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SOLAR SEED SOWING ROBOT

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***Abstract*—The concept of producing innovative machinery for use in India's agricultural sector is a sound one, given that such tools have the potential to both lessen the amount of labour that is physically required of farmers and boost their output. The use of automation in agriculture has the potential to both decrease waste and boost productivity. Farmers may find value in the suggested system that includes a control mechanism for sowing, ploughing, and plant cutting since it has the potential to assist in the performance of tasks that are more exact and precise. This method has the potential to boost production while also decreasing the number of seeds that are wasted. Additionally, the concept of connecting this device to tractors in order to automate the process is a sound one since it has the potential to save time and minimize the amount of physical labour that is required of farmers. Automation may also assist in creating regularity in processes, which can lead to higher quality output. This can be accomplished via the use of automation. Solar robots are another option that should be considered since they have the potential to lessen our dependency on nonrenewable energy sources and bring down the total cost of farming. Another important benefit is that the solar robots can turn themselves down at night and start up automatically in the morning. This feature allows the robots to save energy. Overall, the suggested system has the potential to be a game-changer for the agricultural industry in India. If it is well implemented, it can aid in lowering the amount of physical labour that farmers do, boosting their output, and reducing the amount of food that is wasted.**

Keywords—Skin cancer; Multi-resolution analysis; Support vector machine; Medical image classification; Bendlet Transform.

I. INTRODUCTION

Agricultural robots and other technologies have the potential to revolutionize the way farming is done in India. While the country has made significant progress in improving agricultural productivity over the years, there is still a lot of room for improvement. The use of robotics and automation can help to address some of the challenges faced by the sector, such as labour shortages, low yields, and rising costs.

One of the most significant challenges faced by Indian farmers is the lack of skilled labour. As the rural population continues to decline, farmers are struggling to find workers who are willing and able to work in the fields. In many cases, this has led to a reliance on inefficient manual labour, which is time-consuming and costly. Agricultural robots can help to reduce the need for human labour and improve productivity. For example, seed planting, which is traditionally done by hand, can be automated using robots, reducing the need for manual labour and improving the accuracy of seed placement. The use of agricultural robots may also assist to enhance efficiency since they make it possible for farmers to complete their task in a more timely and productive manner. For instance, a robot that can plough a field can cover a great deal more territory than a human worker can in the same amount of time, and it can do it far more efficiently. This allows farmers to plant crops and harvest them more quickly, as well as react more swiftly to changing circumstances in the field.

A further advantage of agricultural robots is that they may assist in the process of cost reduction. Farmers are able to save money on the expenses of employing personnel and providing them with training if they can reduce their reliance on human labour. In addition, farmers are able to cut down on the amount of time and resources required to execute certain jobs via the use of automation, which may contribute to a reduction in total expenses.

The use of agricultural robots also has positive effects on the surrounding natural ecosystem. For instance, the use of robots may assist cut down on the quantity of water and fertiliser that is required for agricultural production, which in turn can contribute to the preservation of natural resources and the reduction of pollution. In addition, agricultural robots may contribute to the reduction of greenhouse gas emissions and the enhancement of the sustainable nature of farming by making use of alternative energy sources such as solar power.

While there are many benefits to using agricultural robots, there are also challenges that need to be addressed. For example, the high cost of robotics technology can be a barrier

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to adoption for many farmers, particularly small-scale farmers who may not have the resources to invest in new equipment. Additionally, there may be concerns about the impact of robotics on employment in rural communities.

The overall potential exists for the development of agricultural robots and other technology to increase the efficiency, production, and long-term viability of farming in India.

Nevertheless, it is essential to make certain that these technologies are developed and implemented in a manner that is suitable for and easily accessible to all farmers, and that they do not result in unexpected effects such as the loss of jobs or damage to the environment. Indian farmers can continue to enhance the productivity and sustainability of their farms while also guaranteeing that they are able to provide for their families and communities if they collaborate with one another to develop and apply these technologies.

II. METHODOLOGY

The development of agricultural robots has gained momentum in recent years as farmers look to increase their efficiency and yield while reducing costs. Agriculture is the oldest and one of the most important economic activities in the world, as it provides food, fibre, and fuel necessary for our survival. The use of agricultural robots is an effective way to improve productivity and enhance the quality of crops, as well as reduce the impact on the environment.

The key focus of the development of agricultural robots is to create machines that are more intelligent, efficient, and cost-effective. By automating the plowing, seeding, and grass cutting process, agricultural robots are helping farmers to reduce labour costs and improve productivity. These robots can be operated by the farmers themselves, who can control them remotely using a PC or mobile device. This remote control also enables farmers to guide the robot manually, ensuring that the humidity in the environment is stabilized.

The use of advanced sensors and control systems is also an essential aspect of agricultural robots. These sensors can monitor various factors such as soil moisture, temperature, and nutrients, enabling the robot to optimize resource management and integrated pest and disease management. Obstacle detectors and sowing control sensors are also used to ensure precise seed placement and reduce the risk of exposure to rats, birds, and snails. This improves the overall yield of the crops and reduces the need for manual labour.

The seed drill is one of the critical components of agricultural robots. The seed drill is a sowing gadget that accurately positions seeds in the soil and covers them. Prior to the introduction of the seed drill, farmers would plant seeds by hand, which was inefficient and led to poor distribution of seeds, resulting in low productivity. The use of a seed drill can improve the proportion of harvest yield by as much as nine times. By automating this process, agricultural robots are helping farmers to increase their yield while reducing costs.

The grass cutter is another important component of agricultural robots. The grass cutter is used to remove unwanted grass that can compete with crops for nutrients and resources. By removing this unwanted grass, agricultural robots help to improve the overall quality of the crops, resulting in higher yields.One of the key advantages of agricultural robots is that they are powered by solar energy using solar panels. This ensures that the robot operates with minimal impact on the environment and without the need for fossil fuels. The use of solar panels is a sustainable and cost-effective way to power agricultural robots and reduce the carbon footprint of farming.

The development of agricultural robots is a significant step forward in the field of agriculture. By automating the plowing, seeding, and grass cutting process, agricultural robots are helping farmers to increase their yield while reducing labour costs. The use of advanced sensors and control systems, seed drills, and grass cutters is ensuring that the quality of crops is improved while reducing the risk of exposure to pests and diseases. The use of solar panels is a sustainable and cost-effective way to power agricultural robots and reduce the carbon footprint of farming.

A. Project Specification:

The main components being used in making the robot have been discussed in this chapter.

Hardware components: the list of hardware which has been used in the project is as stated below and is briefly described in the further sections.

- Microcontroller: R5F100LE
- Power Supply: 5V DC
- Dc Motors
- ALCD
- L293D Driver circuit
- Bluetooth HC-05 2.485GHz Transceiver

The software which has been used in the project isCube Suite+: For Programming the Controller Operations

B. Implementation:

The Renesas R5F100LEcore is a microcontroller that combines a rich instruction set with 32 general purpose working registers. These 32 registers are directly connected to the Arithmetic Logic Unit (ALU), which allows for the simultaneous access of two independent registers in one single instruction executed in one clock cycle.

This architecture results in a more code-efficient system, while also achieving throughputs up to ten times faster than conventional CISC microcontrollers. This makes the Renesas R5F100LEcore an ideal choice for applications requiring high speed and efficient processing.

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A DC Motor is an electric motor that runs on direct current (DC) electricity. They have been used to run machinery, often eliminating the need for a local steam engine or combustion engine. DC motors can operate directly from rechargeable batteries, providing the motive power for the first electric vehicles. They are still widely used in a variety of applications, including robotics, manufacturing, and automotive industries.

SONAR sensors provide a simple concept of sonar technology that works by emitting high frequency pulses of sound forward. When an object obstructs the path of the sound waves, they bounce back to the source.

By measuring the time, it takes for the pulse to be emitted and received, the distance to the object can be determined.

The speed of sound (340.29 m/s) is used to calculate the distance travelled by the sound wave, allowing for the distance to the object to be deduced.

The L293D is an integrated circuit motor driver that can be used for simultaneous, bidirectional control of two small motors. It is limited to 600 mA, but in reality, can only handle much smaller currents unless heat sinking is used to keep the case temperature down.

To test if the L293D can work with a particular motor, the circuit can be hooked up and the motor can be run while keeping a finger on the chip.

If it gets too hot to touch, it is not suitable for use with the motor. The L293D comes in a standard 16-pin, dual-in-line integrated circuit package and is commonly used in robotics, drones, and other motor control applications.

The BLUETOOTH HC-05 is a single chip 2.485GHz transceiver with an embedded baseband protocol engine (Enhanced Shock Burst), designed for ultralow power wireless applications. It is designed for operation in the worldwide ISM frequency band at 2.400 - 2.485GHz. An MCU (microcontroller) and very few external passive components are needed to design a radio system with the BLUETOOTH HC-05. The important characteristic of the BLUETOOTH HC-05 is that it has a built-in antenna for the transmission of wireless packets, making it a popular choice for wireless communication in robotics, drones, and other applications.

C. Hardware Implementation:

The microcontroller manufactured by Renesas and referred to as the R5F100LEcore is the most important part of the TMR system. It is in charge of processing data and carrying out instructions. It comes with a comprehensive instruction set and 32 working registers that may be used for any purpose, and it has the capacity to access two separate registers within a single cycle of the clock. This design offers throughputs that are up to 10 times quicker than those achieved by standard CISC microcontrollers while also being more code efficient.

The TMR system draws its motive power from the DC motor, which is installed in it. Direct current (DC) is the kind of energy that it utilises, and it may get its power straight from rechargeable batteries. The integrated circuit motor driver L293D is used for the purpose of simultaneously controlling two smaller motors in both directions.

It is restricted to 600 mA and comes in a conventional 16-pin, dual-in line integrated circuit package. Because the current output is limited, a heat sink is required to maintain a low temperature within the case.

The SONAR sensors operate by sending out pulses of sound at a high frequency in front of them. When those pulses are reflected back to the source, the sensors are able to find anything that might be dangerous to the environment. If both the speed of sound and the length of time it took for the pulse to be emitted and received are known, then it is feasible to determine the distance to the object that was obstructing the path of the pulse. This is because the distance can be calculated using the speed of sound.

Ultralow power wireless applications are the focus of development for the BLUETOOTH HC-05, which is a single chip transceiver operating at 2.485GHz and including an integrated baseband protocol engine (Enhanced Shock Burst). In addition to having an antenna for the transmission of wireless packets that is integrated right into the device, it is constructed for operation in the ISM frequency range that is used globally, which runs from 2.400 to 2.485GHz.

In addition to these components, the TMR system makes use of a variety of additional hardware components as well as software applications. These components include UART, SPI, and I2C channels, as well as several wireless transceivers, and a variety of sensors and control systems. The use of three UART channels offers the benefit of employing several wireless transceivers concurrently, which gives the TMR system the ability to carry out more complicated activities and reach better levels of productivity.

D. Renesas R5f100le Microcontroller:

Renesas microcontroller offers several advanced features compared to its predecessor, the 8051 family of microcontrollers. Some of the notable features include:

Variable instruction time: The Renesas microcontroller offers application-specific minimum instruction time adjustment. Real-time processing and high-speed data transport applications benefit from this.

Memory capacity: The memory capacity of the Renesas microcontroller ranges from 16 to 512KB of ROM and 2 to 32KB of RAM, depending on the series and number of pins. This large memory capacity allows for the storage of a significant amount of data, making the Renesas

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microcontroller well-suited for applications that require extensive data storage and processing.

Built-in oscillators: Renesas microcontrollers come with on-chip high-speed (32 MHz to 1 MHz) as well as low-speed (15 MHz) oscillators, which can help to reduce system costs and simplify the design process. The high-speed oscillator allows for fast clock speeds, making the Renesas microcontroller suitable for applications that require fast processing speeds. The low-speed oscillator, on the other hand, is useful for low-power applications.

Analog to Digital converter: Renesas microcontrollers are equipped with a 10-bit resolution A/D converter, which allows them to convert analog signals to digital values. The number of channels for the A/D converter ranges from 6 to 26 depending on the series, making the Renesas microcontroller suitable for applications that require analog signal processing.

Serial Interface: The Renesas microcontroller offers application-specific minimum instruction time adjustment. Real-time processing and high-speed data transport applications benefit from this.

Timer with PWM features: The Renesas microcontroller has 0-7 channels for timers with built-in PWM features, which makes it well-suited for controlling various devices. The PWM feature is useful for controlling the speed of motors or the brightness of LEDs.

Multi-tasking: Most of the pins of the Renesas microcontroller have multi-task features, allowing them to perform multiple functions with a single pin. This feature can help to reduce the number of pins required for an application, reducing the overall cost of the system.

Cost-effective: Renesas microcontrollers are comparatively less expensive than other microcontrollers with similar features. This makes them an attractive option for applications that require advanced features but have a limited budget.

Rigid body: The Renesas microcontroller has a rigid body, which makes it less prone to damage due to electrostatic charge. This can help to extend the lifespan of the microcontroller, making it more reliable in the long run.

Power supply: Renesas microcontrollers operate with a 5V power supply, making them compatible with a wide range of power sources. This makes the Renesas microcontroller easy to integrate into existing systems and reduces the need for additional power management components.

E.DC Motors:

Electric motors are indeed an essential part of our daily lives, and their versatility allows them to power various applications ranging from large-scale industrial equipment to small household devices.

As mentioned, there are two broad categories of electric motors: DC and AC. DC motors are capable of operating from direct current, whereas AC motors require alternating current. DC motors are further divided into two types: brushed and brushless motors. Brushed motors use a commutator and brushes to transfer power to the rotor, while brushless motors use an electronic controller to direct the current flow to the stator.

In addition to the types of motors, there are different types of configurations, such as single-phase and three-phase motors, each having their own benefits and limitations. AC motors are commonly used in industrial applications due to their efficiency and ability to produce high torque, whereas DC motors are often used in applications where speed control is necessary.

In the case of the robot mentioned, two DC motors with a speed of 60rpm are being used for movement. The selection of the type and size of motor is crucial in designing the robot and achieving the desired performance. The DC motors used in this robot likely have a high torque output and can be precisely controlled to provide accurate movement.

Overall, electric motors are crucial in powering many of the devices we use in our daily lives, and advancements in motor technology continue to increase their efficiency, reliability, and range of applications.

F.Construction:

DC motors consist of one set of coils, called armature winding, inside another set of coils or a set of permanent magnets, called the stator. Applying a voltage to the coils produces a torque in the armature, resulting in motion.

Stator:

The stator is the stationary outside part of a motor.

The stator of a permanent magnet dc motor is composed of two or more permanent magnet pole pieces.

The magnetic field can alternatively be created by an electromagnet. In this case, a DC coil (field winding) is wound around a magnetic material that forms part of the stator.

Rotor:

The rotor is the inner part which rotates.

The rotor is composed of windings (called armature windings) which are connected to the external circuit through a mechanical commutator.

Both stator and rotor are made of ferromagnetic materials. The two are separated by air-gap.

F.Construction:

A winding is made up of series or parallel connection of coils usually made of copper.

Armature winding - The winding through which the voltage is applied or induced.

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Field winding - The winding through which a current is passed to produce flux (for the electromagnet).

G. Hardware System:

The Agricultural Robot described here is a useful and innovative solution that can help farmers perform various tasks efficiently and accurately. The robot is designed to perform four primary tasks, namely grass cutting, plowing, seeding, and obstacle detection. Additionally, it is powered by solar energy, which is stored in a battery and used to supply electricity to the robot.

The robot receives user inputs through a Bluetooth module that has a range of 100 meters. This feature provides farmers with the convenience of controlling the robot from a distance, eliminating the need for them to be physically present near the robot. The robot is equipped with a DC motor and blades that are capable of effectively cutting grass. The plowing arm, made of screws, is another essential feature of the robot that can be used for soil plowing. The plough arm moves down and plow the soil, and after completion, it is lifted up.

Seeding is another vital aspect of farming, and the robot is designed to drop seeds using the open-close movement of valves at equal intervals, ensuring proper spacing between the seeds. In case of any obstacle detected by the robot, it stops its movement and waits for the user to remove the obstacle and reset the robot. This feature ensures the safety of the robot and prevents any damage that may occur in case of collision with an obstacle.

The solar panel connected to the robot is capable of generating electricity from the sun. This electricity is stored in a battery that is used to supply power to the Agriculture Robot. The use of solar energy eliminates the need for fossil fuels, reducing the carbon footprint and making the robot environmentally friendly. Additionally, the battery backup ensures that the robot can operate even in the absence of direct sunlight.

Overall, the Agricultural Robot is an innovative and efficient solution that can help farmers increase productivity and reduce manual labour. Its features, such as Bluetooth connectivity, obstacle detection, and solar power, make it a sustainable and practical solution for modern farming practices.

III. Application

The mode of operation of this machine is very simple even to the lay man.Labour problem can be reduced.Wastage of seed is less.Power generated using solar panel which reduces the electricity supply which is major breakthrough in agricultural development system.

The use of this agricultural robot can increase efficiency and productivity in farming.The accuracy and precision of the tasks performed by the robot can result in better crop yield.

The use of the robot can reduce the need for manual labour, which can help reduce labour costs.With the ability to perform tasks like plowing, seeding and grass cutting, the robot can help reduce the time and effort required for these activities.

The robot can also be programmed to operate at specific times, which can help optimize farming operations.With the obstacle detection feature, the robot can help prevent damage to crops and other obstacles in the field.

IV. Conclusion

The use of wireless technology in agriculture has become increasingly popular in recent years. This technology has the potential to revolutionize the way we farm by allowing farmers to monitor and control their operations remotely, reduce labour requirements, increase crop yields, and improve overall efficiency.

One of the key benefits of this technology is that it can significantly reduce the need for manual labour. Farming is a labour-intensive industry, and finding reliable and skilled workers can be challenging. With the help of wireless technology, farmers can automate many of the routine tasks that were previously done by hand, such as plowing, seeding, and harvesting.

In addition to reducing labour requirements, wireless technology can also help increase crop yields and productivity. By providing farmers with real-time data about weather conditions, soil moisture levels, and other factors that affect crop growth, they can make more informed decisions about when to plant, fertilize, and harvest. This can help maximize the potential of the land and increase profits for farmers.

The integration of solar power with wireless technology can also help reduce the dependence on traditional energy sources. This can be an eco-friendlier option for farming, as it reduces the carbon footprint and overall environmental impact of farming operations. Additionally, solar power can provide a reliable source of energy in remote areas where traditional electricity sources may not be available.

The flexibility of the user interface can also make it easier for farmers to adopt new technologies and improve their farming practices. The user interface can be designed to be intuitive and easy to use, allowing farmers to quickly and easily control their operations using a smartphone or tablet.

Finally, the use of wireless technology can help farmers stay connected and informed about the status of their crops and farming operations. This can help them make more informed decisions and respond quickly to any issues that arise. This can ultimately result in higher yields, lower costs, and greater profits for farmers.

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Overall, the use of wireless technology in agriculture has the potential to transform the industry and improve farming practices globally. As this technology continues to evolve, we can expect to see even more innovative applications and solutions that help farmers produce more food with fewer resources.

V. Future Work

Adding more sensors and integrating advanced technologies can greatly enhance the capabilities of the Agriculture Robot and make it even more efficient and intelligent. Here are some possible extensions to the initial prototype:

Soil sensors: By adding soil sensors to the robot, it can analyze the soil's moisture content, pH level, and nutrient concentration. This information can be used to optimize the amount and timing of irrigation and fertilization, leading to more efficient use of resources and higher crop yields.

Obstacle detection sensors: In addition to the basic obstacle detection feature, additional sensors can be added to detect various obstacles in the field, such as large rocks, trees, or other non-movable obstacles. This will help the robot to navigate around them and avoid any damage to the robot.

360-degree camera: By integrating a camera with a 360-degree view on the robot, farmers can monitor the field from the comfort of their home. This will allow them to assess the crop growth, monitor the movement of the robot, and make adjustments to the robot's tasks in real-time.

Climate sensors: By adding climate sensors to the robot, it can analyze the environmental conditions such as temperature, humidity, and wind speed. This information can be used to make adjustments to the robot's tasks and optimize the crop growth conditions.

Advanced connectivity technologies: In addition to Bluetooth, advanced technologies such as GSM, Zigbee, WIFI, IOT, Wi Smart, etc. can be used to connect the robot to a larger network. This will allow farmers to access real-time information on the status of the robot, analyze data on the crop growth, and even control the robot remotely.

Reference

[1] Ms. Gaganpreet Kaur, Anushka Upadhyay, Akash Srivastava, Abhishek Yagnik, Abhishek Bhardwaj Solar Powered Seeding and Ploughing Robot-A Review - IJRAER.2017

[2] Prof. Pranil V.Sawalakhe, “Solar powered seed sowing Machine” presented in Global Journal of Advanced Research.

[3] Abdulrahman, Mangesh Koli, Umesh Kori, Ahmadakbar Department of MECHANICAL and Engineering Theem College of Engineering Seed Sowing Robot International Journal of MECHANICAL Trends and Technology (IJMET) – Volume 5 Issue 2, Mar – Apr 2017.

[4] Andrew English, Patrick Ross, David Ball, Peter Corke 2014 Vision Based Guidance for Robot Navigation in Agriculture IEEE International Conference on Robotics & Automation (ICRA) IEEE

[5] Amrita Sneha.A ;Abirami.E; Ankita.A; R. Praveena; R. Srimeena 2015” Agricultural Robot for automatic ploughing and seeding” IEEE Technological Innovation in ICT for Agriculture and Rural Development (TIAR)Year: 2015 | Conference Paper | Publisher: IEEE

[6] K Durga Sowjanya ; R Sindhu ; M Parijatham ; K Srikanth ; P Bhargav, 2017, International Conference on Electronics, Communication and Aerospace Technology(ICECA),Wed, 7 Oct, 2020 – Fri, 9 Oct, 2020

[7] Nitin P. V., Shivprakash, "Multipurpose Rural Robot", Global Diary of Designing Exploration Vol.5, Issue, 06, PP:1129-1254, 20 May 2016.

[8] Mahesh. R. Pundkar and A. K.Mahd-Sowing Machine: Review”
International Journal of Engineering and Social SciencVolume3,
Issue3, Pp-68-74

[9] Laukik P. Raut, Smit B. Jaiswal and NitinY. Mohite, “Design,development, and fabrication of agricultural pesticides. Withweeder”, International Jour of Applied Research and Studies,2013.

[10] Ramesh and H. P. Girishkumar, “Agriculture Seed Sowing Equipment: A Review”, International Journal of Science,Engineering and Technology Research, 2014, Volume 3, Issue 7,Pp-1987-1992

[11] Pranil V. Sawalakhe, Amit Wandhare, Ashish Sontakke, Bhushan Patil, Rakesh Bawanwade and Saurabh Kurjekar, “Solar Powered Seed Sowing Machine”, Global Journal of Advanced Research, Vol-2, Issue-4, Pp-712-717

[12] Sridhar H. S “Development of Single Wheel Multi-Use Manually Operated Weed Remover”, International Journal of Modern Engineering Research, 2013.