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ECONOMICAL AGRIBOT WITH SELFPATH SENSOR

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Abstract - *The microcontroller-based agricultural robot is an intelligent device used in agricultural activities to reduce the human activity. This is related to the effect of labour shortages, the recent major crisis in agricultural production. The primary issue for the cause of reduction is the lack of labour. For this project, the system is fitted with 12v battery powered by solar power cell. Automatic control is proposed here to engage in multiple agricultural activities, as this robotic machine is designed to overcome the labour shortage. This machine involves the agricultural activities namely ploughing, seed spraying and closing. The drive action is done with the help of Arduino UNO microcontroller. The robot will be powered by a battery that is connected to its electric charger for recharging. The goal of this paper is also to be economically so as it is an investment of one time.*

Key Words: Agribot, Arduino UNO, Solar panel, servo motor, Stepper motor, self-path sensor.

1. INTRODUCTION

Farmers today spend a lot of money on machinery to support them in reduced labor work for the increased crop growth. The machine available for various processes such as ploughing, harvesting, spraying pesticides and so on, other than labor shortages, is another problem in the world's increasing population demand. The perfect solution for overcoming all the limitations including Automation. It is done by developing the devices that conduct more than one farming activity and automating those operations to improve large-scale crop production.

Nearly 70 per cent of the people are dependent on agriculture. The revolutionary invention in the agricultural system is a major task due to rising demand for good quality agricultural products and lack of work in rural agriculture. This smart machine will be very useful to farmers who are eager to take farming in hand but are faced with the question of labor shortages.

2. LITERATURE SURVEY

Farmers play a significant role in food production and can therefore be confidently identified as the backbone of food production. In India, about 56 per cent of people rely on farming to earn a living. But in agriculture, technical advancement is less compared with other fields. Agriculture robot is one of those machines with the ability to perform efficient work that is possible with the help of various computational algorithms. The improved specification allows design, intelligent control and render agriculture safe and suitable for all.

Nidhi Agarwal1, Ritula Thakur2 et al[1] developed a new advance in robotics agriculture to improve the farming method, and also complained about the system's difficulty. Charansingh A. Patil1, Sunil U. Nyati2[2] proposed a multifunctional mechanical vehicle for application in agriculture and on past technology. L.Manivannan1, M.S.Priyadharshini2 [3] designed the integration of all functions such as planting, irrigation, fertilization, monitoring and harvesting with the aid of a single robot, namely Fire bird v robot, and automatically performs the above functions in the case of an onion field.

M. Mathankumar, P. Thirumoorthi [4], proposed paper has two main sections such as monitoring section and control (robotic) section. The communication between them is done through wireless technologies. The control section is constructed by using temperature sensor, humidity sensor, seed dispenser, seed storage, sprayer construction, robotic system with motors, wireless camera network, microcontroller, Zigbee transceiver and power supply. The entire system is controlled by microcontroller, which dictates the operating sequence to all networks. Here sensor outputs are processed by their corresponding embedded programs, robot driven by their internal motors in desired directions. Based on the wireless camera footages monitoring section transmits the commands for ploughing, seed sowing and spraying using LABVIEW software through Zigbee.

C. Jeeva, Saher Mairaj, Archit keshav Gangal and Farheen [5], designed Agrobot is a multifunctional robot that performs three noteworthy capacities typically required in Agriculture field i.e. Ploughing, Seed dispensing or spreading the fertilizer and harvester. Agrobot comprises of a control unit which chooses field estimation in length and breadth in the feat. After size determination of the field, a set capacity enters in the board permits choosing modes like Plowing, Seed circulation and Harvester. This is a working undertaking that has been totally amassed properly tried and employments Mechanical/ Electrical/Electronic segments according to the necessity of the model of Agribot.

Sridevi Rao, Sushma Nayak R, Sushmitha N G, Sowmya Poojary, Nagaraja Rao [6], designed to automate work of a farmer so that he can tirelessly perform his farming tasks. The aim is to automate the most common and frequent tasks of the farmer. This paper focuses on remote controlling and slightly automating the tasks in agriculture so as to get daily farming tasks done with ease. The qualitative approach of this paper is to develop a system which minimizes the working cost and also reduces the time for ploughing, cutting, digging, seed sowing operation, spraying, and weed control by utilizing solar energy and power supply to run the robot.

Mutharasu, Divya.V, Dhivya Bharathi.k, Elakkiya.M.V, Janani.E [7], proposed project is developed for automatically cultivating the land. This project consists of two mechanisms. The first mechanism contains working principle to navigate the assembly of the robot vehicle, whereas the second mechanism is prepared to plough the land, seeding and watering it.

Sweety Dutta, Udit Shanker, Sulekha Katiyar, Venktesh Singh, Mohd. Nayab Zafar , J. C. Mohanta [8], designed a robot that divides the field into a grid with intersection points as places where the seeds are sown. The depth of the hole, the distance between points where the seeds are sown is calculated according to government data and is fed to the logic board of the robot. The robot goes to the starting point and makes a hole using a toothed wheel with teeth of increasing height. The delivery system makes sure that only one seed is dispensed per hole and the back plate mechanism fills the hole after sowing is done. Sensors are used for obstacle detection and robot changes its path accordingly.

Most of the literature in the above review showed us the use of various robots used worldwide for performing specific functions. However considering the Indian economy and the agricultural scenario in India, it is highly infeasible to use multiple robots in the field as it would be expensive as well tough to manage. The literature also failed to throw light on the integrated functions performed on a single robot, thus avoiding the use of multiple robots in the same field.

3. EXISTING SYSTEM

This concept attempts to develop the farmer could be separated while the computer operating in the field of agricultural processes, where initially only minor progress was made in the semi-automation of agri-robots or even an automotive industry. This system will be taken after gradual development in the agricultural sector, using improvement. But this method requires huge manpower nowadays, and spends more on seeding and plugging method investment. The biggest downside is manpower shortage and higher power usage.

4. PROPOSED SYSTEM

The automation robot is invented in the agricultural process to improve production, profitability, effective usage of resources and materials and the labor cost. An autonomous seed-sowing robot is modeled in this paper which is integrated with self-path sensor. Once the robot will place at the starting point, initially using the drive's teeth to cut mechanism to create a hole. One seed per hole is sprayed via the seeding system. After delivery of seeds the closing mechanism is used to close the mud and the water is sprinkled above the mud. In this robot the ultrasonic sensor is used to detect the obstacle. The sensor senses the obstacle and the path of the robot when the robot encounters the obstacle.

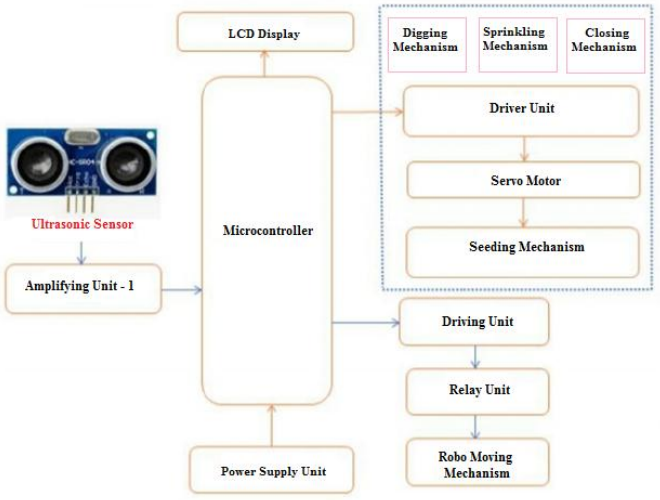

Fig-1: Block diagram of proposed system

There are many robots available on the market and agricultural process work has been done to perform the above functions separately. For this work the above functions have been combined into one framework. This proposed robot is the best solution in manufacturing and the best for economics. The overall function of the robot is powered by Microcontroller Arduino UNO.

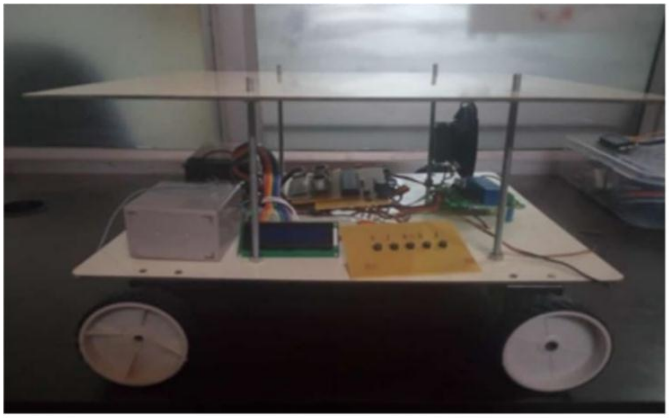

Fig-2: Economical agribot with self-path sensor- kit review

5. COMPONENTS OF PROPOSED SYSTEM

The main components of the proposed system is following below

1. Arduino UNO Microcontroller
2. Ultrasonic Sensor
3. Servo Motor
4. Stepper Motor
5. Power supply

5.1. Arduino UNO Microcontroller

Arduino UNO microcontroller is a programmable circuit board with open access. Arduino establishes base on Atmega 328. This microcontroller serves to sense and monitor the programmable object. It has the features of running a microcontroller and running a USB cable which is connected directly to the device using IDE (Integrated Development Environment). This cable is used to move the codes from the programmer to the controller.

Fig-3: Arduino UNO Microcontroller Board

5.2. Ultrasonic Sensor

Fig -4: Ultrasonic Sensor

Ultrasonic sensors are used to electrical-mechanical energy transformation. In this concept mechanical energy is mentioned to ultrasonic waves which is in longitudinal mechanical waves. Ultrasonic sensor has two component such as transmitter and receiver. The transmitter is used to convert the ultrasonic sound into electrical signal and the receiver is used to convert the electrical signal into ultrasonic sound.

The Electrical signals are propagated and travelled in longitudinal manner, when this signal meet target object that means the electrical signal incident on any physical object, the electrical signal will be reflected. This diffused reflected electrical signal is reach the receiver. After the reach of the reflection wave the drive triggers by wide angle. The angle is 180 degree.

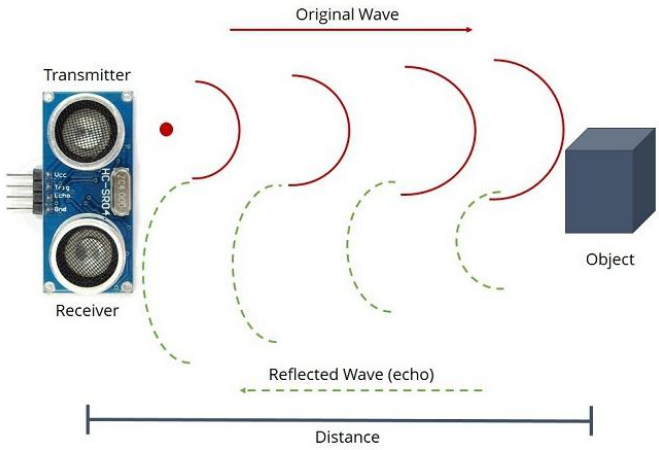

Fig-5: Ultrasonic waves

5.3. Servo Motor

The Servo motor is a rotating or linear actuator which provides control of angular or linear position, speed and direction. The servo motor rotates or moves the body with great precision. In small size motor it has the advantages of high efficiency and strength, and it has an encoder that converts mechanical movement into digital pulses. Because of the servomotor's advantages it is used for robot moving mechanism in agribot.

5.4. Stepper Motor

Stepper motor is brushless DC motor which contains three frames. It drives with step angle rotation. It divides a full rotation into equal number of steps. Switched reluctance motors with reduced pole count. In this agribot contain stepper motor to seeding mechanism.

5.5. Power Supply

Power supply in agriculture robot is one of the most important things for their service. This agribot 12v battery is used to meet all power requirements, and the solar panel is also used for battery recharge. The power supply package contains bridge rectifier, condenser, and regulator. When the polarity is modified, the bridge

rectifier is used to secure the capacitor to the condenser. The condenser is used for maintaining balance of power. Input voltage is controlled by the regulator. The drive operates in 12v supply which is used throughout the condenser and the ultrasonic sensor and Arduino microcontroller is worked in 5v supply which is used in the regulator.

6. CONCLUSION

Such autonomously operating systemare more robust than conventional one. The reduction in labor costs and the amount of limits on daily working hours has been greatly increased. And thus this greatly results in the reduction of most job routines. Since the system's initial investment and annual cost is high but designing the economically noticeable robotic systems is simple. These systems are working grass cutting, and autonomous weeding has a huge effect on the critical use of this automation system due to the comparison of labor cost, lost rotation and farm structure between different European countries.

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