor | 150 |
| Relay | 200 |
| Wheels | 100 |
| RF- transmitter & reciever | 400 |
| Total | 1350 |