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# Solar Powered Agribot and Surveillance System

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**Abstract**: Agricultural robotics technology helps to produce qualitative products at higher speeds and with fewer errors. Robotics helps in various fields like agriculture, medicine, mining and space researches. The major disadvantage of driverless machines for agriculture is liability. This technology can completely change cultural or emotional appeal of agriculture. Robotics in agriculture could play a very important role in automizing the several processes. Agriculture consists of grass cutting, Ploughing, Seed Sowing, Seed watering and Crop cutting for early growing plants/crop. These operations can be achieved by means of solar operated multifunctional vehicle. Current methods for off-road navigation using vehicle and terrain models to predict future vehicle response are limited by the accuracy of the models they use and can suffer if the world is unknown or if conditions change and the models become inaccurate .In this paper, an adaptive approach is presented that closes the loop around the vehicle predictions. This approach is applied to an autonomous vehicle known as field robots used in agriculture Agricultural Robotics is the logical proliferation of automation technology into biosystems such as agriculture, forestry, green house, horticulture etc. Presently a number of research are being done to increase their applications. Some of the scientist contributions are mobile robot, flying robot, forester robot, Demeter which are exclusively used for agriculture.

Keywords: Robotics, Navigation, Field Robots, Proliferation, Demeter

## I. INTRODUCTION

Agriculture is an essential industry that plays a critical role in providing food, fibre, and other important resources to people around the world. However, traditional farming methods are often labour-intensive, time-consuming, and can have a significant impact on the environment. To address these challenges, solar-powered agricultural robot and surveillance system is designed to improve the efficiency, productivity, and sustainability of farming operations. Solar-powered agricultural robots are equipped with various sensors, cameras, and other technologies that enable them to perform tasks such as planting, weeding, fertilizing, and harvesting crops autonomously. These robots are powered by solar energy, which makes them an eco-friendly and cost-effective alternative to traditional farming methods that rely on fossil fuels. In addition to agricultural robots, solar-powered surveillance systems are also becoming increasingly popular. These systems use solar panels to power cameras and other surveillance equipment, making them ideal for remote locations where access to electricity is limited. They can be used for a variety of applications, including monitoring crops, livestock, and equipment, as well as providing security for farmsteads and rural properties.

## II. LITERATURE REVIEW

**A S Prajith et al.,[1]** has discussed about Agrobot being designed to perform a variety of agricultural tasks, including plowing, planting, and harvesting crops. The robot was equipped with a range of sensors, including a camera, GPS, and distance sensors, which allowed it to navigate and operate autonomously in the field. The robot was also powered by a solar panel, which allowed it to operate for extended periods without the need for external power. The paper provides a detailed description of the Agrobot's design and components, including its mechanical and electrical systems, as well as its control system. The authors also discuss the testing and validation of the Agrobot, including field trials in which the robot successfully performed a range of agricultural tasks.

**Nithin P et al.,[2]** The multipurpose agricultural robot was designed to perform a variety of tasks in agricultural operations, including soil tilling, seed sowing, and pesticide spraying. The robot was equipped with a range of sensors, including a GPS and distance sensors, which allowed it to navigate and operate autonomously in the field. The robot was also powered by a solar panel, which allowed it to operate for extended periods without the need for external power.
The paper provides a detailed description of the design and components of the multipurpose agricultural robot, including its mechanical and electrical systems, as well as its control system.

  

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**Abdul Rahman et al., [3]** The paper provides a detailed description of the design and development of the seed sowing robot, including the use of CAD software to design the robot's mechanical and electrical components, as well as the programming of the robot's control system. The authors also discuss the testing and validation of the robot, including field trials in which the robot successfully planted seeds in a variety of agricultural crops.The robot was powered by a solar panel, which allowed it to operate for extended periods without the need for external power. The robot was also equipped with sensors that could detect obstacles and adjust its path to avoid them. The authors note that the use of a seed sowing robot can help to reduce labor costs and improve planting accuracy, resulting in higher crop yields.

**C. N. Okafor et al., [4]** The paper provides a detailed description of the design and components of the solar-powered surveillance system, including its mechanical and electrical systems, as well as its control system. The authors also discuss the testing and validation of the system, including field trials in which the system successfully detected intruders in the farmland. The surveillance system was designed to monitor farmland and detect intruders or potential threats. The system consisted of a camera that was connected to a solar panel for power supply, and a microcontroller unit that controlled the system's operations. The camera was mounted on a pole in the field and captured images of the farmland at regular intervals. The images were then processed by the microcontroller, which analyzed the images for any potential threats and alerted the farmer if necessary.

**S Das et al.,[5]** The paper provides a detailed description of the design and components of the solar-powered autonomous mobile robot, including its mechanical and electrical systems, as well as its control system. The autonomous mobile robot was designed to perform precision agricultural tasks, such as seed sowing, fertilizer application, and weed removal. The robot was equipped with a range of sensors, including GPS, light sensors, and temperature sensors, which allowed it to navigate and operate autonomously in the field. The robot was also powered by a solar panel, which provided the necessary energy for the robot to operate for extended periods without the need for external power.

## III. METHODOLOGY

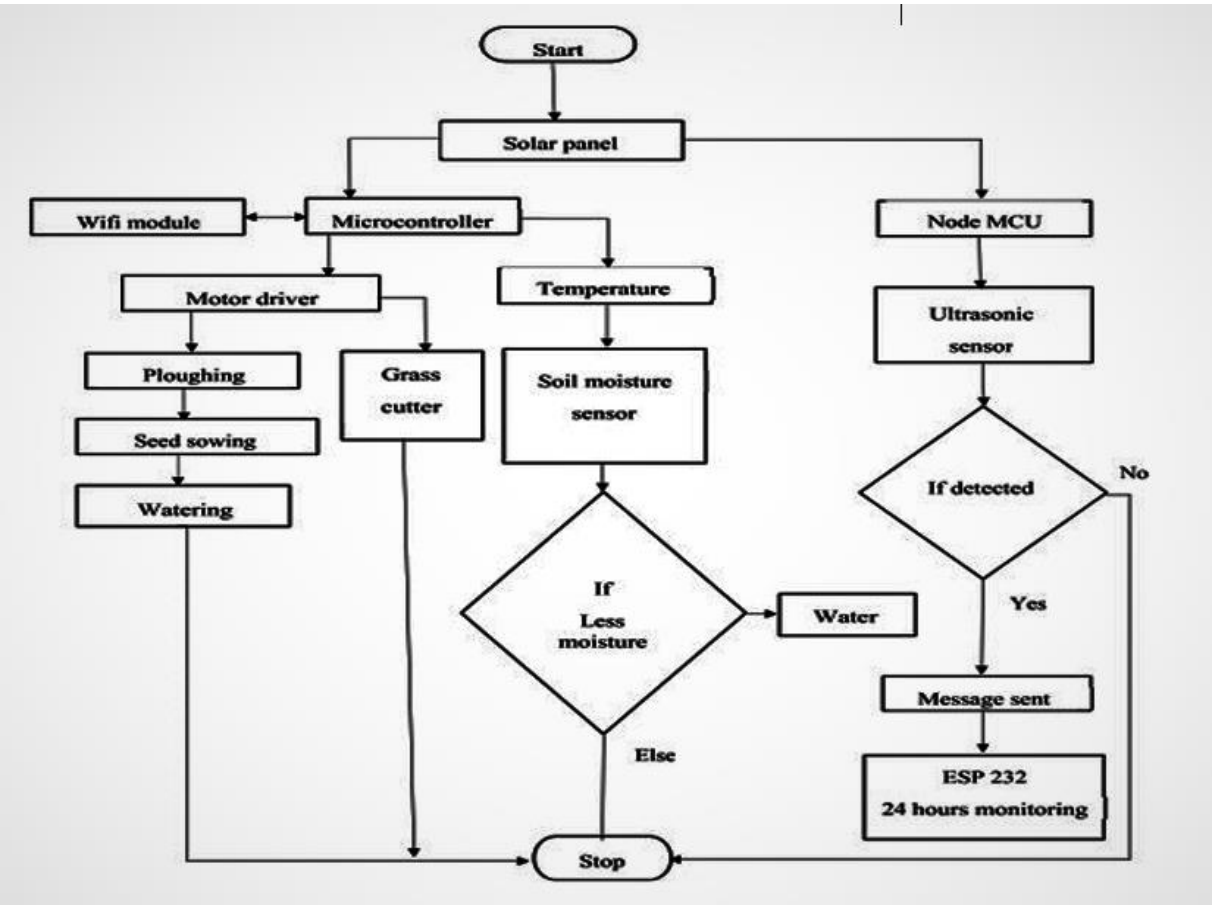


**Fig 1: Flowchart of Working Mechanism**

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Working mechanism

A. The working of the device is powered by solar panel
B. Throughout each phase of the project, a range of tools and techniques may be used to support the development of the Multipurpose agricultural robot.
C. The switches consist of different keys for different applications. Movements are done automatically by Bluetooth.
D. Ploughing, Seed Sowing and Watering is done sequentially one after the other.
E. Controlling the operations is done by user friendly android application.
F. 24-hour surveillance is achieved by means of ESP camera powered by the microcontroller.
G. Object detection is incorporated by using ultrasonic sensor.

## IV. MODELING AND RESULTS

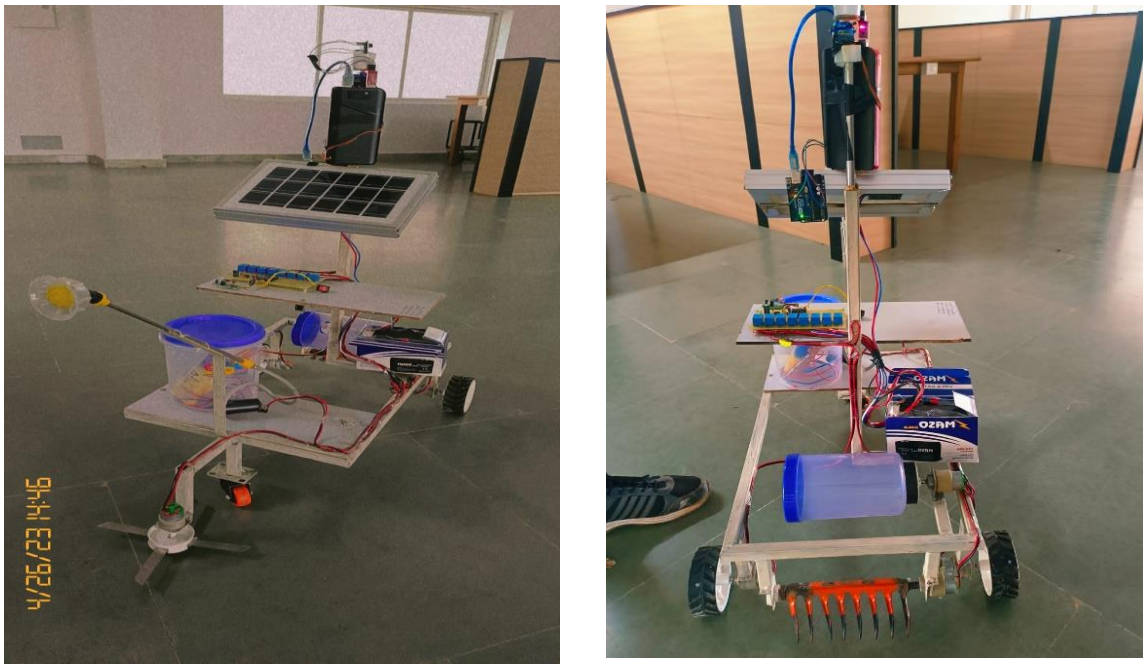

Fig 2: Working Model

Result Practically this multipurpose agricultural equipment can be used for weeding, fertilizing, seed sowing and also used for weed removal purposes. All the parts are connected in such a way that in every stage of agriculture the equipment can be rearranged or easily assembled with fasteners to required length and specifications of field operation. The working model of solar powered multipurpose machine successfully functioned and the machine can perform their operation such as weeding, seed sowing, and pesticide spraying and leveling the soil successfully. Then the working model is performed well and proved their functions. 24-hour field monitoring of agricultural field is achieved through ESP 32 camera and ultrasonic sensor.

## V. CONCLUSION

Overall, the project has the potential to revolutionize the way agriculture is done by introducing automation, precision, and sustainability. With further research and development, this system can be improved and made more accessible to farmers around the world, leading to increased productivity and profitability in the agricultural sector.

The objectives satisfied are:

1. To design and develope multipurpose agricultural robot by vertical movement using solar panel and Arduino circuit board.
2. To monitor the agricultural field using ultrasonic sensor for surveillance.

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