

Autonomous Seeding and Spraying Spider Robot

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ABSTRACT

Farmers today spend a part of money on machines that offer assistance them decrease labor and increase yield of crops but the profit and efficiency are especially less. Hence automation is the perfect arrangement to overcome all the shortcomings by making machines that perform one operations and robotizing it to increment yield on a large scale. Robott able of performing operations like automatic seed dispensing, and pesticide spraying. Legged robots are well suited to walk on troublesome landscapes at the cost of requiring complex control frameworks to walk indeed on flat surfaces. It should be assumed that walking on abrupt terrain is the typical situation for legged robot. . With this premise in intellect, we have created a robot controller for a four legged robot that permits it walk over difficult terrains in an independent way. The main component here is the Attiny2313 microcontroller that oversees the entire process. Its hexapod body can independently walk in any direction, avoiding objects with its ultrasonic sensor. Its walking algorithms allow it to instantly change direction and walk in any new direction without turning its body. Robot capable to dig a hole and plant a seed and make a hole and apply fertilizers on the marking agent. The device used for route is an ultrasonic sensor which persistently sends data to the microcontroller. On the field the robot operates on automated mode, but outside the field is strictly operated in manual mode.

Keywords: Attiny2313 microcontroller, fertilizers, automation.

I. INTRODUCTION

Farmers today spending a lot of money on machines that help them decrease labor work and increase yield of crops. There are different machines that are accessible for plugging, harvesting, spraying pesticides etc., however these machines have to be manually worked to perform the required operations and in addition separate machines are used for each functions. The profit and yield returns from utilizing these equipment are very less as compared to the

investment. Another issue is the growing requests because of increasing world's population. According to World Health Organization estimation, Earth's population will touch 9 billion in 35 years which will leads to a increasing demand for food crops. Automation is the perfect solution to overcome from all the above mentioned problems by creating machines that perform more than one operation and robotizing those operations to increase yield on a large scale. Robotics in agriculture is not a new concept; in current situation, it has a history of more

than 20 years. Robotics technology plays an very important role in all sections of organization societies and industrial units. We can use robotics for the various operations which are done in agriculture. There is a need to design a better automatic machine which will be available to the farmers at a cheaper rate and which will sow and seed the crop at the same time.

In the world of globalization, different technologists are upgrading a new development based on automation which works very effectively and within a period of time. The rapid growth in the industries forces the labors who are situating in the villages to migrate to the cities. This issue creates the labor problem for the agricultural operations. The wages for the labor is also more. These factors forces the farmers who are interested in agricultural activity to leave their land uncultivated. So it's a time to automate the sector to overcome this problem. An imaginative idea of our project is to automate the process of sowing crops such as sunflower, groundnut, cotton and vegetables like beans, lady's finger, pumpkin and pulses like black gram, green gram etc to reduce the human effort and increase the yield. The plantations of seeds are automatically done by using DC motor. The distance between the two seeds are controlled and varied by using Microcontroller. It is also possible to cultivate different kinds of seeds with different distance. Also the project consists of sprinkler, which would be used for reducing the wastage of fertilizers that is done by spraying appropriate amount of fertilizers required for the particular crop. The sprinkler would sprinkle on the senses from wheel movement and the on and off of the sprinkler would be controlled by Microcontroller. The whole process is controlled by Microcontroller.

PROBLEM STATEMENT

The rapid growth in the industries forces the labors who are situating in the villages to migrate to the cities. This issue creates the labor problem for the agricultural operations.

- Machines have to be manually operated to perform the required operations
- Wheels are not comfort with all surfaces.
- Repetitive tasks are not comfort with manpower.

Basically we can divide this problem into four major parts

- Chassis
- Gripping Mechanism
- Spraying, Sowing & Drilling Mechanism
- Control system

MOTIVATION

- As we are interested in Embedded Electronics based projects and there are many advantages of the embedded system as well in spite of the electronics based projects.
- We can control the speed and angle of the Servo motor which is an electrical component by using a delay in the source coding. We are motivated for doing this project because it is an autonomous agricultural based project and here we get to deal with the controller, its interfacing with the dc motors, interfacing with the ultrasonic sensor, a linear actuator which is used for opening and closing of the valve required for the dispension of seeds and so on.
- Need to build a autonomous robot capable of moving around any surfaces with gripping also drilling, sowing & spraying techniques in one robot.

OBJECTIEVES

Reduces the amount of labor requirement. Gradually diminishes the amount of the time required for sowing seeds and fertilization. The technique of sowing and fertilization is automatic. Only single seed can be sowed at a time. appropriate (exact) distance is maintained between seeds. Wastage of fertilizers and seeds are reduced to a larger amount. Due to proper cultivation, the harvesting of the crop is done at once that is no crop grows earlier or later the yield comes at once. It is eco friendly that is it

doesn't cause any pollution or harm to the environment.

II. LITERATURE REVIEW

Sl.No	Authors Name	Year of Publication	Methodology	Proposed work
1	Gulam Amer, S.M.M.Mudassir, M. A. Malik,	2016	Agribot using Arduino and Raspberry pi	In this paper Agribot is a prototype and implemented for performing various agricultural activities like seeding, spraying offertilizers, insecticides. AgriBot is controlled with a Arduino.
2	Enric Celaya Josep M. Porta	2000	Six-legged robot that has been built to walk on abrupt terrain.	The walk level can be seen as a low level of locomotion that keeps the robot advancing on rough terrain, comparable to the level at which a wheeled vehicle keeps the robot advancing on at ground by turning its wheels at a constant speed.
3	Amrita Sneha. A, Abirami. E, Ankita. A, Mrs.R.Praveena, Mrs.R.Srimeena	2015	Robot controlled using AVR atmega microcontroller and GSM module	Robot capable of performing operations like automatic ploughing, seed dispensing, fruit picking and pesticide spraying. It also provides manual control when required and keeps tabs on the humidity with the help of humidity sensors
4	Tanupriya Choudhury, Arashdeep Kaur, Utsav Singh Verma	2016	Robot vehicle equipped with a camera, a digital image processing unit and a seed cultivation unit.	A quadcopter is chosen as an aerial vehicle is independent of the form and shape of the ground and is not deterred by these factors while providing high mobility and reliability.

III. METHODOLOGY

An autonomous robot which can be able to move in field rows, agricultural plain fields or greenhouses. In this section, design criteria and overview of the system is described.

The components used in this design are:

- ✓ At mega8 micro controller. (AT MEGA8)
- ✓ Servo board.
- ✓ Servo motor. (MOTOR-PWMSERVO)
- ✓ Geared DC motor.
- ✓ Battery
- ✓ Power source.
- ✓ Grounding.

The following system design is achieved depending upon the requirements. The block diagram of the robotic end and control section is shown in figure given below. This system has two fundamental sections, control and robot end section. The robotic station possess the seed dispenser, seed storage, fertilizer storage, fertilizer dispense, robotic system with motors, microcontroller and power supply. The controller used here is the “At tiny2313 Microcontroller”. The microcontroller is brain of this

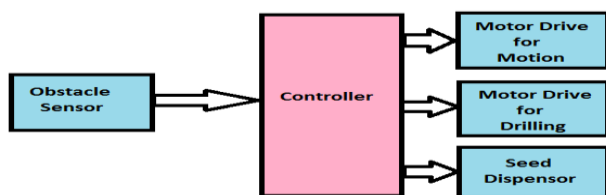


Figure 2. Block diagram

framework, which will supervise whether the order of suggestions received to all the networks, and sensible factors processed by their corresponding embedded programs.

Robotic mechanism played by their motor drivers and internal motors that drive the robot in desired directions. Here the one will monitor the robot and send the signal, according to the received signal the robot will move in the specified direction and it will

plant/sow the seed and spray fertilizer at that field for every specific distance. Its tetra pod body can autonomously walk in any direction, avoiding objects with its ultrasonic sensors. Its walking algorithms allow it to change its direction instantly and walk in any new direction by using servo motor. The angular movement of the motor can be controlled by the microcontroller. An underbody array of sensors allows the robot to know if a seed has been planted in the area at the specified spacing and depth. Robot can then dig a hole using driller, plant a seed in the hole, cover the seed with soil, and apply any herbicides and/or pre-emergency fertilizers along with the marking agent.

AGRICULTURAL PROCESSES

A. Seeding

This process basically deals with two mechanisms one is drilling and other is dropping the seed.

B. Driller

The driller is attached underneath of the robot. The frontal part of the driller is a sharp spade that is attached to a dc motor with a shaft and performs the digging operation by the robot. The up-down motion of the driller is associated with the limbs of the bot. The digging varies from crop to crop.

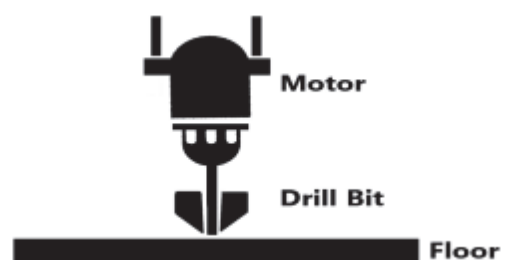


Figure 3. Drilling Action

C. Seed Dropper

There are three different approaches for this mechanism. The seed tank is attached to the dropping mechanism which performs the seeding process. The mechanism is designed in such a way that only one seed should drop at a time. The

mechanism is a servo dropping mechanism which takes the seed from the tank when in vertical position and turns 90 degree to horizontal position and releases the seed into the pipe through which the seed is dropped to the soil. This is a high precision mechanism.

D. Chemical Tank

Now this particular tank can be used for the insecticides or pesticides. It is sprayed at the crop for its protection. This particular tank can also be used to spray herbicide with a more precise liquid ejector as the crop has to be avoided being sprayed.

IV. RESULTS

The proposed system gives a compact, low power and low cost system with an efficient output. Agribot gives near about 93 % accuracy regarding placement of seeds. Robot is serving all the necessary requirement of farmers, it will be the great initiative and contribution to the society.

V. APPLICATIONS

The applications of the proposed project are: -

- The robot will be used to increase cultivation in inaccessible or remote areas.
- It will be made possible to farm under unfavorable weather conditions.
- Vast area of barren and uncultivated land can be covered with greenery.
- Hill farming can be made safer by using the robot in hilly areas.

VI. ADVANTAGES

- ✓ Autonomous design reduces human errors in controlling, thus reducing labour dependency.
- ✓ Legs provide more versatility on farm ground mud.
- ✓ Drilling before seeding reduces the chance of exposure to elements, thus helping the crop protection.

- ✓ Almost equal amount of seeds will be dispensed each time. (Uniformity)

VII. CONCLUSION

In this project we tried to overcome some problems in agriculture. The fast development in the businesses is leading the labors who are residing in the villages to migrate to the rural areas. This is creating the labor problem in the agricultural field. The wages for the labor is also more. As the prices of commodities such as food grains, fuels, cloths and other essentials of daily life is increasing rapidly the labors demand for the more wages from the owners. These factors influencing the farmers who are interested in agricultural activity to leave their land uncultivated. By implementing this project in the field of agriculture we can help the farmers in the initial stage of agriculture i.e. during the seeding and fertilizing. This project can be a better substitute for the human who performs the seeding, fertilizing. This project is very useful for the farmers who are interested in agricultural field but facing the labor problem.

VIII. ACKNOWLEDGEMENT

It is my proud privilege and duty to acknowledge the kind of help and guidance received from several people in preparation of this report. It would not have been possible to prepare this report in this form without their valuable help, cooperation and guidance.

First and foremost, I wish to record my sincere gratitude to the **Management** and to our beloved **Principal, Dr. Peter Fernandes**, Alva's Institute of Engineering and Technology, Moodbidri for his constant support and encouragement and for making available library and internet facilities needed to prepare this report.

I would like to thank **Dr. D.V. Manjunatha**, Head, Department of Electronics and Communication Engineering, AIET, for his valuable suggestions and guidance throughout the period of this report.

I would like to express my sincere gratitude to my guide, **Mr Roshan Shetty, Assistant Professor**, Department of Electronics and Communication Engineering, AIET, Moodbidri for his guidance, encouragement and inspiration.

I am thankful to my Project Coordinator, **Mr Shankar B.B. Assistant Professor**, Department of Electronics and Communication Engineering, AIET, Moodbidri for her valuable guidance, encouragement and co-operation during the course of the seminar and presentation.

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