Unmanned Robotics Service Unit In Agricultural Tasks

Mayur Kute[1], Kaustubh Nangare[2], Sourabh Khemnar[3]
[1 ,2, 3]*Department of Electronics and Telecommunication, PREC, Loni*

Abstract *- Developed agriculture needs to find new ways to improve efficiency. One approach is to utilize available information technologies in the form of more intelligent machines to reduce and target energy inputs in more effective ways than in the past. Precision Farming has shown benefits of this approach but we can now move towards a new generation of equipment. The advent of autonomous system architectures gives us the opportunity to develop a complete new range of agricultural equipment based on small smart machines that can do the right thing, in the right place, at the right time in the right way. Here, the project addresses an advanced system which improves agriculture processes like cultivation on ploughed land, based on robotic platform. We have developed a robotic vehicle having four wheels driven by DC motor. The four wheeled vehicle with belt is able to cultivate the farm or ploughed land by considering a particular row of specific column at a particular distance depending upon the crop. Also, it has ability to sense the obstacle in the way of vehicle with the help of infrared sensor. The distance between rows and columns, sensing of obstacle and signal conditioning all are integrated in one body to utilize in real world. The particular distance in between two seeds is controlled.*

Keywords - *Agriculture, efficiency, energy, autonomous, machines, ploughed, obstacles, signals.*

I. INTRODUCTION

In modern globalization, researches are trying to update the development based on automation which is very rigid, highly effective. The agriculture system may be advanced by modifying the mechanism in ploughing, cultivating, harvesting, weeding system which works automatically without man.

The idea of robotic agriculture (agricultural environments serviced by smart machines) is not a new one. Many engineers have developed driverless tractors in the past but they have not been successful as they did not have the ability to embrace the complexity of the real world. Most of them assumed an industrial style of farming where everything was known before hand and the machines could work entirely in predefined ways much like a production line. Therefore, now development in agriculture machines is the important phenomenon. This machine not only applies to robotic agriculture (RA) and Photo technology but it also implies a level of automation inherent in the machines. Automatic sensing and control for each task is also important and many research papers have shown that these systems are feasible but most are too slow, and hence not economically viable, to be operated on a manned tractor.

Modem agriculture uses a lot of energy. It comes in many forms from fertilizers and chemicals to tractors and fuel. The Photo technology approach tries to target the introduced energy to improve efficacy. Generally, 70% energy saving can be made in cultivation energy by moving from traditional trafficked systems to a non trafficked system. This was for shallow sloughing and did not include any deep loosening. From this we estimate that 80-90% of the energy going into traditional cultivation is there to repair the damage done by large tractors. It would be much better to not cause compaction in the first place which is one of the reasons that leads us to consider using small light machines.

II. PROBLEM DEFINATION

During work farmers have to suffer many problems, at the time of spraying pesticide liquids they have to face some breathing diseases. Robots have to done work also an unequal surface, so it is hard to do work in the fields. Sensing distance, these robot are work in particular distance sets by user. Capital cost of the robot. To obtain a fully autonomous agricultural system, the aforementioned two general frameworks must be merged in an architecture (hardware and software) that shares the sensorial system and the planning methods for both the autonomous guidance and the autonomous treatment application. This task must be performed with the objective of reducing the amount of hardware while maintaining the required performance. This architecture must be capable of integrating different sensor and actuation systems developed by diverse research groups as well as different types of commercial equipment. Furthermore, it must be flexible and integrate several standard communication protocols that are common in high-tech agricultural applications. A modular architecture to provide convenient settings of the interfaces between the sensors and devices and proper organization of the perception, processing, and actuation of these types of systems are required due to the large variety of available technologies.

OBJECTIVES

1. This machine not only applies to robotic agriculture and photo technology but it also implies a level of automation inherent in the machines.
2. Automatic sensing and control for each task is also important and many research papers have shown that these systems are feasible but most are too slow, and hence not economically viable, to be operated on a manned tractor.
3. It would be much better to not cause compaction in the first place which is one of the reasons that leads us to consider using small light machines.

THEORY

In the project of robotic agriculture cultivation system, it is presenting that the farm cultivation process in advanced agriculture system which is controlled by microcontroller assembly. The technique of seed boring in ploughed land is in the form row per column with fixed standard distance depending upon type of crop or type of cultivation .The other main part of this technique is sensor part. The sensor perform the well job of identifying obstacles as well as turning of robotic vehicle to next row per column and follow remaining part of the farm.

The block diagram of the robotic cultivation process as advanced agriculture system is as shown in figure 3.1 which consists of following main parts-

1. DC motor with driver L293D.
2. IR sensor.
3. Input software, display and memory unit.
4. Microcontroller (89C51).
5. Power supply.
6. Switches
7. Crystal Oscillator

One approach to design agricultural vehicle provides four wheels which individually driven by four DC motors. The figure 3.1 shows prototype system block diagram and vehicle schematic model for closed loop control to driving vehicle in straight way and turn properly. This four wheeled vehicle can makes robot more normally on bumpy road. But given non linear nature on bumpy road with four independent controlled wheels, the belts are provided to system. The infrared sensor performs the function of sensing object In way of vehicle. Also DC perform important role of inserting seeds from seed box in to the ploughed land. The description of all the block components is given by following.

Most of the world's adjustable speed business is addressed by DC motors. DC motor speeds can easily be varied; therefore they are utilized in applications where speed control, servo control, and/or positioning needs exist. The stator field is produced by either a field winding, or by permanent magnets. This is a stationary field (as opposed to the AC stator field which is rotating). The second field, the rotor field, is set up by passing current through a commutator and into the rotor assembly. The rotor field rotates in an effort to align itself with the stator field, but at the appropriate time (due to the commutator) the rotor field is switched. In this method then, the rotor field never catches up to the stator field. Rotational speed (i.e. how fast the rotor turns) is dependent on the strength of the rotor field. In other words, the more voltage on the motor, the faster the rotor will turn.

The following will briefly explore the various wound field motors and the permanent magnet (PMDC) motors. Shunt wound motors with the shunt wound, the rotor and stators (or field windings) are connected in parallel. The field windings can be connected to the same power supply as the rotor, or excited separately. Separate excitation is used to change motor speed (i.e. rotor voltage is varied while stator or field winding is held constant). The parallel connection provides a relative flat speed torque curve and good speed regulation over wide load ranges. However, because of demagnetization effects, these motors provide starting torques comparatively lower than other DC winding types.

III. METHODOLOGY

A. CULTIVATION PROCESS

***a). Seed bed preparation*:-**Plugging is one of the most important primary cultivation processes and has been carried out since the start of civilization. It is effectively the inversion or mixing of topsoil to prepare a suitable seed bed. It also has the ability to bury surface crop residues. A small robot utilizing current technology does not have the energy density to sustain cultivating over a large area due to the high levels of energy needed to cut and invert the dense soil.

***b). Seed mapping*:**-Seed mapping Seed mapping is the concept of passively recording the geospatial position of each seed as it goes into the ground. It is relatively simple in practice as infra red sensors mounted below the seed chute. As the seed drops, it cuts the infrared beam and triggers a data logger that records the position and orientation of the seeder. A simple kinematic model can then calculate the actual seed positions. The seed coordinates can then be used to target subsequent plant based operations.

***c). Seed placement*:-**Seed placement rather than just record the position of each seed it would be better to be able to control the seed position. This would allow not only allow the spatial variance of seed density to be changed but also have the ability to alter the seeding pattern. Most seeds are dropped at high densities within each row, whilst having relatively more space between the rows. From first agronomic principles, each plant should have equal access to spatial resources of air, light, ground moisture, etc.

Perhaps a hexagonal or triangular seeding pattern might be more efficient in this context.
If suitable controls are fitted to allow synchronization between passes, then there is the possibility to plant seeds on a regular grid that can allow orthogonal inter-row weeding.

d). Re-seeding:-Reseeding is the concept of being able to identify where a seed was not planted, or that a crop plant has not emerged and a machine can automatically place another seed in the same position. This concept could be extended to transplanting a seedling instead of a seed if the surrounding plants are too far advanced. A reseeded would have the ability to insert individual seeds/plants without disturbing the surrounding crop. Prior local microcultivation could be achieved by using a targeted water jet (or gel) to pierce the soil and soften it ready for the seedling roots.

e). Mechanical designing of Seed Planting Vehicle:-A robot is a mechanical and artificial agent. It is usually an electromechanical system, conveys a sense that it has agency of its own. It is a device that automatically complicated task, because of software programming.

f). Design of Seed planting vehicle:-In this project, for developing the structure of robotic agriculture machine, simple technique is used. It shows the designing of vehicle. It has four wheels which are individually driven. These wheels drive respectively with two dc motor, provides direct drive without gearing. Also there are two sliding bearings, respectively connect to the front wheel and body, so that the front wheel can rotate between +45° or -45°around bearing. All dc motors are energized by dc supply through microcontroller circuit. Infrared sensor sets at the front edge of vehicle for sensing obstacle in the way of vehicle, provides instruction to microcontroller for controlling motion of wheels through dc motor. The cultivation pipe with funnel is fitted at front side of assembly, shown in figure 2. It is used to boring the seed, stored in funnel and controlled by servo motor.At cultivation section, a servo motor is used to boring seed in ground. If any error is detected in this process like seed box (funnel) is empty, land is not ploughed, battery backup problem etc., then it stop vehicle and shows the fault on display board. Path controlling Mechanism of Vehicle.
In agriculture environment heavy or loaded vehicle can't move easily on the bumpy road, so small vehicle is designed with bait wheel, operates on dc motor, in this project. Automatic navigation of agricultural vehicles, such as tractors and harvesters, can increase the level of automation in the agricultural process, thereby lessening the human workload. In the agricultural environment, where vehicles move on uneven terrain, achieving maneuverability and mobility can be difficult, particularly when the path curvature is small or vehicle orientation and path tracking must be independently controlled.

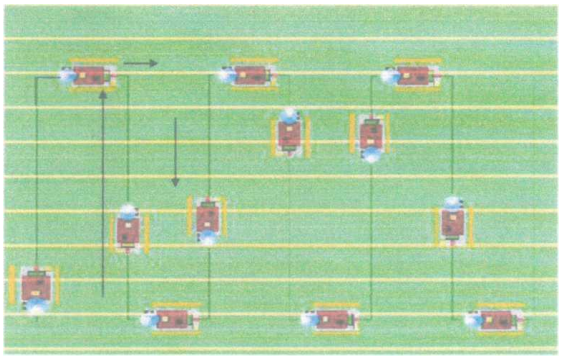

Fig. Path Control Mechanism

DETAILS DESCRIPTION AND BLOCK DIAGRAM

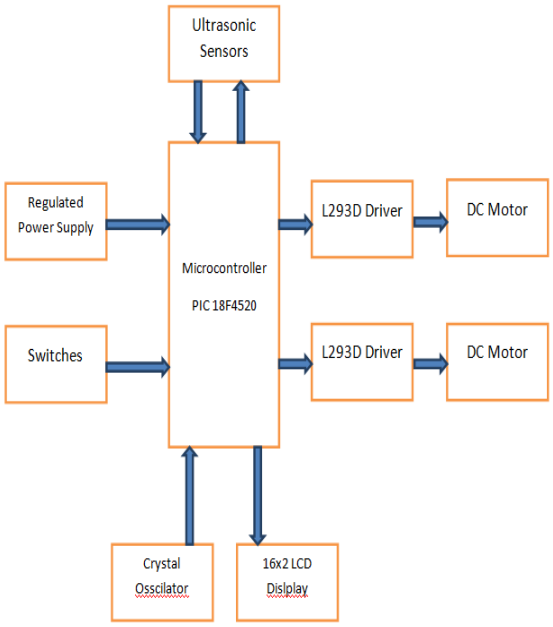

Fig: Block Diagram Of Agriculture Robot

IV. PROPOSAL RESULT

Not enough knowledge about mechanical movement:
We have not enough knowledge about the theory of mechanical movement it gives the problem to design the body of the project.

Do not know the best material for project body:
After designing the body of project, we confuse to choose the best material for built this project.

Vehicle do not work properly:
The designed vehicle do not work properly i.e. the way followed by the vehicle is not in straight line due to some mechanical distortion.

Turning problem:
One more and important problem is turning of vehicle. When given particular column is completed or obstacle is detected, it was not able to take precise **90°** or **180°** turn.

V. EXPERIMENTAL RESULTS

Experiments were conducted to check the robustness and accuracy of the control
system.

Vertical distance in between two seeds:
The experiments were conducted on different two kinds of ground surface; moisturized surface and dry surface. The base vehicle contains the whole cultivation system, i.e. seed box. For this experiment three repetitions were performed. A track was constructed to simulate the given path to system according to seed. The observed speed of vehicle is constant everywhere. V= 60 rpM

VI. CONCLUSION

This paper present the requirements and progress made towards achieving a future precision autonomous farming system. The assembly is developed for cultivating ploughed land automatically i.e. no man power required. The project has consists of two different mechanism. The first mechanism contains making an assembly of vehicle and its motion, where as second mechanism is preparing a seed bed on ploughed land. The microcontroller is used to control and monitoring the process of system motion of vehicle. It is controlled with help of DC motor. This system also detect obstacle present in path of the vehicle by ultrasonic sensor. It is also used for sensing turning position of vehicle at the end of land. Because of no man power requirement and high speed of operation, it has scope for further expansion

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