

Plant Irrigation Water Sprinkler Robot

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ABSTRACT

Plant Irrigation Water Sprinkler Robot System Uses a robot with a single sprinkler that moves through the field with a water tank moves throughout the field spraying water all over it. It is like a moving water tank that automatically moves all over the field spraying water through it. The robot can be equipped with geo fencing sensors so it will cover complete fields without needing any manual intervention.

Keywords: Plant irrigation, Water sprinkler robot.

1. Introduction

The limitations of water resources and global population growth have led states and governments worldwide to increase agricultural products per area and optimize soil and water resources productivity with using new irrigation methods.

Generally, current irrigations systems are classified into pressure and gravitational systems; the pressure category includes sprinkler and drip irrigation systems and Gravitational system usually involves furrow irrigation.

Thus, choosing each system could maximize water productivity and minimize costs of keeping farms.

Although, an water Irrigation Sprinkler system could meet the needs with presence and monitoring during the growing season, continual presence of the worker to control irrigation automatic instruments is not economic.

Through advancements in technology and advent of processors and controllers, it will be more serious improving the role of farmer as an

observer off-field particularly in the light of new irrigation systems.

2. 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.

3. Literature Review

S. M. Wange et al., [1] (2018) Presented the “Automatic Water Springler 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.

Constantinos 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.

4.Components and their Functions

Keyboard

There are 4 keys in the remote for controlling the Irrigation Robot. This is interfaced to the controller.

The operation of the keys is:

- Forward
- Reverse
- Left turn
- Right turn

Mild steel

Mild steel is steel in which the main interstitial alloying constituent is carbon in the range of 0.12–2.0%. The American Iron and Steel Institute (AISI) definition says. Steel is considered to be carbon steel when no minimum content is specified or required for chromium, cobalt, molybdenum, nickel, niobium, titanium, tungsten, vanadium or zirconium, or any other element to be added to obtain a desired alloying effect; when the specified minimum for copper does not exceed 0.40 percent; or when the maximum content specified for any of the following elements does not exceed the percentages noted: manganese 1.65, silicon 0.60, copper 0.60.

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.

Micro Controller

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.

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 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

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 perfboard may have pads on only one side of the board, while better quality perfboard can have pads on both sides (plated 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).

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

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.

Dot Board

Wheels

Wheeled 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, not-so-rugged terrain

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 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.

interfaced using microcontroller Atmega3268P.

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.

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. Material Selection

FE 350 MILD STEEL is selected.

Chemical composition of Mild

Steel:

CARBON 0.16 to 0.18 % (maximum 0.25% is allowable)

MANGANESE 0.70 to 0.90 %

SILICON maximum 0.40%

SULPHUR maximum 0.04%

PHOSPHOROUS maximum 0.04%

IRON remaining

percentage

Mildest grade of carbon steel or mild steel contains a very low amount of carbon - 0.05 to 0.26% Composition.

A. 3D Model of the Machine

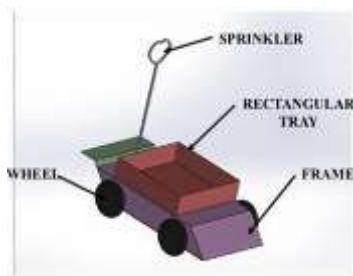


Fig. 1. Design of plant irrigation water sprinkler robot

3D Model and Drafting for Plant Irrigation Water Sprinkler Robot is done using SOLIDWORKS, each and every parts or components in the machine is analyzed using ANSYS software.

6. Programme Code

```
char t;
```

```
void setup() { pinMode(13,OUTPUT); //left
motors forward pinMode(12,OUTPUT); //left
motors reverse pinMode(11,OUTPUT); //right
motors forward pinMode(10,OUTPUT);
```

```
//right motors reverse pinMode(9,OUTPUT);
```

```
//Led
```

```
Serial.begin(9600);
```

```
}
```

```
void loop() {
```

```
if(Serial.available()){ t
```

```
= Serial.read();
```

```
Serial.println(t);
```

```
}
```

```
if(t == 'F'){ //move forward(all motors rotate in
forward direction) digitalWrite(13,HIGH);
```

```
digitalWrite(11,HIGH);
```

```
}
```

```
else if(t == 'B'){ //move reverse (all motors rotate in
reverse direction) digitalWrite(12,HIGH);
```

```
digitalWrite(10,HIGH);
```

```
}
```

```
else if(t == 'L'){ //turn right (left side motors rotate in
forward direction, right side motors doesn't rotate)
```

```
digitalWrite(11,HIGH);
```

```
}
```

```
else if(t == 'R'){ //turn left (right side motors rotate in
forward direction, left side motors doesn't rotate)
```

```
digitalWrite(13,HIGH);
```

```
} else if(t == 'W'){ //turn led on or
off)
```

```
digitalWrite(9,HIGH);
```

```
} else if(t ==
```

```
'w'){
```

```
digitalWrite(9,LOW);
```

```

}
else if(t == 'S'){ //STOP (all motors stop)

digitalWrite(13,LOW);

digitalWrite(12,LOW);

digitalWrite(11,LOW);

digitalWrite(10,LOW);

}

delay(100)

;

}

```

7. Working

Actually, this consists of a Rover which moves around and sprays pesticides, water etc. Initially the 12v battery is connected with dc motor and a 4channel relay. This 4-channel relay used for forward, backward, right, left motion of rover. And battery also connected with Arduino board, receiver and one channel relay. In Arduino Uno board 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 pesticides or water in tank. Then sprinkler should turn on. It sprays it around. Then the rover motion controlled by transmitter. It sprays wherever the signal is processed manually.

8. Conclusion

Thus, we have come up with a low-cost Plant Irrigation Water Sprinkler Robot. The project carried out by us made an impressive 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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