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STUDY OF AUTOMATED AGRICULTURE ROBOT FOR HOUSE FARMING

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ABSTRACT

The technology has developed more in the field of agriculture by using different developed tools like machines and robots for doing different works, but nowadays there is no land for cultivation due to destruction of agriculture lands and cost of these equipment's is high for the farmers in our country. The aim is to develop the small-scale low-cost agriculture robot for farmers to make house farming. This developed robot overcomes these issues, it is a multifunctional robot which can do different operations like seeding, ploughing, watering, weeding etc. which is controlled by the microcontroller, and this robot is user friendly for the farmers. By giving inputs like length, breadth and crop varieties in the program the robot can perform certain operation automatically. This robot helps the users to cultivate the crops in the home with optimum usage of space without using lands.

KEYWORDS

Agriculture, Machines, Robots and House farming.

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INTRODUCTION

Agriculture is the backbone of our country, nearly 80% of world is depends on the agriculture for cultivating foods, but nowadays it is reduced due to the destruction of agriculture lands most of the lands are used for construction purpose. Mainly no labors are available for agriculture works nowadays and the cost for maintaining the lands are raised. Because of these issue farmers are leave the agriculture lands for non-cultivation. In this developing world more technologies are invented for agriculture, day by day more automations are developed but it is applicable only for foreign countries due to their cost, peoples in our country are not ready to inverse on these type

of technology, mainly farmers are not able to buy this costly equipment's for their lands, and they are not more skilled to maintain these type of machines and robots. Due to this problem the demand for the foods are raised, so rectify this demand, sellers are going for hybrid plants varieties and using more pesticides to protect the crops. Which affects the human life completely. To overcome from these issues a low-cost automation is to developed in the field of agriculture. It can be performed by using low cost microcontrollers by interfacing with robot structures. Before developing the robot, the main two things to be considered one thing is cost of components using should be less and the robot should adopt for all environmental conditions. The developing robot should do all the operations automatically based on user commands, from developing stage to cultivation stage all the process should be performed and monitored by robot, no manpower should be required. It gets inputs from the user like length, breadth, crop varieties and motor controls etc. through mobile application which is controlled by microcontrollers.

Proposed Idea

After studying different types of technologies and methods an new ideas is proposed in this paper, which is gantry type agriculture robot fabricated with low cost and able to withstand for different environment conditions, the robot structure is gantry type similar to CNC machine having X, Y, Z movements which is performed by DC motors controlled by microcontroller, the developed robot can able to do operations like seeding, watering, ploughing, weeding etc. These whole operation is performed by separate tools. From starting stage to cultivation stage, the whole process is performed and monitored by this robot itself no man power is needed. Due to CNC mechanisms the different tools for different function can be changed easily by pick and place technique performed by the robot hammer. The sensor for monitoring the moisture level also interfaced with micro controller. The whole processes are controlled by micro controller based on the programming, by using this robot the user can easily operate and controls the entire function from starting stage to cultivation stage. This robot can be

used to cultivate crops in the house itself by using small place of 1.5FT to 2.5FT, based on the requirement of user and based on place available the robot can be easily altered to that situation only by extending the frames. It does not need more land for cultivation due gantry type design.

METHODOLOGY

The main aim of this project is to fabricate a small-scale agriculture robot in low cost which is affordable to the farmers our country, this robot is developed to do function like seeding, weeding, ploughing, watering etc. To perform each functions the separate tools are developed based on the commands from user. The tools are fabricated by ABS plastic which is weight less and suitable for robot to work in different environments, we mainly developed this robot for small scale with low cost, which capable to produce crops in small space. To fabricate in low cost and to reduce weight we use aluminium frames for structures along with LM guide ways is used to have linear movements of the robot, all these movements are performed by the DC motors interfaced with Arduino board, based on the programming the robot do the certain functions. The power supply for robot is given from external source; it requires 12V DC power supply to run all the motors.

The robot has X, Y, Z movements performed by using LM guide ways, rack and pinion mechanisms, the Guide ways consists of SS shaft which is free from corrosion and wear.

The tool hammer is attached in Z axis to have pick and placing the tools from the tool bay, the tools for different functions are developed. Based on the commands from user and instruction in programming the robot takes required tool from the bay and do certain function in the fixed path.

All the tools are made up of ABS plastic which have high strength and suitable for different environment, by using plastic the life of the tool is high and it is free from the corrosion.

To reduce the tool changing time we developed a new tool which contains both seeding and watering functions, both functions are performed in it.

The tool holder is fixed permanently in the hammer of the robot, based on the needs of operation the robot picks the tools and after finishing the work it returns the tool to the bay.

All these motors and sensor are interfaced with the microcontrollers to do all the function automatically; once input is given in the program the robot performs the entire functions without using the manpower.

The developed model of the robot is shown in the Figure No.1.

Algorithm for Robot

The algorithm of the robot is performed as follows,

- a) ON/OFF switch is included to start the robot functions.
- b) It gets the length and breadth of the cultivation area from the user. X and Y values.
- c) The timings and modules of each operation are selected. It includes seeding, watering, ploughing, and weeding.
- d) Motor speeds are given the program as values.
- e) The process is repeated based on the sensor reading.
- f) After completing the process, the machine goes to sleep position until the next command sends by the microcontroller through sensor readings.

The circuit diagram of the robot is shown in the Figure No.2.

Tool Development

Seeding and watering

We developed a new tool which have both functions together, once the seeding process is over the watering process also carried continuously, to reduce the tool changing time, we combined both the tool together. This developed tool has separate section to perform both processes. For this function, separate pump is used to feed the amount of water to the tool. As similarly vacuum pump is used to suck the seeds from the tray. By giving the crop varieties in the input the tool picks suitable seeds from the tray.

Weeding

The weeding tool of this robot is developed with small size DC motor along with the stainless-steel blade is attached with shaft of the motor to weed the unwanted plants in the path of the cultivation area. The weeding speed is given in the program to avoid damages.

Ploughing

The ploughing tool contains gripper to plough the fruits and vegetables from the plant, the suitable force should give to the grippers, to avoid the damages to the plant during ploughing the input are given in the program.

Based on the algorithms all above functions are performed by the microcontroller through interfaced hardware's and sensor.

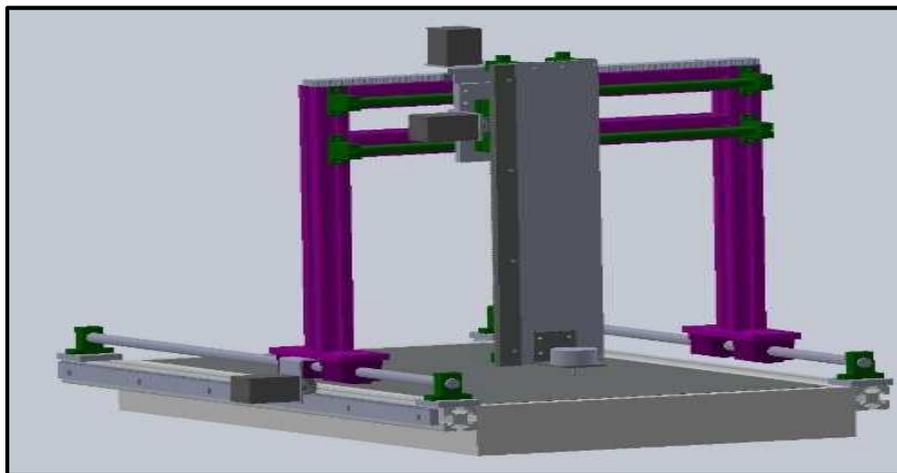


Figure No.1: Developed model of the robot

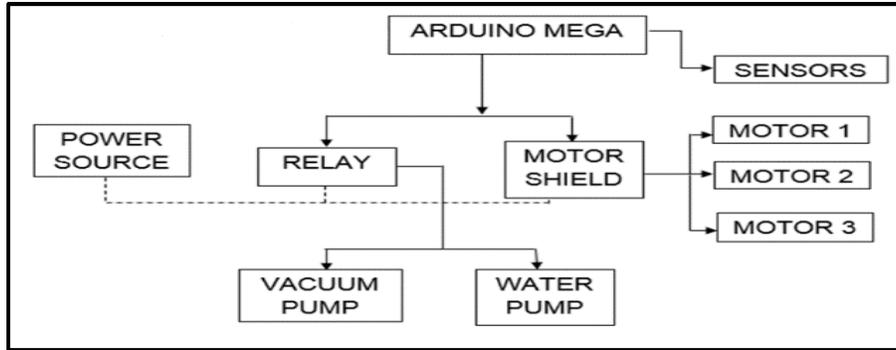


Figure No.2: Circuit flow diagram

CONCLUSION

This agriculture robot is mainly developed for our country to provide it in very low price and in small scale. This robot will fulfill the user's requirements and due to small scale, it is easily adopted to home farming's, it can be used in both homes and apartments. This robot is user friendly were all commands are given in the program itself. User can easily operate this machine by giving inputs like length, breadth and crop varieties through program. This machine has capable to cultivate the vegetables and crops from small place without needing more lands. The structure of the robot can be easily extended to any size based on users' needs and areas available for placing it. Mainly there is no maintenance needed for this robot.

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CONFLICT OF INTEREST

We declare that we have no conflict of interest.

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