

Design and Fabrication of Bluetooth Controlled Solar Multiple Agricultural Vehicle

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Abstract: India's agricultural landscape thrives on the cultivation of various crops, with seeds being a cornerstone of its agricultural economy. One such crop, cultivated extensively in village areas, is seeds, which hold global significance. They are vital for both small-scale farmers and large commercial producers, particularly in tropical and subtropical regions. The seed business presents lucrative opportunities, but it also comes with challenges. Traditional methods of planting seeds, often done manually, are time-consuming and labor-intensive. Additionally, the high cost and bulkiness of imported planting machinery pose barriers for many farmers. To address these challenges, a novel solution has been developed: a multi-functional agricultural machine tailored for small-scale farmers. This machine is designed to perform a range of tasks crucial for seed cultivation, including weed removal, seed sowing, grass cutting, and fertilizer spraying. Moreover, the versatility of this agro machine extends to its control mechanism. Instead of complex interfaces, it operates seamlessly through Bluetooth connectivity with a mobile phone, enhancing user convenience and accessibility. By empowering farmers with cost-effective, multi-functional machinery, this project aims to revolutionize seed cultivation, boosting efficiency, and productivity in India's agricultural sector.

Index Terms— labor-intensive, this agro machine, seed cultivation.

I. INTRODUCTION

The production and productivity of ground nuts, corns, etc., were quite low, when India became independent in 1947. The production was not sufficient to feed the Indian population. The country used to import them in large quantities for fulfilling

the needs of our people from many countries. The reasons of low production and productivity were unavailability of machines in the cultivation field. In India most of the farming work is done manually when compared with foreign countries. There were no machines for sowing the seeds like groundnuts, corns then and it is done by man power only.

The cost spent for man power was more and the speed of the operation was very less. When small farmers with minimal physical resources or financial assets attempt to improve their productivity, they have a limited choice. The only resource they can maximize is knowledge in which they are not poor. To prove the above statement, Mr. Shivraj was invented the first bullock driven sowing machine in the year 1987 at Madhya Pradesh to improve his productivity. It was light weight and can perform up to six agricultural operations. India is a world leader in groundnut farming with 8 million hectares of cultivated area in the year 2003.

Groundnut cultivation has increased from 6.8 million hectare in 1980 to 8 million hectares in the year 2003. Groundnut is grown mostly in five states namely Andhra Pradesh, Gujarat, Tamil Nadu, Karnataka and Maharashtra and together they account for about 90 percent of the crops total. The sowing time is the most important non-monetary input influencing productivity. Delay in sowing by one week result in considerable yield losses. Results obtained from all India coordinated research projects revealed that in most parts of the country, sowing should be done between the first week of June and the last week of

July. Advancement of sowing by a fortnight with pre-sowing irrigation was found to increase the yield substantially.

The government of India appointed a commission to assess the feasibility of increasing the crop productivity under prevailing Indian ecological conditions. In order to develop the standard of living of small farmers we should make the machines with low cost. Then only small farmers can implement the recent modern machines for farming purposes. Our proposed groundnut planting machine is used to plant groundnuts. They can be used to plant other seeds such as corns, peanuts, etc. So, in this work an attempt has been made to provide the groundnut planting machine at low cost and of less weight compared to the machines available in the market.

II. LITERATURE REVIEW

Review on Multipurpose Agriculture Robot

- Arcot Aashish Arun Kumar, Ramarungula Sai Deepak, Sagar Kusuma, Dr. D. V Sreekanth, 2020.

The paper aims at the overall review of planning, development and thus fabrication of the multipurpose agriculture robot which is able to dig the soil, leveler to shut the mud, sprayer to spray water and fertilizer separately, these whole systems of the robot work with the battery, and therefore, the alternative energy. Quite 40% of the population within the planet chooses agriculture due to the first occupation, in recent year the autonomous vehicles within the agriculture have experienced increased interest. The vehicle consists of Relay switch and Bluetooth. This language input allows a user to interact with the robot which is familiar to most of the people. The agriculture robot works on solar energy. The advantages of these robots are hands-free, and fast data input operations. In the sector of agricultural autonomous vehicle, a concept is being developed to investigate if multiple light compact autonomous machines may be more efficient than traditional large tractors and human forces. Hence, the device is to be designed which helps farmers to beat the stated problem. It's geared toward increasing the productivity and reducing the labour involved, the robot is intended to execute the essential functions required to be administered within the farms.

- Design and implementation of a wireless communication-based sprinkler irrigation system

with seed sowing functionality-Bhupalam Venkatesh,

Y. Suresh, J. Chinna Babu, N. Guru Mohan, C. Madana Kumar Reddy, Manoj Kumar. (2023)

This study addresses the critical health risks faced by farmers owing to the use of harmful chemical pesticides in agriculture. The primary objective is to create an effective solution to minimize these risks and reduce the use of pesticides. To achieve this, a smart irrigation system has been implemented by connecting various sensors, such as moisture sensors and thermal imagers through the Internet of Things. These sensors collect vital data on crop moisture levels and thermal images that are securely stored in a cloud-based system. The data collected were subjected to extensive analysis to ensure accurate pesticide use and to identify specific pests affecting crops. In addition, the smart irrigation system includes an Android phone for remote monitoring and pesticide spray detection, thus offering a convenient remote-based operating system for farmers. The advent of modern solar-powered electric agricultural machinery: A solution for sustainable farm operations

- Shiva Gorjian, Hossein Ebadi, Max Trommsdorff, H. Sharon, Matthias Demant, St ephan Schindele (191-235), 2020

With an uprising trend in cutting agriculture's reliance on fossil fuels because of their limited supply and associated adverse impacts on the environment, the use of infrastructures adapted with alternative energy sources would be of crucial necessity. Among all renewable sources, solar energy has the highest compatibility with agricultural activities. The emergence of photovoltaic (PV) solar energy conversion technology in agriculture diminishes the need for oil-based fuels in this sector, offering a more affordable and sustainable electricity generation technique, and causing a remarkable reduction in greenhouse gas (GHG) emissions. In modern farm activities, the need for electrification has been raised, leading to the creation of a great opportunity for the employment of PV technology in this sector. The current study investigates the integration of PV technology with electric farm tractors and agricultural robots by discussing research works and commercial case studies. The results indicate that two major challenges against the widespread deployment of modern solar-powered electric farm machinery are high initial costs mainly associated with PV modules and battery storage units, along with deficiencies in

electricity storage technologies. Due to operating in outdoor conditions, the effect of environmental parameters on the performance of PV modules integrated with agricultural machines including surface temperature, dust accumulation, shading, and air humidity should also be considered.

- Automated seed sowing and watering robot using wireless sensor network M. Somasundaram; A. Naveen Kumar; B. Nikhil Vamsi; B. Vishal Chowdary; S. P. Karthikeyan; B. Sarala, 2022.

This Project is intended for vertical horticultural purposes. It is intended to limit the work of ranchers furthermore to speeding up and precision of the work. Today the natural impact of rural creation is very much engaged and accordingly the requests to the business are expanding. In the current situation, by far most of the metropolitan regions in India don't have satisfactory gifted work in cultivating region which impacts the progression of farming country. In this manner ranchers need to utilize redesigned innovation for development movement (burrowing, seed planting etc.). Seed planting Machine which grew hitherto are worked physically or there is no Smartness of work done by it expects seed planting. Manual technique incorporates broadcasting the seeds by hand. This Project is made by utilizing Arduino UNO, LCD Board, PH Sensor, DC Gear Motor for seed planting, Water Pump Motor, Four Relay Board, Robotic Vehicle Full Set. At times technique for drilling for example making openings and dropping seeds by hand is utilized. Additionally, a couple of bullocks is utilized to hold the substantial gear of evening out and seed dropping. Hence, it's an optimal chance to automate the region to beat this issue. There is a need to focus on updating agrarian equipment.

- Bluetooth controlled agricultural bot Sagar G Janokar, Nachiket K Kulkarni, Saurabh S Datey, Kiran P & more, 2019 International Conference on Nascent Technologies in Engineering (ICNTE), 1-5, 2019.

Agriculture in India is considered the backbone of our economy and is also considered a very promising and important sector towards India's development [1], keeping the importance of agriculture and the condition of Indian farmers in mind, we have tried to contribute in the development of this sector by merging the latest technological ideas in primary agricultural process by developing an agricultural bot. This bot can be fully controlled by a mobile

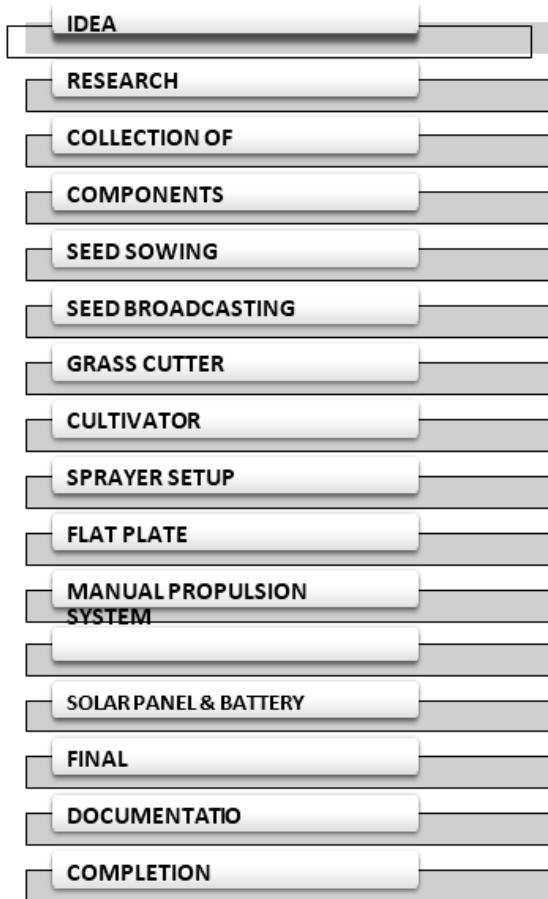
phone through Bluetooth, this bot is designed to perform the primary functions of the agricultural process (seed sowing, ploughing the field, watering/pesticide the crops) and also the bot functions can be modified according to farmers need simply with the help of the mobile application in a very user-friendly way.

- Towards a sustainable future: design and fabrication of a solar-powered electric vehicle Jatoth Heeraman, R Kalyani, Banoth Amala IOP Conference Series: Earth and Environmental Science 1285 (1), 012035, 2024.

The integration of solar PV technology with the burgeoning EV market has the potential to expedite the transition towards sustainable and environmentally friendly transportation. By intertwining solar PV technology with the expanding EV landscape, this collaborative effort aims to secure a greener future for forthcoming generations. In particular, the performance, security, and long-term viability of solar-powered electric vehicles (EVs) hinge significantly upon the design of their chassis and body. Solar panels seamlessly integrated into the vehicle's structure serve as sunlight receptors, transforming solar energy into electricity. This electricity, in turn, propels the vehicle's engine or is efficiently stored in batteries for subsequent utilization. The intricate interplay between these elements underscores the complex nature of developing a successful solar-powered EV. By perspective and weaving together innovative technologies, sustainable design, and strategic integration, the endeavor to establish efficient and eco-friendly solar-powered EVs gains traction, ultimately contributing to a cleaner and more sustainable transportation future. This study undertakes a comprehensive evaluation, meticulously assessing the possibilities, challenges, and potential widespread application of solar PV-EV charging systems. This presents an opportunity for stakeholders to play a pivotal role in shaping the future of transportation. The findings of this research furnish invaluable insights that can catalyze decision-makers, businesses, and researchers in their efforts to drive a revolutionary transformation of the transportation industry.

III. METHODOLOGY

The following steps are:

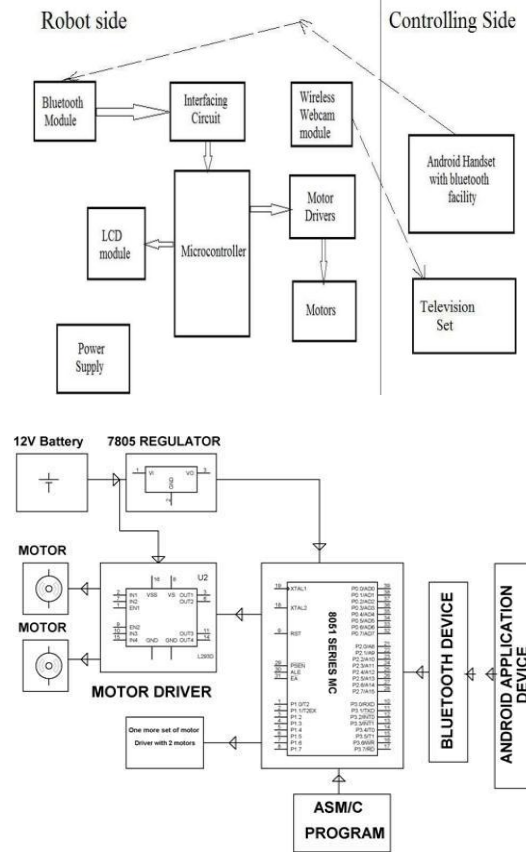


IV. COMPONENTS

The major parts that are effectively employed in the design and the fabrication of the blue tooth controlled solar multiple agricultural vehicles for weed remover, seed sowing, water spraying and grass cutter described below:

- Bearing,
- Frame,
- D.C Motor,
- Battery,
- Spur gears,
- Chain and sprocket drive,
- Seed feeder,
- Planting pipe,
- Water tank,
- Water or fertilizer sprayer,
- Solar Panel
- Grass cutter,
- Bluetooth control unit.

V. BLOCK DIAGRAM AND CIRCUIT DIAGRAM



VI. COMPONENTS REQUIRED

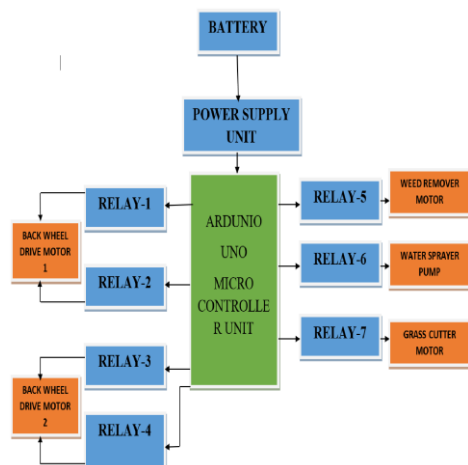
- Arduino Uno Microcontroller: To define the task of the four motors. To start or stop a motor according to the commands obtained from the android application device using a Bluetooth module.
- Bluetooth Module (HC-05): To establish a connection between the android application device and the circuit. It basically incorporates a serial communication between the android application device and the circuit.
- Relay driver unit: It is a motor driving unit for motor.7805, 5V regulator IC: The various components used in the circuit operate at a voltage 5V but the input supply may be of either 12V or 9V. hence, we use a 7805- voltage regulator IC to convert the input voltage into desired voltage.
- Resistors 10-kilo-ohm
- Capacitors - 0.1µF, 33pF
- 16.0MHz Crystal Oscillator: It provides oscillation frequency to the microcontroller.
- 60 rpm DC Motor: This is a high torque motor which is basically being used here for the weight lifting purpose.

VII. WORKING PRINCIPLE

The main objective of this project is to cultivate the land, sow the seeds, and make the land even and to spray the water or fertilizer. Grass cutting operation also added in this agri vehicle. These are the aims of our project and they are done in a single operation. A motor is used to run the thresher setup which contains blades so that when the groundnut is fed manually, the motor operates the blades and the ground nut seeds are threshed within few minutes and the motor is powered up by a battery. The chain and sprocket drive are connected to the wheels and the seed sowing setup with the help of a shaft. Also a seed feeder is provided inside a hopper setup such that they feed the seeds to the planting hose. In front of the setup, a cultivator arrangement is made in such a way that they can be loosened and taken off the ground and can be tightened by using a lead screw arrangement. Just behind the delivery end of the hose, a flat plate is provided so that the seeds are planted and the ground is made flat.

First the seeds are fed manually to the hopper and the machine is propelled manually. The chain and sprocket drive delivers power from the wheels to the seed feeder. The seed feeder picks up the seeds as it rotates and feeds the seeds to the planting pipe. Similarly, we have another setup for seed broadcasting, in same way the seeds are filled in hopper and the seeds are carried by a rotating disc like structure and drops downward. Then it hits the rotating spinner, as soon as it hits it gets scattered in the field.

BLUETHOOOTH BLOCK DIAGRAM



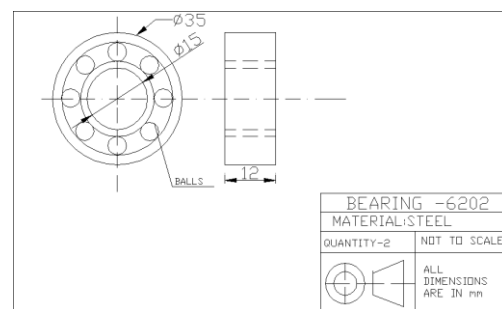
The planting pipe delivers the seeds on the grounds thus planting them. Before this operation, the cultivator is tightened so that it presses against the

land. This is done because when the vehicle moves, the land is cultivated automatically. Then the seeds are planted in the cultivated land and finally the land is made even by a flat plate provided at the back of the planting pipe.

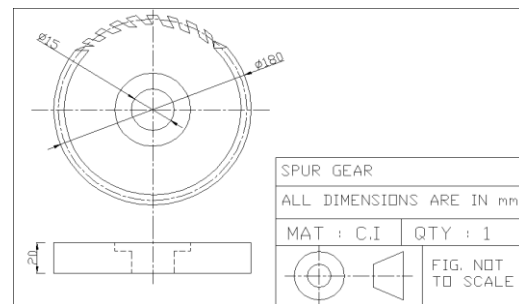
Near the handle of the machine is provided with the water tank which is connected to the water sprayer. This setup is used to spray the water or the fertilizer that is stored in the tank automatically.

Thus, when the machine is started, the groundnut can be threshed, the land is cultivated, seeds are sowed, the land is made even and the water is sprayed. Grass cutter operation also done by rotary blade cutting grass with the help of dc motor.

1.2D DRAWING

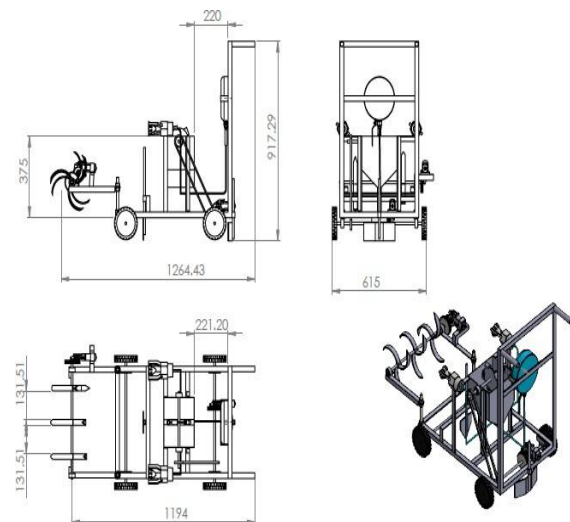


Bearing



Spur Gear

BLUE TOOTH CONTROLLED SOLAR MULTIPLE AGRICULTURAL VEHICLE



VIII. ADVANTAGES, DISADVANTAGES AND APPLICATIONS

1. ADVANTAGES

- Simple in construction.
- Maintenance cost is low.
- The cost of the system is less.
- Small in size, hence portable.
- Light weight.
- Time taken for planting operation is less.
- No need of skilled operators for operating the machine.
- Fully automated process and hence no need of any assistance.
- It ensures simple and safety operation.

2. DISADVANTAGES

- More number of moving parts.
- Must be handles carefully because of more number of moving parts.
- Suitable only for planting small sized seeds.

3. APPLICATIONS

- It is applicable in agricultural for seed sowing. Applicable for agricultural areas are given below:

It can be used for sowing the following seeds

- Ground nut seeds
- Lady's finger seeds
- Maize
- Sun flower, etc.,

It can be used to spread the following seeds

- Rice seeds
- Wheat seeds
- Sorghum seeds
- Mustard seeds
- Pearl millets, etc.,

It can be used to spray the fertilizers for following plants

- Sugar cane plants
- Turmeric plants
- Tapioca plants
- Vegetable plants, etc..

IX. CONCLUSION

This project work has provided us an excellent opportunity and experience, to use our limited knowledge. We gained a lot of practical knowledge

regarding, planning, purchasing, assembling and machining while doing this project work. We feel that the project work is a good solution to bridge the gates between the institution and the industries.

We are proud that we have completed the work with the limited time successfully. The DESIGN AND FABRICATION OF BLUE TOOTH CONTROLLED SOLAR MULTIPLE AGRICULTURAL VEHICLE is working with satisfactory conditions. We can able to understand the difficulties in maintaining the tolerances and also the quality. We have done to our ability and skill making maximum use of available facilities. In conclusion remarks of our project work, let us add a few more lines about our impression project work. Thus we have developed a "Blue tooth controlled solar multiple agricultural vehicle" which helps to sow the groundnut seeds and also corn seeds sometimes by automating the entire planting process with the help of simple mechanisms.

Multi agricultural purposes can be carried out simultaneously with the help of this machine and thus the name Multi Agro Machine. So, for in future the same project will be remolded and designed to carry out multi-functional operation.

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