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# Design and Implementation of Seed Sowing Agricultural Robot

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**Abstract:** ***Agricultural is one of our most important industry for providing food, feed and fuel necessary for our survival. Certainly, robots are playing an important role in the field of agriculture for farming process autonomously. The robotics is the field which provides a scope and accomplish the given task as per the given instructions by using an electro mechanical system called as robot. In this project the problem of a farmer in sowing the seeds is taken and overcame using a fire bird v robot. Here, a DC servo motor equipped with a driller is used to dig a hole and sow the seeds using a simple wheel mechanism attached to that servo. This system uses AVR ATMEL STUDIO 4.0 and AVR Boot loader for the programming part of the robot. The AVR ATMEL STUDIO 4.0 s/w is used for writing the coding and AVR Boot loader acts as an interface between the PC and the robot. It is used for burning the coding from PC to a robot. The Atmega 2560 is used to control the servo action and monitor the process of motion of the robot by using a pair of DC geared motors. A field for sowing the seeds is planned and the seeds are sowed accordingly with defined spaces between them. The result of the implemented unit is also presented.***

**Keywords:** Agricultural robot, Atmega 2560, AVR ATMEL STUDIO 4.0, AVR Boot loader, DC servo motor, wheel mechanism

## 1. Introduction

In the current generation most of the countries do not have sufficient skilled man power specifically in agricultural sector and it affects the growth of developing countries. So it's a time to automate the sector to overcome this problem. In India there are 70% people dependent on agriculture. So we need to study agriculture. Innovative idea of our project is to automate the process of sowing seeds like corn, watermelon and vegetables like lady's finger, brinjal, pulses like black gram, green gram etc & to reduce the human effort and increase the yield.

## 2. Objectives of the Project

To create a prototype of Seed Sowing Agricultural Robot which is used to drill a hole in the prescribed field at defined spaces between them and sow the seeds automatically in to the digged hole. Our objective in this project is to drive an external dc servo motor for which the drill equipment and seed sowing equipment is connected. Here, the motion of the robot is decided by using a black line and the seed sowing equipment works at every successive node on the black line.

## 3. Existing System

Around 70% of the Indian population is dependent on the agriculture for their livelihood. But with the up gradation of the technology the farming techniques are not up to the mark, manual work only exists in many places. Many arduino driven robots were introduced with less compatibility and memory.

## 4. Proposed System

In this project the problem of a farmer in sowing the seeds is taken and overcame using a fire bird v robot. Here, a DC servo motor equipped with a driller is used to dig a hole and sow the seeds using a simple wheel mechanism attached to that servo. This system uses AVR ATMEL STUDIO 4.0 and AVR Boot loader for the programming part of the robot. The AVR ATMEL STUDIO 4.0 s/w is used for writing the coding and AVR Boot loader acts as an interface between the PC and the robot. It is used for burning the coding from PC to a robot. The Atmega 2560 is used to control the servo action and monitor the process of motion of the robot by using a pair of DC geared motors. A field for sowing the seeds is planned and the seeds are sowed accordingly with defined spaces between them.

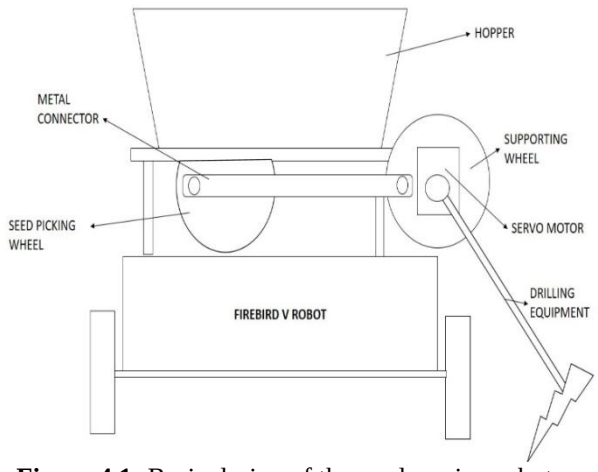



**Figure 4.1:** Basic design of the seed sowing robot

**4.1 Fire Bird V Robot:** Fire Bird V will help to get acquainted with the world of robotics and embedded systems. Thanks to its innovative architecture and adoption of the 'Open Source Philosophy' in its software and hardware design, you will be able to create and contribute too, complex applications that run on this platform, helping you acquire expertise as you spend more time with

them. Fire Bird V is designed by NEX Robotics and Embedded Real-Time Systems lab, CSE IIT Bombay.

**Figure 4.2:** Fire Bird V ATMEGA2560

As a Universal Robotic Research Platform, Fire Bird V provides a good environment for experimentation, algorithm development and testing. Fire Bird V is evolved from Fire Bird IV and Fire Bird II. Its modular architecture allows you to control it using multiple processors such as 8051, AVR, PIC and ARM7 etc. Modular sensor pods can be mounted on the platform as dictated by intended applications. Precision position encoders make it possible to have accurate position control. The platform can be upgraded to tank drive and Hexapod insect or any other desired form very easily. It is powered by high performance rechargeable NiMH batteries. A 2.4 GHz ZigBee module provides state of the art secure and multi-channel wireless communication up to a range of one kilometer.

**4.2 Servo motor:**

Servo motor is used to make a hole and put the seed in to the hole in this project. It is connected to PORTB of ATMEGA2560 micro controller. If it rotates $180^0$ in clock wise it will put the seed in to the hole with the support of supporting wheel which in turn is connected to seed picking wheel by means of metal connector. If it rotates anti clockwise direction then it will pick the seed.

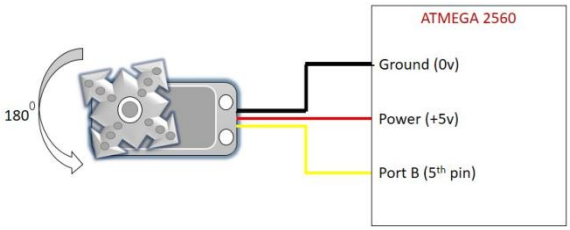



**Figure 4.3:** servo motor connections

**4.3 Drilling hand:**
It is used to make a hole by means of a servo motor; it will move up and down to make a hole in the field.

**4.4 Supporting wheel:**
It is used to rotate to seed picking wheel either clockwise or anti clock wise.

**4.5 Seed picking wheel:**

It is used to pick the seed from the funnel and put it in the hole by means of a supporting wheel.

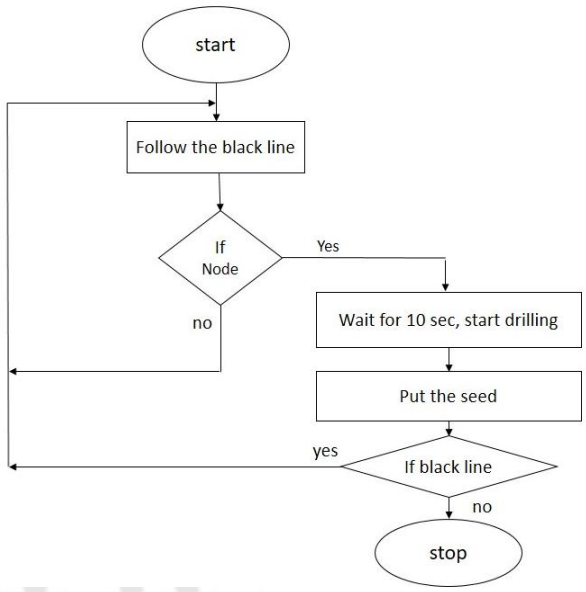
**4.6 Metal connector:**

It is used to connect the supporting wheel with the seed picking wheel.

## 5. Working

The field for the robot is shown as shown in the figure 5.1, the robot is programmed to follow the black line using three white line sensors placed at the bottom of the robot and perform the seed sowing action at every successive node. If the node is obtained then the robot waits for 10sec and servo action is implemented in that time.

**5.1 Flowchart for the working of robot**




## 6. Algorithm

**Algorithm for the working of the robot:**

**STEP 1:** Put the robot on the working field.
**STEP 2:** Follow the black line, if a node is obtained then wait for 10 seconds.
**STEP 3:** Initialize the PORTB for interfacing an external servo motor.
**STEP 4:** Rotate the servo in clock wise direction for $180^0$ and make a hole using driller equipped to the servo, rotate the supporting wheel in clockwise direction.
**STEP 5:** put the seed in to the hole.
**STEP 6:** Rotate the servo in anti-clock wise direction for $180^0$ and take out the driller out of the hole,
Rotate the supporting wheel in anti-clockwise direction.
**STEP 7:** pick the seed in to the seed picker.
**STEP 8:** Stop the servo action, and follow the black line.
**STEP 9:** Repeat the step from 2 to 8.

**Implementation of the robot:**

**Figure 5.2:** Front view of the robot

**Figure 5.3:** Back view of the robot

**Figure 5.4:** working field

**Figure 5.5:** Robot in the working field

**Figure 5.6:** Robot making a hole and putting the seed in the field

## 7. Conclusion

Design and Development of seed sowing agricultural robot is the proposed method which automatically put the seeds based on the servo motor rotation. In this project, an advanced microcontroller kit i.e., FIREBIRD V is used for this purpose. The key points in conclusion are:

1. It reduces the burden on farmer.
2. Robot will put the seed in to appropriate field accurately.

## 8. Future Work

1. It can be implanted to work on the hilly areas to support counter bunding.
2. It can be designed to work at any climatic conditions
3. It can be designed to do whole farming work like sowing, irrigation, harvesting and so on

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