DESIGING AND DEVELOPMENT OF FARMBOT

[1]Minaxi Sondarva, [2]Prof.(Dr.) Vipul Shah, [3] Mr.Jayesh Parmar

[1]PG Scholar Student, [2]Professor , [3]Director of Shaktikrupa Automation

[1]Instrumentation and control Engineering,

[1]Dharamsinh Desai University, Nadiad, India.

Abstract: Farmbot is the combition of farming and robot technology which is design for the smooth and scalable automated precision machine to make agricultural more convenient and techno savvy. As the world population is growing and with that growth we must produce more food. Conventional agriculate methods are unsustainable. Farming robot and software pakage from the ground up with today's technologies. Similar today's 3D printer, Farmbot hardware employs linear guides in X, Y, and Z directions that allow for plows, seed injections, watering nozzles and sensors to be positioned and used on plants and soils. We can expect the farmbot performing agriculature opinions autonomously watching the farms day and night for an effective report. It is designed to minimize the labor of farmers and increasing the speed and accuracy of the work.

IndexTerms – Plaguing, Seed sowings and Water spraying.

I. INTRODUCTION

The main objective of this research study is to decrease the manual effort and increasing the efficiency of farmers in farming.Agriculature is the cultivation and breeding of animals and plants to provide food, fiber, medicinal plants and other products to sustain and enhance life. The history of agriculture records lot of hardwork, extra efforts and usage of animal resource at large scale. Similarly agriculture required lot of caring and planning to get the desired results of fruitful crops. Over the years there have been many cycles of development in this sector which were more of traditional methods gain from ancestor and utilizing it to gain the maximum output. As the decades passed we have seen some of the phenomenal changes owing this credit to technological improvements. This have brought entire new scene of convenience, productivity, quality improvements, reducing manual efforts & creativity.

II. WORKING PRINCIPLE

Farmbot hardware employs linear guides in the X, Y, and Z directions that allow for tooling such as plows, seed injectiores, watering and sensors to precisely positioned and used on the plants and soil. All the components are placed on the base frame of wooden. There is rack and pinion assembly on the base frame to move in the X direction; here I have used stepper motor for the accurate operation of moving in the X direction as well in the Y direction. The stepper motor is known by its property to convert a train of input pulses into a precisely defined increment in the shaft position. Each pulse moves the shaft through a fixed angle. For the Z direction linear actuator as it creates motion in a straight line, in contrast to the circular motion of a motor.

For the seeding, water spraying and to check the water content in the soil I have used the soil moisture sensor. To pick the seed and placing inside the soil, vacuum technology has been used. Water spraying is done by the water nozzle which is operated through pressure water tank and soil moisture sensor is used to check the moisture of soil. Automation is done by using the Programmable logic controller (PLC) and Human machine interface (HMI).So automatically the motor moves in X direction direction, Y direction and Z direction. Giving appropriate command in plc programming to pick and place the seed through Z direction.

III. DESCRIPTION OF EQUIPMENT

Description of various Equipment used in the research work.

3.1 Rack and Pinion.

A rack and pinion is a type of linear actuator that comprises a pair of gears which convert rotational motion into liner motion. Circular gear called the pinion engages teeth on a liner gear bar called the rack. Rotational motion applied to the pinion causes the rack to move relative to the pinion, thereby translation the rotational motion of the pinion into linear motion.

3.2 Stepper Motor

Stepper motor or step motor is a brushless DC electric motor that divides a full rotational into a number of equal steps. The motor's position ca then be commanded to move and hold at one of these steps without any position sensor for feedback as long as the motor is carefully sized to the application in respect to torque and speed.

3.3 Water Pressure Tank

As water is pumped for the tank, it compressed the air in the tank until it reaches a preset level .when someone turns on a facet, air pressure in the tank forces water thought the pluming until the pressure drops to the preset trigger pressure.

3.4 Vaccum cleaner

To pick and drop the seed inside the soil I have used the vacuum cleaner for the vacuum mechanisms.

3.5 Linear Actuator

A linear actuator is an actuator that creates motion in a straight line, in contrast to the circulate motion of conventional electric motor. Linear actuators are used in machine tools and industrial machinery, in computer peripherals such as disk drives and printers, in valves and dampers, in many other places where linear motion is required.Hydralic or pneumatic cylinder inherently produce liner motion.

3.6 Soil moture sensor

Soil moisture sensors measure the volumetric water content in soil. Since the direct gravimetric measurement of free soil moisture requires removing, draying and weighting of sample, soil moisture sensors measures the volumetric water contect indirectly by using some other property of the soil.

3.7 Wecon PLC

WECON Technology co ltd is a Chinese high technology company. Here I have used the Model no LX3V-0806MR which has 8 Input and 6 outpus.it is used for the controlling the motors and to make automation in farmbot.

3.8 Human Machine Interface

WECON LEVI 430T series HMI is use for the interface, it has USB printer/Serial port printer for the communication. and its screen size is 4.3 inches.

IV. CONTROLLING AND HUMAN MACHINE INTERFACE

Wecon plc is used for controlling the various parameter in the farmbot.which consists of 8/6-I/Os.Motors's drive is connected through the plc.programming in done in such a way that we can move the stepper motor position in various direction.
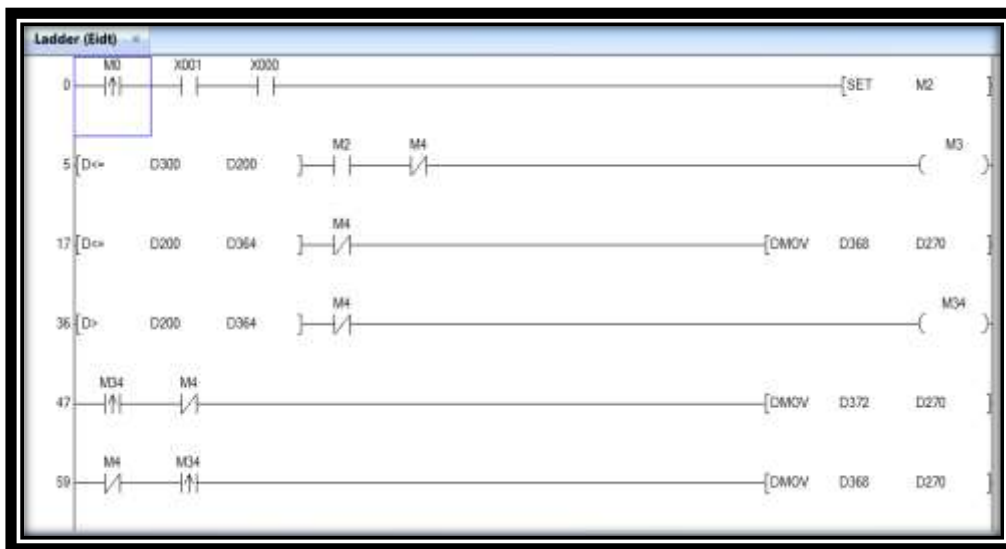
"Figure 1 : Programming screen of PLC"

In main operating screen of farmbot shows the stepper motor position because through which we have create the automation .Start and stop button for to command the machine run/stop.if stepper motor is runiig that indication also show by red led. Other parameter like forward and reverse position of motor is also show by red led.
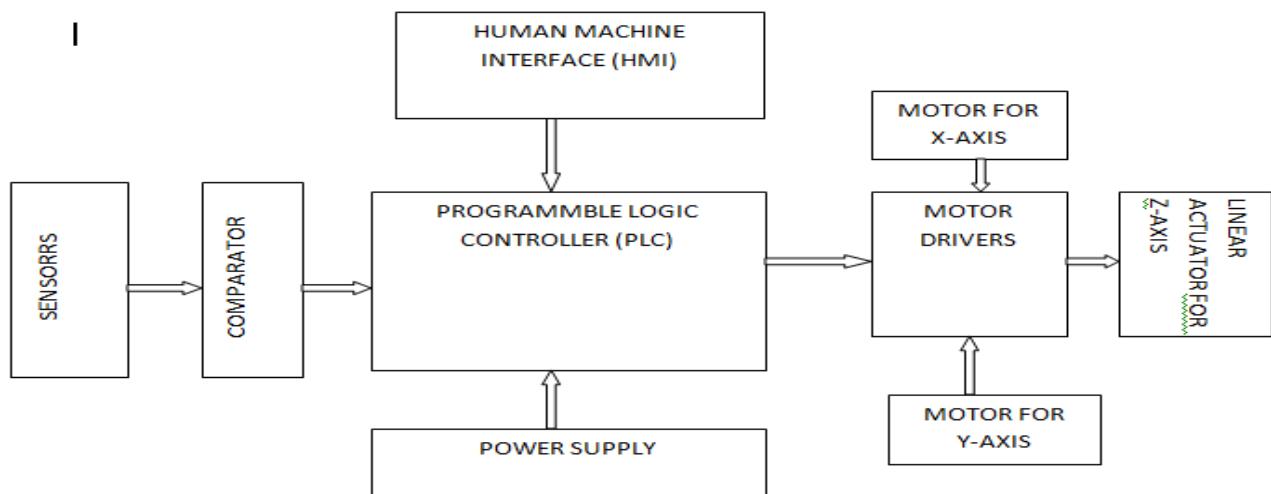

"Figure 2 :Human machine interface operating system"

Abbreviations and Acronyms PLC- Programmable logic controller, HMI- Human Machine Interface, PC-personal computer, I/O- Input and Output.
Units
Motor forward and reverse position in mm,stroke of linear actuator in mm.

V. BASIC BLOCK DIAGRAM OF FARMBOT

"Figure 3 : Basic block diagram of farmbot"

VI. WORKING DIAGRAM AND RESULTS

In our project all the components are placed on the base frame of wooden. Rack and pinion used for the smooth movement of stepper motor. The spraying nozzle is couled with the motor to spray the plant. Then water is pumed from the water tank to spray nozzle. Seed are available in the seeder train to pick and drop the seed inside the soil I have used vacuum system. When all ther motors are switched ON then farmbot will move in X-Axis,Y-axis and Z axis in the agricultural filed.

When farmbot is stared first it will check the moisture level inside the soil for the requirement of water level to spray the plant.Then seed is sprayed after that to the plowed filed.

"Figure 4 : Basic wooden frame for component placed"

"**Figure 5: Ready to use farmbot prepared by Author**"

VII. CONCLUSION

The project "DESIGNING AND DEVELOPMENT OF FARMBOT"was under taken with a aim of reducing the cost, make it more convenient and producing quality output to the end users. There were quite a few challenges while executing this project in terms of its designing, operational aspects. Learn many technical things while executing this Project work. Thus it was a wonderful experienced to complete this project work successfully.

VIII. ACKNOWLEDMENT

REFERENCES

[1] S.S.katarial, S.S.Gundal2, kanawade MT3 and khan Mazhar4, Automation in Agriculutere, Internationl journal of Recent Scientific Research Vol.6, Issue 6, June 2015.

[2]Robotic Agriculture,Simon blackmore q,Bill stout2,Maohau wang 3,Boris Runov$,5th European Conference on Precision agriculture,Uppsala,Sweden 9-12th june 2005.

[3]http://farmbot/whitepaper.published on 19th September 2013 by Rory Landon Aronson.

[4] Gopinath S, Kavinraja G,Bala G,R.Arvindhan,S.krisna.P.G.(2017) "Automated Farming Bot" International Journal of Infromative and Futuristic Reserach Volume 4,April 2017.

[5]Bhagyashree patil,Madhulika patole, Prasad Bhavsar,Tanvi shetty, "Smart Farming" IJSRD National conference on Technological Advancement and Automatizaiton in Engineering.,January 2016.ISSN:2321-0613.