

Design of Solar Powered Automatic Pesticide Sprayer, Grass Cutter and Seed Sower using WIFI

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Abstract - Agriculture is a backbone of our nation. Nowadays various operations are performed in agriculture field. The manual method for all these operations is difficult to handle. This work intends to create a machine that can quickly sprinkle fertilizers and pesticides, mow grass, and sow the seed easily with less human assistance. With the assistance of a battery, this machine sprays pesticides on crop and prevent crop from insects, cut the unwanted grass efficiency using spinning cutters and having a polished cutting tool on either surface. In planting of seed operation, the seedlings are kept safe in a funnel and disseminate the seed in area at frequent interval with hole in a slider. Solar-powered batteries are used to power the device which reduces the operating cost. Due to use of solar power, it preserves fuel cost, and the maintenance cost is low, in which a single machine can operate various operations. The microcontroller is used to control the machine, which is programmed to respond to WIFI. The WIFI can transmit the corresponding command from the Android Application to the microcontroller for the required operation and movement of the machine. By using this designed machine, Farmer can reduce lot of labour cost and can save more time.

Index Terms - Agriculture, DC Motor, Solar powered, Microcontroller, WIFI.

I.INTRODUCTION

The farming is one of the most essential areas of human existence. In this paper we have focused to solve the problem in manual farming sector such as grass cutting, planting of seeds and pesticide sprinkling. The machine gets supply from solar powered battery. The dc motor is used to operate the wheels of the machine. The ATmega Microcontroller is used to control all the system process. The goal of robotics is to eliminate individual's paperwork and enable operational precision. This robot is capable for cutting the grass and to accomplish seed positioning

and optimal seed compaction, the soil is scooped to a specific depth and the seeds from the crusher are shoved into the area at different time intervals. Covering of clusters with soil is done by the bent rod which is at the backside of machine. The pesticide is pumped from the tank in order to sprays pesticides to the field, it protects the farmers and cultivators from harmful pesticides and chemicals. Shoveling, planting, grazing, mowing, storing, and sprinkling are a few of the operations carried out in the crop fields etc. Out of them grass cutting, seed sowing and pesticide spraying are one of the producers' most critical and day-to-day tasks. To develop our economic conditions, our agriculture output and quality must be improved. Work becomes simple and error-free with the use of automation. The machine's little wheels function admirably, and its light weight prevents the dirt from becoming compacted.

The conventional methods are very difficult and inconvenient to perform it. The development of the advanced technology in the field of farming is much needed, which results in the higher yield and reduce the efforts and stress of farmers.

Automation in the agriculture is still in the developing stage due to lack of technical knowledge, advanced technology and machinery. The majority of countries have competent labour in the agricultural sector, which has an impact on developing countries' prosperity. Therefore, the use of new technologies in agricultural activities can provide greater support to farmers.

The aim of this paper is to automate the farm sector processes such as pesticide spraying, planting of seeds and grazing of grass. In India 70% people are dependent on the agriculture. This machine is controlled by the microcontroller which means it is programmed in it. The existing pesticides spaying machine runs on fuel, whereas the proposed system

uses solar panel, which can reduce fuel cost and eco-friendly. Mostly, tractors are used for performing sowing operation in agricultural field. It causes pollution and consumes large power that can be decreasing with this system. The grass cutting operation reduces labour cost and it cuts the grass fastly and efficiently.

II. RELATED WORK

This paper proposes to design a solar-powered machine, which seems to be a clean energy source. The operations are carried out with the help of an Android app. The objective of this process is to transplant into two different sized seeds. The Bluetooth device can then be used to communicate between two microcontrollers, such as an Arduino, or with any Smartphone device, such as a phone or laptop. This increases the efficiency of the system and problems faced when planting by hand. Using Bluetooth/Android app, we can send signal for the required movement of the robot and for the required mechanism [1]. This paper sprays pesticide automatically with almost less human assistance. Solar energy that can be preserved either as electrical or thermal energy. It may also store as mechanical energy in the form of flywheel. Sprayer can spray liquids quickly and easily, which reduces the efforts of farmers. Zigbee is used for the wireless control and monitoring applications. A powerful, highly flexible, and cost-effective microcontroller is used for controlling the machine [2]. Seeds were placed in ploughed agricultural soil with this four-wheel drive robot. It sows seed on ground at regular interval of time. This robot can detect the number of seedling emergence sites and perform the process autonomously. In this project, the robot is powered by lead acid battery. The Arduino manages the robot's mobility using an L298N voltage regulator. In this paper, the movement of the machine is done by using motor. Farmers that utilize a handheld pesticide sprayer may be exposed to health risks. This issue can be resolved by using our solar-powered pesticide sprayer. The separate machine for this operation such as grass cutting, and pesticide spraying demands more workspace and the expense of buying a different machine will be higher. The primary benefit of this process is done in order to save money, space required for both machines and manpower required for both the

operations. Solar panels are used to provide battery charging sources. The source is solar energy, which is harnessed through the use of a solar plate. Arduino UNO R3 would be used to control the device. Sensors and the Arduino UNO R3 are used to accomplish the task. The system is powered by a DC battery and currently runs in standby mode. The entire supply voltage for the machine is afforded by the battery, and the portable battery circuit is used to charge batteries. This paper presents about the wireless technology used for the automation purpose. The various wireless technologies used are ZigBee, z-wave, Wi-Fi and Bluetooth. This paper compares performance of these wireless technologies such as power consumption, range, and cost. Wi-Fi is predominantly used for wireless home appliance design and implementation. Wi-Fi are easy to use, we can connect most of the devices easily to Wi-Fi.

III. EXISTING SYSTEM

In Existing system, the conventional method for grass cutting, pesticide spraying, and seed sowing endures from a wide range of issues. Conventional techniques continue to rely on human strength and outdated methods; they take more time and effort. Rest is necessary for human beings. They might not be able to work in precarious environments. In muddy soil, large wheels that can compact the groundwater are required. Agriculture necessitates the use of qualified workers. The process can be automated to start reducing the need for manpower. The automation is done by using an Arduino and Bluetooth. The conventional system suffers from various problems. Bluetooth loses connections under certain circumstances, has a poor bandwidth roughly equivalent to Wi-Fi, and only permits for short-range information exchange between devices which are all downsides of the existing system.

IV. PROPOSED SYSTEM

In proposed system, automated robot is simple in construction and employed to reduce the human effort and saves times in farming operations. This proposed system uses Wi-Fi. Instructions are sent to the system via Wi-Fi, which eliminates direct human touch and ensures the operator's safety. Farmers can save time and money by embracing this challenging tasks. It has significant influence in agriculture. It has a

programmed control towards all directions in the field. The main goal of the paper is to design a microcontroller-based system which aids in accuracy in the operation of spraying pesticides, cutting grass and sowing seeds and it is controlled using Wi-Fi module. This proposed model consists of four wheels that are driven by the dc motors and the corresponding command is passed to the motor for their required movement and operation. It can transmit the command to the Microcontroller using Wi-Fi. The most prominent advantage of Wi-Fi over Bluetooth is that the working speed of Wi-Fi is much faster, about 11 Mbps, while the working speed of Bluetooth is much slower, about 720 kbps.

V. METHODOLOGY

A. BLOCK DIAGRAM DESCRIPTION

The Android application is used to send the commands to microcontroller for the required operation and movement of the machine. The commands are transferred using Wi-Fi technology. The ATmega 328 microcontroller is used. The proposed system uses solar panel. Electrical radiation is converted into an electrical signal, which would then be preserved in the system. The machine is driven by the battery. The motor driver is a device that regulates the operation of two motors at the same time which is used to move the machine. When the command is transmitted to microcontroller using Wi-Fi, the relay is used to perform such operations like pesticide spraying, grass cutting and seed sowing.

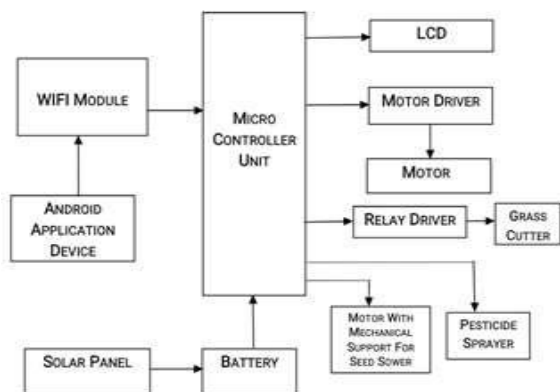


Fig 1. Block Diagram

B. WIFI UNIT

The ESP8266 Wi-Fi Adapter is a self SOC with an embedded TCP/IP application layer that would

provide access to your Wi-Fi hotspot towards any microcomputer. The ESP8266 may either access the network or offload all Wi-Fi networking functionalities to a dedicated application processor. AT instruction set system is a software which is pre-programmed inside every ESP8266 unit, which means you only need to plug it into your Arduino maneuver to acquire by way of many functions as the Wi-Fi expansion board. The ESP8266 module is a very profitable development panel using a large mounting facility.



Fig 2. WIFI Module

C. SEGMENT FOR CLEAN ENERGY

Photovoltaic (PV) cells are superconducting materials that can also be observed on spacecraft and gadgets as shown in Figure 3. As it suggests (photos mean “light” plus “voltaic” means energy), the solar power is unswervingly converted into electricity. A component is a set of batteries (usually called solar panels) that are electrically connected and encapsulated in a frame. Photovoltaic arrays are an excellent approach to eliminate or at least minimize our home's carbon impact by cutting off the power that everyone wants to live without. This goal is made achievable by solar panels. Photovoltaic (PV) cells are used in solar panels to generate electrical energy.



Fig 3. Solar panel

D. DRIVER UNIT

A direct current (electrical) motor is a machine that converts electrical input into mechanical power. The wheels connected to the device are governed by two motor drives. The 200 rpm Economy Series DC Motor is a high-quality, low-cost DC geared motor with a

centre shaft. Steel gears and pinions enable a longer service life and higher wear and fatigue strength. From inside, the gears are attached to the gearbox. Despite the fact that the motor runs at rpm at 12V, it runs perfectly from 4V to 12V and has a wide array of Speed and performance. The table underneath shows a properly hardened steel spindle.



Fig 4. DC motor

E. STABLE REGULATOR

A voltage regulator is an electronic appliance that provides a stable DC voltage regardless of load current, climate, or AC line multiple requirements. A simple feed forward architecture or negative feedback can be used in the regulator. Electromechanical mechanisms or circuit boards can be used. It can be used to modulate one or more AC or DC voltages, depending on the manufacturer.

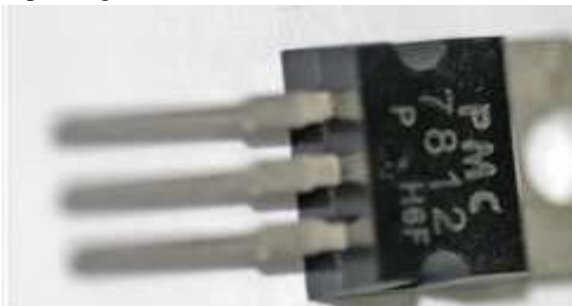


Fig 5. Voltage Regulator

F. Battery

To power the dc motors, a 12V dc battery is needed. The unit's controller, LCD, and relay use a 5V power supply.



Fig 6. Battery

VI. HARDWARE IMPLEMENTATION

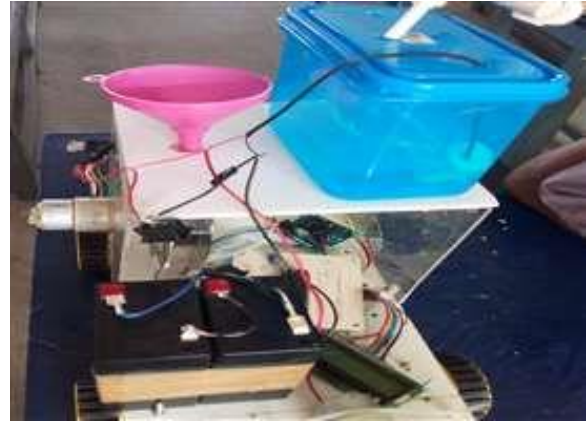


Fig 7. Hardware Implementation

VII. CONCLUSION

This machine is meant to operate automatically in the field of agriculture. The important thing is to automate the operation like pesticide spraying, grass cutting and seed sowing, in order to obtain the greater yield and assist the farmers to move towards the using of advanced technology. It helps them to attain globalization. The seeds were placed in the right location, culminating in proper vegetative growth. This advancement in agricultural sector is quite possible achieve greater productivity rate and reducing the power consumption and labour requirement. This Smart machine is designated to increase the productivity and to decrease the human efforts. It is the perfect tool that does not contribute to climate change because it starts running on solar energy.

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