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Development of Plant Irrigation Water Sprinkler Robot

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ABSTRACT: Water plays a significant role among other existing natural resources. The daily demand for water supplies is increasingly on the rise as the population grows. In daily operations related to farming or gardening watering is the most important practice and the most labor intensive task. No matter whichever weather it is, either too hot and dry or too cloudy and wet, you want to be able to control the amount of water that reaches your plants. Modern watering systems could be effectively used to water plants when they need it. To effectively use water for crops, an automated irrigation system has been developed which irrigates the field. This plant irrigation water sprinkler robot system uses a robot with a sprinkler that moves throughout the field with a water tank mounted on it. The rover can be controlled either by remote controller or by using geo fencing sensors. The whole system works under a micro controller called Node MCU.

KEYWORDS: Sprinkler robot, water irrigation, rover, Node MCU

I. INTRODUCTION

We all know that plants are very beneficial to all human beings in many aspects. Plants help in keeping the environment healthy by cleaning air naturally and producing oxygen. Many people love to have plants in their backyard. But due to civilization and insufficiency of place many people used to grow plants in a mold or dirt, pot, and placed on the windows. In addition, the world's biggest problem in modern society is the shortage of water resources, agriculture is a demanding job to consume large amounts of water. It is very essential to utilize the water resources in proper way. Choosing a way of irrigation which conserves water as well as saves time. Sprinkler watering is the method of applying water in a controlled manner. It is a way similar to rain fall. 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 sandy soil. Through advanced technologies and developing intelligence, the role of farmer can be spotted as an observer. By using this type of irrigation system, we can reduce the cost of irrigation process.

In normal irrigation system long pipes as well as a lot of workers are required to maintain and supervise the process, but when it comes to our robot, lesser man power and pipe work is required.

The next objective is to avoid underground water leakage. Since manual irrigation system has a lot of underground pipe line which will cause leakage at random times. This robot is capable of irrigating fields as per the user requirement and uses small motors and components while as in normal irrigation system uses big motors which consumes a large amount of power as well as a huge loss of water takes place as well.

II. PROBLEM STATEMENT

During day to day activities many people often forget to water their plants and thus it becomes challenging for them to keep their plants healthy and alive. Also it is a challenge for farmers to maintain their fields and manage watering of plants during shortage of water.

Based on the above background, we thought that it is necessary to implement the automated system which will take care of plants considering all the different aspects of home gardening system (for system based on household purpose) as well as larger landscape (for the system based on agricultural farms) and helps them to grow healthy.



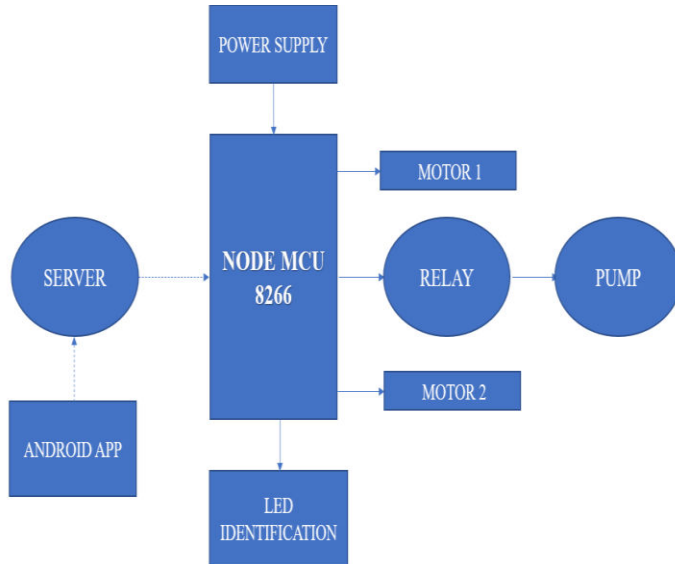
One of the main part of irrigation is under ground as well as over ground piping system. By the introduction of these robot a huge amount of under ground piping can be minimized as the robot moves and provide water where necessary.

The other problem with the irrigation is it has to be always under supervision which in this case can be reduced as it can be controlled by remote

III. METHODOLOGY

Sprinkler/spray irrigation is the method of applying water to a controlled manner in that is 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.

Figure 1:Block diagram of the proposed system



Efficient application of irrigation water is one the most important ways to mitigate any effects that increased biofuels production may have on water resources. There are several irrigation techniques that reduce the amount of water applied per unit of biomass produced, thus improving irrigation efficiency regardless of crop type. Here our proposed system consists of a Rover which moves around and sprays water will be used for the project. Initially the 12v battery is connected with dc motor and a 4 channel relay. This 4-channel relay used for forward, backward, right, left motion of rover. In NODE MCU all functions are programmed. One channel relay used to on off the sprinkler which is placed at tank on the top of the rover. By filling water in tank. The sprinkler is turn on. It sprays it around. Then the rover motion controlled by transmitter. It sprays

wherever the signal is processed manually.

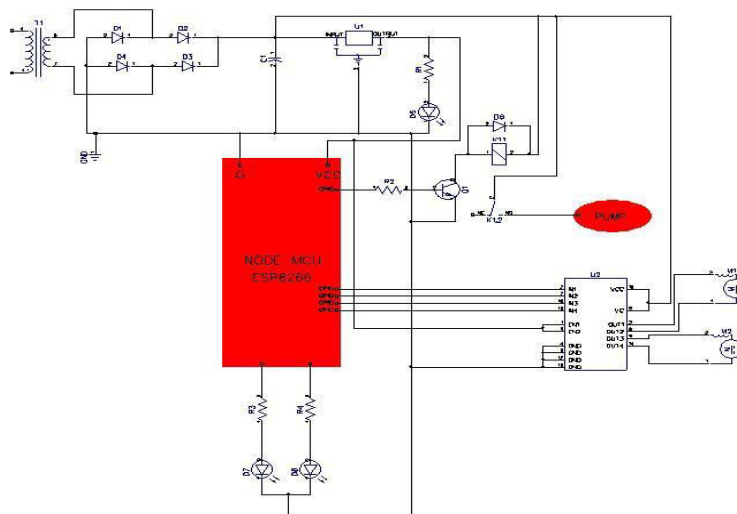


Figure2:The proposed model's circuit diagram.



Using an IoT mobile application, a user may able to control the robot as per required.

1. Micro Controller

Depending on the key pressed the controller will be transmitting the data. Here in this project we are using Node MCU 8266 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.

2. Channel 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 Node MCU, Arduino 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 Node MCU, 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 output to control 4 individual relays.

3. Dot Board

Perf board is a material for prototyping electronic circuits (also called DOT PCB). It is a thin, rigid sheet with holes pre- drilled at standard intervals across a grid, usually a square grid of 0.1 inches (2.54 mm) spacing. These holes are ringed by round or square copper pads, though bare boards are also available. Inexpensive perf board may have pads on only one side of the board, while better quality perf board can have pads on both sides (plate-through holes). Since each pad is electrically isolated, the builder makes all connections with either wire wrap or miniature point to point wiring techniques. Discrete components are soldered to the prototype board such as resistors, capacitors, and integrated circuits. The substrate is typically made of paper laminated with phenolic resin (such as FR-2) or a fiber glass-reinforced epoxy laminate (FR-4).

4. 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.

5. Battery

This is an important block why because all the components require power supply to be operating. Micro controller requires +5v, relay and DC motors require +12v. In the transmitter a 9v battery is used and a voltage regulator in order to derive the required power supply for the micro controller i.e., 5v. And in the receiver as we require a maximum of 12v we are using a 12v battery to operate the relay and the DC motors. Again voltage regulator is used to derive 5v DC.

6. Wheels

4 wheels are attached at the rover which helps it to move in all direction. The 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, not- so-rugged terrain.

7. HC-05 Bluetooth module

A Bluetooth module is used in the system in order the receive the controlling signal from the mobile application. The robot is controlled by Bluetooth connectivity.

8. Robot Controlling Mobile Application

An android mobile application is developed to work the robot in controlling the given movements;

- Forward
- Reverse
- Left
- Right
- Switch on/off the pump

IV. RESULTS AND ANALYSIS

This project include two parts one part is the controlled part and the other part is the controlling part. The controlled part consists of a robot which is the rover and the sprinkler. The rover consists of 2 DC motor which is used for the desired movements. Now the irrigating sprinkler which is powered by a submersible pump. Now the controlling part, which actually consist of a remote control and a signal receiver. Here we have used HC-05 bluetooth module as a receiver, so the rover is controlled byBluetooth connectivity. An android mobile application is used. Here we are using Node MCU ESP 8266 microcontroller. The main objective of using this micro controller is that it has build in wi-fi so even if the Bluetooth system stopped working, it can still be controlled by IOT mobile application.

The robot is mounted by a water tank from which the required water is pumped into the sprinkler, while the rover is controlled.

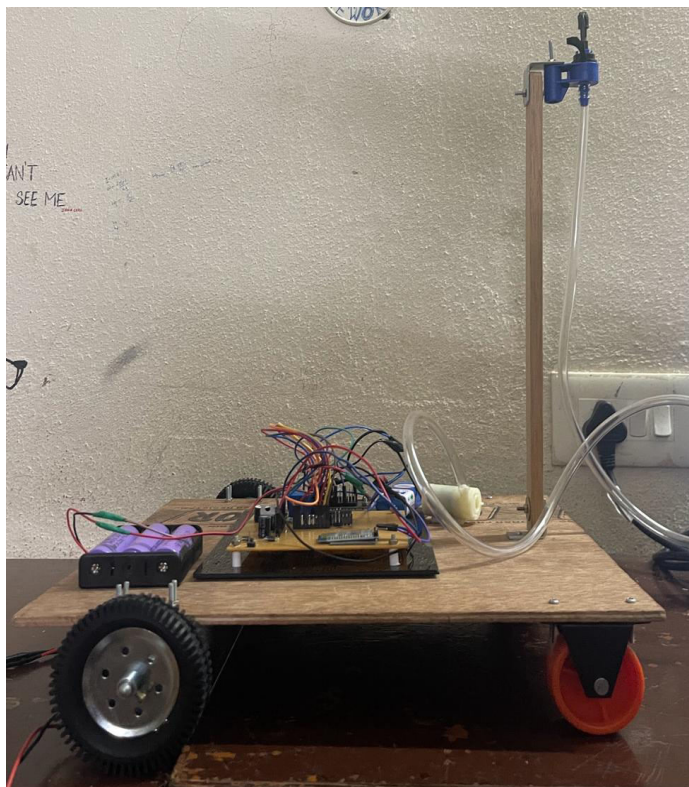


Figure 3: photograph of the proposed system

V. CONCLUSION

Thus, we have come up with a low-cost Plant Irrigation Water Sprinkler Robot. The project carried out by us made an impressing task in the field of Agricultural industries. It is very useful for water irrigation from streams or rivers. This project has also reduced the cost involved in the concern. Project has been designed to perform the entire requirement task, which has also been provided.

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