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Smart Phone Operated Water Spraying Robot – SPOWSR

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Abstract - *This project is for the design, development and manufacture of robots that can spray water, and these entire systems of robots run on batteries and solar energy. With more than 40% of the world's population choosing agriculture as primary occupation, interest in developing self-driving vehicles in agriculture has grown in recent years. The vehicle is controlled by a relay module and Bluetooth. Input allows users to interact with robots in a way that is familiar to most people. The advantage of these robots is hands-free operations. In the field of agricultural, concepts are being developed to investigate whether multiple small autonomous Robots are more efficient than traditional large tractors or human power. Technology has been developed in various fields, including agriculture. In agriculture there are many automatic machines designed to save human energy, labor and most importantly time, but they are neither efficient nor economical. Therefore, we developed a Smart Phone Operated Water Spraying robot (SPOWSR) operated by a smart phone.*

Key Words: **SPOWSR, Robotic Vehicle, Irrigation, Autonomous, Sensors, Automation, Bluetooth.**

1. INTRODUCTION

Agriculture is the backbone of India. Today, India ranks second in the world for agricultural production. Specialty vehicles play an important role in many areas, including industrial, space, medical, and military applications. The Robotic Vehicles is gradually increasing productivity in the agricultural sector. Some of the major problems in Indian agriculture are skilled labour, scarcity of water resources etc. Automation techniques have been used in agriculture to overcome these problems. Agricultural automation can help reduce labour for farmers. In doing so, robots are developed to be able to concentrate efficiently and are also expected to perform operations as needed. The proposed idea implements a Robotic vehicle to perform the function of water spraying. This function can be carried out our Robotic Vehicle. The idea of using robotic technology and automation in agriculture is very new. In agriculture, the opportunities for robotic productivity are immense, and robots are coming in many forms and increasing numbers on the farm.

2. PROJECT OBJECTIVES

The motivation for this project came from countries whose economies are based on agriculture and where climatic conditions lead to low rain and water shortage. Farmers who work in the fields rely only on rain and water wells to irrigate the land. Even if there are submersible water pumps on the farm, manual intervention by the farmer is required to turn the pumps on and off as needed. The goal of the project is to properly sprinkle water according to the need of plants which is subject to change in different seasons. For instance, in summer due to increased temperature plant need more water, However, in winter the need of water is less. This project will help make plant care easier. The Water Spraying Robotic System serves the following purposes:

- Less water wastage as the robot will sprinkle desired amount of water
- SPOWSR can also be used to spray various pesticides, fungicides, termite treatment agents, fertilizers, and essential plant elements (boron, sulfur, etc.).

3. PROBLEM DEFINATION

Crop failure due to low water availability is one of the main causes of crop loss faced by the famer each year, and in times of water crisis this has reached a significant proportion. To meet growing demand, farmers must increase harvest efficiency through rapidly advancing technology. This system was developed and implemented to solve the irrigation problem. Farmers usually require a lot of manpower to irrigate large areas at once. However, a smartphone-operated water Spraying robot (SPOWSR) is a system that facilitates land irrigation when needed.

4. PROJECT DEVELOPMENT

The hardware components required for a project are:

- Android Phone with Bluetooth Facility.
- IC Arduino Atmega328 (1.8V to 5.5V).
- Voltage Regulator LM7805 (5V Converter).
- Panel Solar Panel (12V).
- Electric Battery (12 V Heavy Duty).
- Relay Board (12 V).
- DC Motor (5V).
- DC Motor Pump (12V, 4.5L/min).
- L298N Motor Driver (5V to 35V).
- Bluetooth HC-05 Range 6 meters.

5. POWER SUPPLY

- Solar Panel

The photovoltaic panel absorbs sunlight as an energy source and produces direct current power. A solar module is an array of packaged and connected solar cells of various voltages and wattages. Photovoltaic modules make up the photovoltaic array of photovoltaic systems and provide photovoltaic power for commercial and residential applications. The most common non-agricultural application of solar energy generation is in solar hot water systems.

- Volt Heavy Duty Battery

The battery converts chemical energy into electrical energy through a chemical reaction. Chemicals are typically stored in batteries. Used in electrical circuits to power other components. Batteries produce direct current (DC), a current that flows in one direction rather than alternately. While it is cheaper and more efficient to use power from a building outlet, batteries can provide power in off-grid areas. It's also useful for things that move, such as electric cars and mobile phones.

6. SYSTEM DESIGN

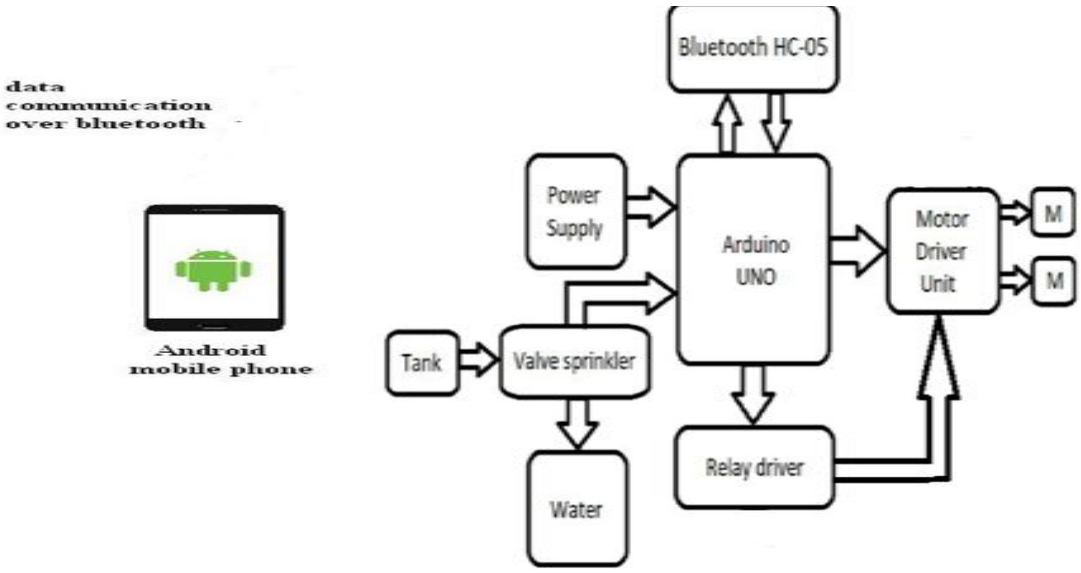

Figure-1: Block Diagram

Figure 1 above shows an overview of the interaction of the system around an Android smartphone with an application installed. Depending on which option the user selects in the application, the corresponding input of the selected option is sent to her Bluetooth receiver in SPOWSR via a radio frequency signal. Based on the input received, the corresponding activity is executed.

6.1 FLOWCHART

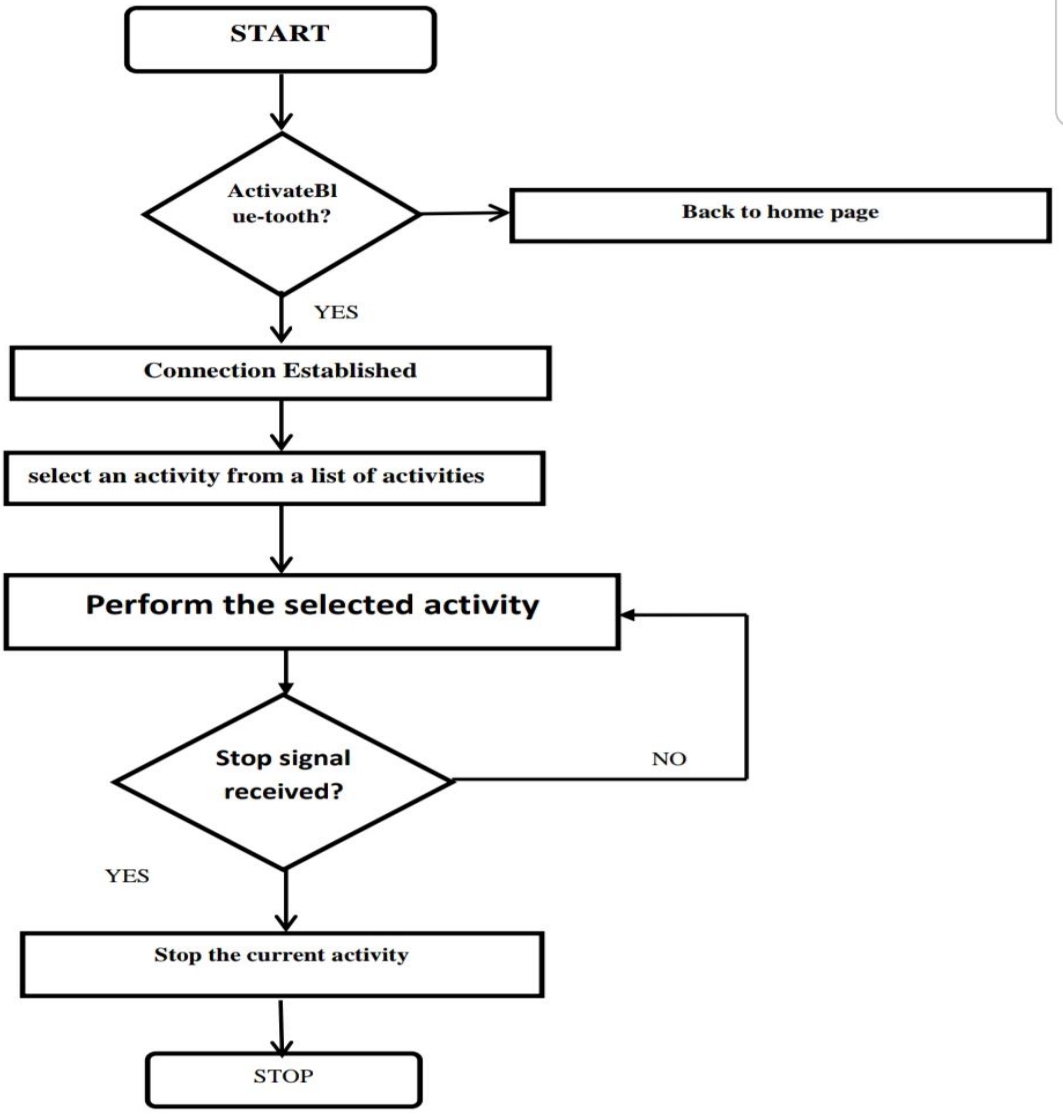

Figure-6.1: Flowchart

Figure 2 shows the sequence of events throughout the system. User enables her Bluetooth. Once connected, it selects an activity from the list and executes the selected activity until a stop signal is received.

7. SPOWSR WORKING

This project consists of an embedded processing unit including IC Atmega328, voltage converter 7085, motor driver LN 298N, relay, battery, solar panel, Bluetooth, DC motor and DC motor pump. In this system, we operate a control system such as Spraying water by wireless communication and a battery-powered system by solar panels. The IC Atmega328 automatically receives signals to operate a water sprayer controlled by a DC motor. Water tanks are used to store water. A water pump is used to sprinkle water on plants. Liquid fertilizers, pesticides or water for spraying can be used here. This project uses a 5V regulated power supply for the internal blocks and a 12V regulated power supply for the relay board.

A switch is connected to visually identify the power status. The wiring is encased in a protective case to prevent damage from unforeseen factors such as stones in the field. Therefore, our IC Atmega328 automatically controls the output device according to the input signal. Our robots are solar-controlled and show farmers charging, discharging, and fully charged.

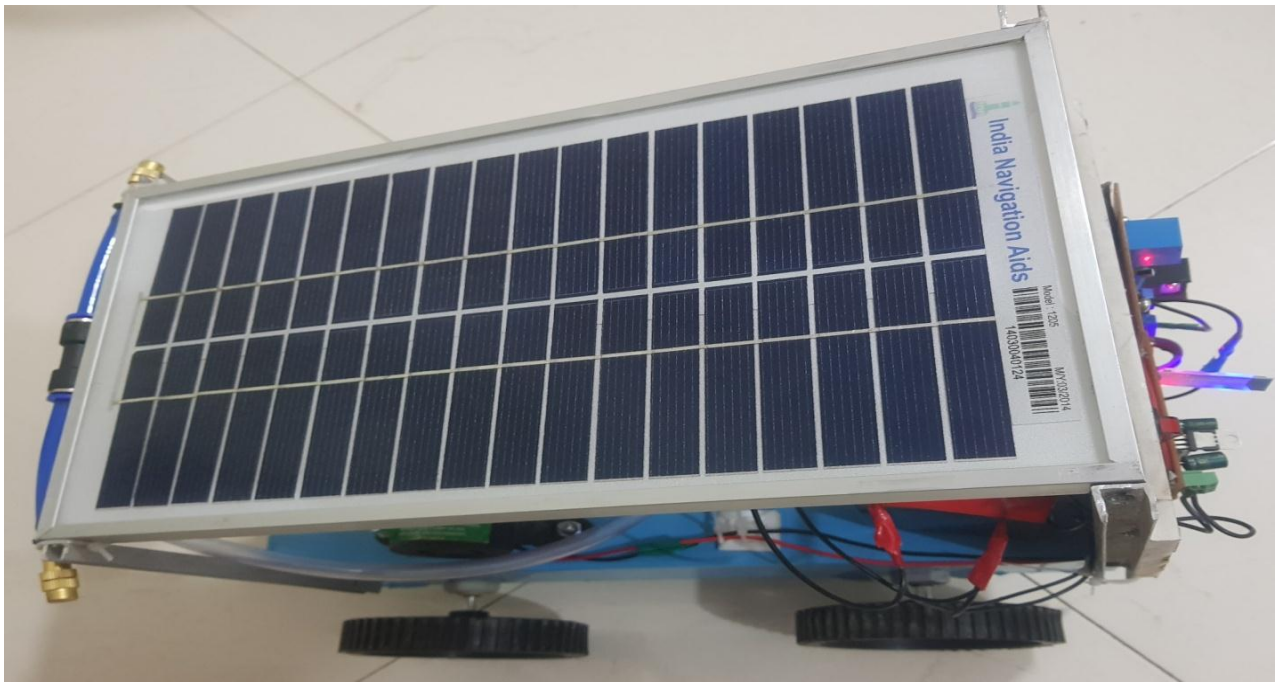

Figure-7.1: SPOWSR

8. MERITS

The list of Merits are as follows:

1. The main advantage of this project is that it runs faster than running the process manually.

2. It is simple, portable and offers high performance.

3 It uses less power.

4. Enables laymen to do the work of experts.

5. Increase productivity by increasing work productivity and improving efficiency for farmers.

6. Save time to reach specific goals.

7. This system ensures that the plants are not subjected to the Problems because of too little or too much water.

9 This system saves up to 70% on labor costs and water. Work on this irrigation system involves over 40 crops on an area of 500 hectares.

9. FUTURE EXPANSION

Applications are certainly much more advantageous. There is no distortion in the covered area and delay is kept as low as possible. The project has plenty of scope when it comes to future expansion. They are listed as below:

- As an extension to SPOWSR, more sensors can be added to detect obstacles, temperature of plant and soil, humidity, moisture in soil and air which in turn makes our Vehicle Intelligent.
- A camera can be attached to the SPOWSR, and the application can be changed to show a 360-degree view of the field in the app while the robot is moving.
- New technologies such as Wi-Fi, IOT can be used to enable broader connectivity.
- Easy to use, operators do not need prior training.
- Very simple design makes the circuit easy to implement and maintain.
- If the workflow changes in the future, system changes can be easily made.
- In future according to the user's requirement it can be updated to meet the user requirements.
- AI and ML based Vehicles are next generation controllers that adjust your irrigation system automatically using real-time weather information. Moreover, you can control it from anywhere, anytime.

10. LIMITATIONS

The system is not 100% reliable. Unexpected factors can cause errors and sometimes losses. A good one, but requires manual checks and maintenance every few weeks.

11. APPLICATIONS

The applications of SPOWSR are as follows:

- 1.Easy to use as everything is automated.
- 2. Uses an Android smartphone, no special training required.
- 3. Cost efficient for farmers as no requirement of manpower.

12. CONCLUSION

Smart Phone Operated Water Spraying Robot (SPOWSR) has been developed and successfully tested. It was developed by integrating all functions of all hardware components used. The presence of each module is justified above and carefully positioned to contribute to the optimal functioning of the unit. The system is tested to work as required and to the best of our capabilities. This should allow the entire system to work at its pace and function normally. This project will introduce wireless technology into the agricultural sector. Explicit Android platform features that greatly assist farmers SPOWSR is a flexible user interface for farmers to effectively control their machinery. It reduces the need for manual labor as workers are very hard to find these days. This is a boon to farmers. This is his one-time investment that significantly reduces the total cost of ownership. SPOWSR serves as a gateway to smart farming.

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