Design and Implementation of Seed Sowing System

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Abstract: This research aims to design and implementation of the seed sowing system. This system introduces a control mechanism to drop the seeds at a particular position with specified distance, to achieve desired seed rate within the row, uniform seed spacing and alarm system. The overall system includes motion sensor, proximity induction sensor, two servo motors, three DC motors and alarm system. These parts are controlled by Arduino Mega 2560 which is the heart of the system. The vehicle is made of iron frame and composed of four wheels. The function of motion sensor is to detect the seed. When there is no seed to detect within the seed storage tank, it sends the signal to the Arduino and indicates the alarm. To get equal seed spacing or seed to seed distance, proximity induction sensor is used. Servo motors are used for precise control of seed rating.

Key Words: Mechanism, Specified distance, Arduino Mega, Storage tank.

1. INTRODUCTION:
Agriculture is the largest livelihood provided in Myanmar mostly in the rural area. For developing the economical condition of Myanmar, it must be necessary to increase our agricultural productivity and quality of one of them, seed sowing is the most important and day-to-day job of the farmers. The conventional method for seeding is manual one but it requires more time and more efforts.

Nowadays, 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. Now a day’s instrumentation and control system plays an important role. So this research develops “Seed Sowing System” using microcontroller (Arduino Mega) which is very economical and beneficial. Due to automation, the work becomes easiest, errorless and it saves money and time requirement.

2. BLOCK DIAGRAM OF SEED SOWING SYSTEM:
Microcontroller Mega2560, motion sensors, proximity induction sensor, DC motors and servo motors are used in this system. The desired seed spacing or distance can be measured with the proximity induction sensor by detecting the iron plate which is designed and placed on the shaft of wheel. The motion sensor will sense whether the seeds are presented on the storage tank or not. If there is no seed to detect, the buzzer will be activated and the overall system will reset.

Figure-1 System Block Diagram of Seed Sowing System

When the seed is detected, it sends the output data to the Microcontroller which will start the overall process. Motor driver, L298N is used to drive stir motor in order to get the rotation of seeds within the seed storage tank. The
function of servo motor 1 is to control the desired count of seed using servo arm. Servo motor 2 is used to drop the seeds after finishing the required seed rate.

2. HARDWARE DESIGN OF SEED SOWING SYSTEM:

Arduino Mega 2560 interfaces with the sensor, motor drivers, motors and other components. Motion sensor, KY-032 is used to sense certain characteristics of its surroundings by either emitting and/or detecting infrared radiation. It can operate the voltage between 3.3V and 5V. The sensibility range is from 2cm to 40cm.

Proximity induction sensor detects piece of thin iron plates to get the desired seed distance or spacing. In this system, the power supply of KY-032 is given from Arduino. There is no seed to detect, the buzzer is on. This system uses two servo motors (SG 90) for precise control of seed rate in Fig-2. The first servo separates three seeds from the seed storage tank and made ready to flow in time. The second servo drops the seed after getting required seed rating by rotating desired angle. DC motor is used to stir the seeds within the seed storage box.
3.1. Materials of System:

The major components of the system are described:
- Body Frame and Wheel
- Microcontroller
- Sensors
- DC motors and its driver circuits
- Servo motors
- Buzzer

4. SOFTWARE DESIGN OF SYSTEM:

The overall flowchart of the system is shown in Fig. 4. When the power is on, the wheel motors start to run according to the calculated RPM and then the vehicle moves along the straight line. When the motion sensor detects the seed, it gives the output signal to the Arduino. And then the stirred motor operates to get the rotation of seed within the seed storage box. In order to drop the desired seeds, the sequencing or flowing of seeds is done by first servo motor. And then, the second servo motor drops the seeds into the ground.

![System Flow Chart of the Seed Sowing System](image-url)

5. EXPERIMENTAL TESTS AND RESULTS

The seed sowing system is focused on controlling the seed rate of groundnut at the specified distance. The desired seed rate of the system is three seed per drop. By the following experimental results, the main problem faced by testing is seed lapping because size and shape of the seeds are not the same. The system is also possible to cultivate different kinds of seeds with different seed per drop.
5.1. Experimental Tests and Results

Although the system is emphasized on groundnut seed, another items of seeds such as marrow pea, red bean, lime bean, gram are also tested for efficiency comparison. According to the testing result, the efficiency of seed rate of marrow pea is 100% because its shape is circle. The efficiency of red bean and lime bean are the same and on the other hand, the efficiency of gram is 70% as shown in Table-1. The photograph of five items of seeds tested in this proposed system is shown in Fig. 5.

Figure-5. Five Items of Seeds

Table-1. Performance Tests for Three Seeds per Drop with Five Items of Seeds

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Total Testing Times</th>
<th>Error</th>
<th>Efficiency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Groundnut</td>
<td>50</td>
<td>15</td>
<td>70%</td>
</tr>
<tr>
<td>2.</td>
<td>Marrow pea</td>
<td>50</td>
<td>0</td>
<td>100%</td>
</tr>
<tr>
<td>3.</td>
<td>Red bean</td>
<td>50</td>
<td>10</td>
<td>80%</td>
</tr>
<tr>
<td>4.</td>
<td>Gram</td>
<td>50</td>
<td>20</td>
<td>60%</td>
</tr>
<tr>
<td>5.</td>
<td>Lime bean</td>
<td>50</td>
<td>10</td>
<td>80%</td>
</tr>
</tbody>
</table>

Figure-6. Efficiency Comparison Graph of Five Items of Seeds
The purpose of this test is to observe the comparison of efficiency of five items of seeds in Fig 6. The efficiency comparisons between the different types of seed are described in the chart. Among them, the efficiency of groundnut is 70% and there is a little difficulty for accuracy because of lapping and crushing.

The experiment result can be clearly seen that the seed sowing machine drops three marrow pea seeds with a distance of six inches. In order to do that, the motion sensor detects seed and then starts the working condition of proximity induction sensor. When the wheel is rotated, the proximity sensor detects its encoder fitted on the shaft of the wheel. The encoder is designed with eight metal plates in which each plates are arranged to get equal seed distance. As soon as the sensor detects its encoder, the first servo motor separates three seeds from the tank. The second servo drops the seed for accomplishing equal seed rate. By the above experimental result, the vehicle moves along the straight line but there is a little deviation due to the condition of ground. To complete the system, the quality of battery, the soil condition, the seed size and seed types are the facts that can be taken into account.

6. CONCLUSION:

In this research, it is emphasized on groundnut and its relevant data are illustrated. To achieve three seeds per drop, the efficiency of groundnut is 70% and is lesser than any other type of seeds tested in this system. Because it has different size, its shape is irregular. So, lapping and crushing are mostly found in testing groundnut. Among other items seeds, the best efficiency is marrow pea as it has equal size, smooth surface and its shape is round. In manual and tractor, the seed sowing method is simple. It does not contain equal seed rate per drop and the distance between seeds are not fixed. Therefore, man power, waste of seeds and energy required is more than the seed sowing system.

REFERENCES: