Smart Robot for Seed Defect Monitoring and Seed Sowing

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Abstract- ***The paper "smart robot for seeds defect monitoring and seeds sowing" is focused on automated monitoring and sowing of seeds for social welfare of Indian agriculture system. The main reason behind automation of farming process are saving time and energy required for performing repetitive farming tasks. Some of the most common robots in agriculture are used for seeding, spraying, digging, harvesting etc.. Very basic and significant operation is seed sowing. But the present methods of seed sowing are problematic. The equipment used for seed sowing is very difficult and inconvenient to handle. As soon as the program dumped into ARDUINO, the robot starts navigating towards it. The robot aligns itself with the troughs as it moves through the aisle using sharp sensors mounted on it. On reaching the trough, the bot activates a motor, attached with a rotor, to drop a single seed. Wheel encoder information is used to calculate the distance moved by the bot. This distance information is used to activate the seed mechanism so that the inner seeding distance of the crop is maintained.***

Index Terms- ***Seed defect, seed sowing, Integrated Development Environment, Transceivers, micro-controller***

I. INTRODUCTION

Agriculture is a backbone of Indian economy [1]. Farmers today spend a lot of money on machines that help them decrease labor work and increase of yield of crops. In the present scenario, most of the cities in India do not have sufficient skilled man power in agriculture sector and that affects the progress of developing country [2]. Therefore farmers have to use upgraded technology for cultivation activity (seeds monitoring and sowing). Manual method includes broadcasting the seeds by hand. Most of the time method of dropping seeds by hand is used. So it's time to automated sector to overcome this problem [3]. In this process, seeds sowing of crops and covering the land automatically so that human efforts will get reduce [4][5]. The energy needed for robotic machine is less as compare with other machines like tractors are any agriculture tools. Nowadays robotics technology plays a paramount role in all sections like medical field, industries and various organizations [6]. In other country robots are used to perform different operation in the agriculture field [7]. The main application area of robots in agriculture is at the harvesting stage and seeds sowing stage. Robot can detect presence of diseases in seeds. Due to the light weight of the robots they do not compact the soil as large as machinery does. Within the grains research field, several studies have been conducted on the application of machine vision systems of quantitatively determine characteristics related to grain quality investigated the measurements of seed color of both the endosperm and grain coat, by machine vision[8]. Fundamental size traits, such as grain length, width and volume have been modeled in various studies, as well as shape of grains.

II. PROPOSED METHODLOGY

This section deals with the description of the proposed system. It explains the block diagram and the components used in the system.

A. Objective of the proposed system

- To enable the farmer to seed the large area of lands in minimum amount of time.
- To detect the seed defects.
- To perform automated seeding process.
- To improve the performance of the Robot.
- To develop a microcontroller-based system at helps in on-farm operations like seeding and fertilizing at pre-designed distance and depths withal applicable.

B. Block Diagram

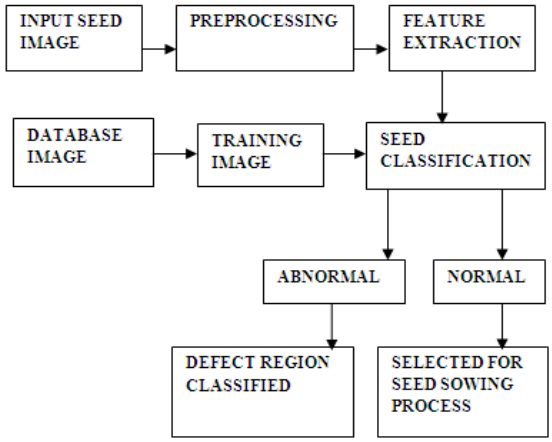

Fig.2.1. Block diagram for seed defect monitoring

The proposed system consists of arduino, DC motors, DC motor driver L293D, Ultrasonic sensor and power supply. The program is dumped to the arduino which controls the driving circuit and DC motor.

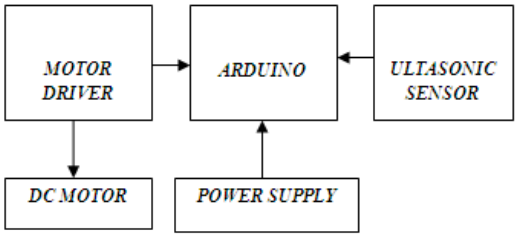

Fig.2.2. Block diagram for seed sowing

III. HARDWARE IMPLEMENTATION OF THE PROPOSED SYSTEM

The project consists of the following hardware components:

Arduino uno: The Arduino uno is open source micro controller board based on the microchip ATmega328P microcontroller. The board is equipped with sets of digital and analog input/output pins. That may be interfaced to various expansions boards and other circuits. The boards has 14 digital pins, 6 analog pins and programmable with the arduino IDE (INTEGRATED DEVELOPMENT ENVIRONMENT) via a type B USB cable. It can be covered by a USB Cable or by an external 9v battery, though it accepts voltages between 7 and 20V.

Power supply: 12V power supply is applied to the arduino to fulfill the power requirements of the system. The primary function of a power supply is to convert electrical current from the source to the correct voltage, current and frequency to the power the load. As a result, power supplies are sometimes referred to as electric power converters.

Ultrasonic sensors: ultrasonic sensors are a type of acoustic sensor divided into three board categories: transmitters, receiver, and transceivers. Transmitters convert electrical signals into ultrasound, receivers convert ultrasound into electrical signals, and transceivers can both transmit and receive ultrasound. Ultrasound can be used for measuring the speed and direction. Ultrasound can also be used to make point-to-point distance measurements by transmitting and receiving discrete bursts of ultrasound between transducers.

DC motor driver: A motor controller is a device that acts as intermediary between the robot's micro-controller, batteries and motors. A motor controller is necessary because a microcontroller can usually only provide roughly 0.1Amps of current whereas most actuators (DC motors, DC gear motors, Servo motors etc.) require several amps.

DC motor: A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic; to periodically change the direction of the current flow in part of the motor.

IV. RESULTS AND DISCUSSION

The major operation in farming which are under research and automation are seeding, weeding and spraying processes are based on the camera and machine vision. In the robot there would be four

rotating actuators at the bottom of the chassis, which would act as wheels to the mechanism, and sow used 60-rpm dc motors. DC motors is very efficient model and it is available of low cost. DC motor is very useful to convert electrical energy into mechanical energy by consuming low power. Keypad consists of a start and a stop button. As soon as the user presses the start button the robot moves in the forward direction, then after reaching a particular distance its stops and then dispenses a seed in the soil. This process is continues until the user presses the stop button.The seeds are chosen and classified into three categories

1. Non defective seeds
2. Normal seeds
3. Defective seeds

The seed images are separated by using matlab algorithms and it gives query image, contrast enhanced, segment ROI.
Case i: Feed cluster value as 1 the robot will move because the cluster 1 is consider as good seed.

Case ii: Feed cluster value as 2 the robot will not move because the cluster 2 is consider as defected seeds.

Case iii: Feed cluster value as 3 the robot will move because the cluster 3 is consider as normal seeds.

A. SIMULATION RESULTS:

The Step by Step procedure of the flowchart is explained below:

Step 1: Initially, Mat-lab program is done.

Step 2: Using image data base the input images were selected.

Step 3: If the selected image is defected means the robot will not move.

Step 4: If the selected image is good means the robot will move and seeding process is started.

Step 5: The ultrasonic sensor is used for distance coverage. If any obstacle found then the robot will stop.

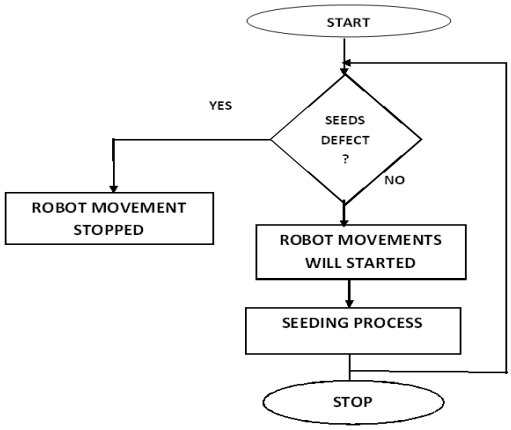

Fig.4.1.Flow diagram for seeding process

B. Using MATLAB software:

To identify the seeds for sowing process, k-means clustering is used.

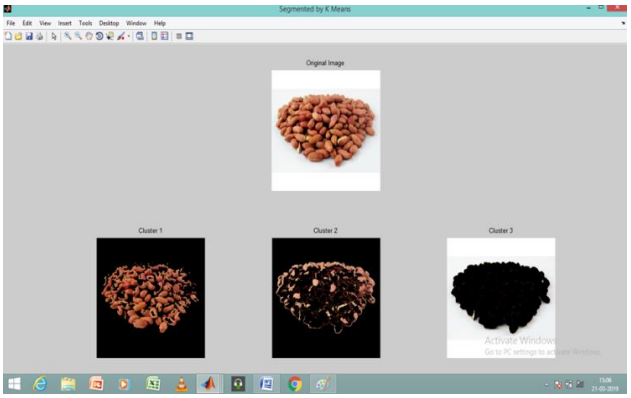

Fig.4.2.Seed segmentation by k-means clustering

To find percentage of affected region, the accuracy of the results and name of the disease also identified using simulation by means of mat lab software.

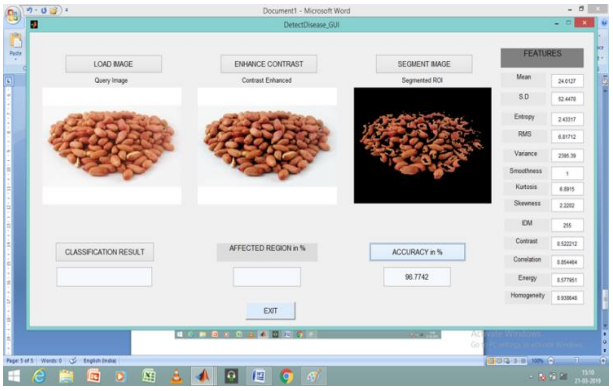

Fig. 4.3. Accuracy for Segmented image

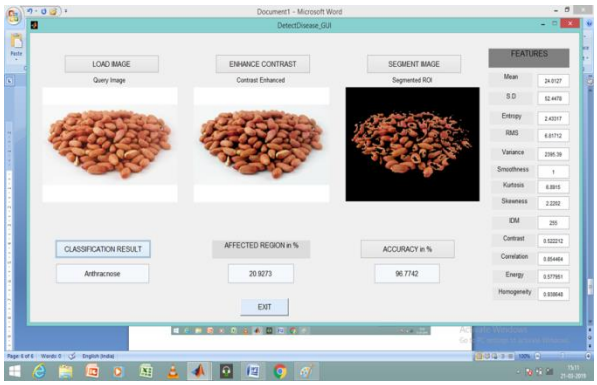

Fig. 4.4. Percentage of Affected seeds

C. Using PROTEOUS software:

ISIS is the software used to draw schematics and simulate the circuits in real time. The simulation allows human access during run time, thus providing real time simulation.

ARES is used for PCB designing. It has the feature of viewing output in 3D view of the designed PCB along with components. The designer can also develop 2D drawings for the product. It offers Auto routing and manual routing options to the PCB Designer.

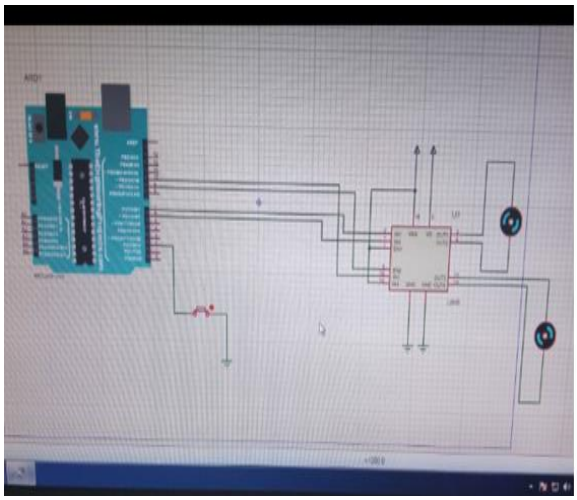

Fig. 4.5. Simulation result for motor

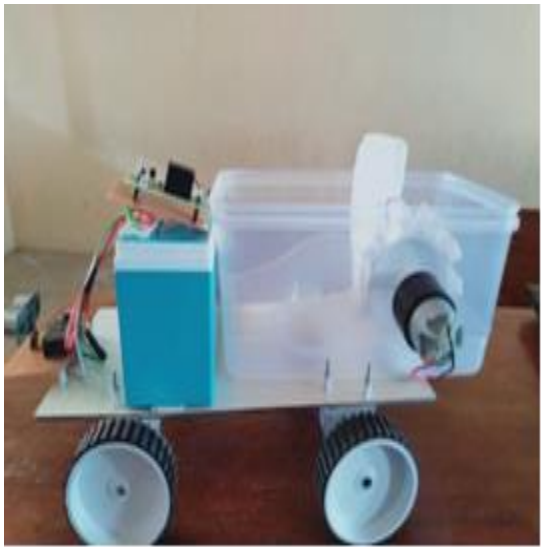

Fig.4.6. Prototype Model for Agribot

V. CONCLUSION

In the field of agriculture the inordinate majority contributes only 18% of the GDP. The key reason for this performance is lack of agricultural task automation. Flexibility of automation system is high than traditional system. An Agribot was designed to carry out automatic and manual seeding. It is expected that the robot will support the farmers in improving the efficiency of the operations in their farms. The robot can be designed with chain roller instead of normal wheel. Hence it can be applicable to the real time agriculture field. The main focus of the system is its automatic way of sowing the seeds. The seeds are been sowed in a proper sequence which results in proper germination of seeds. This automatic way of sowing seeds using a robot reduces the labor requirement. Here the wastage of seeds is also been reduced to greater extent. This system has been developed for the sowing of seeds in automatic way. Here with the help of a robot the seeds are been dispensed in soil in a proper sequence hereby reducing the wastage of seeds.

VI. FUTURE SCOPE

Apart from seed sowing, ploughing, seed dispensing, spraying pesticides, seed defect mointoring and fruit picking other farming process like irrigation, harvesting etc. It can also been implemented in single robot that making the machine capable of multitasking. Also looking forward to learn about and

implement agriculture based agrobots like nursey bot, driverless bot, bee bot that would be qualify the standards from the current precision to autonomous farming methodologies.

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