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Automatic Ploughing And Seeding Robot

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Abstract: *In this paper strives to develop a robot capable of performing operations like automatic ploughing, seed dispensing, fruit picking and pesticide spraying. It also provides manual control when required and keeps tabs on the humidity with the help of humidity sensors .The main component here is the AVR At mega microcontroller that supervises the entire process. Initially the robot tills the entire field and proceeds to ploughing, simultaneously dispensing seeds side by side. The device used for navigation is an ultrasonic sensor which continuously sends data to the microcontroller. On the field the robot operates on automated mode, but outside the field is strictly operated in manual mode. For manual control the robot uses the Bluetooth pairing app as control device and helps in the navigation of the robot outside the field.*

The field is fitted with humidity sensors placed at various spots that continuously monitor the environment for humidity levels. It checks these levels with the set point for humidity and alerts the farmer. The alerting mechanism is GSM module that sends a text message to the farmer informing him about the breach in set point. The farmer then responds via SMS to either switch on the water sprinklers or ignore the alert. The water sprinklers, if on, bring down the humidity level thus providing an ideal growing environment to crop. The major concept of the paper fruit picking and pesticide spraying is described under the process domain. Farmers today spend a lot of money on machines that help them decrease labor and increase yield of crops but the profit and efficiency are very less. Hence automation is the ideal solution to overcome all the shortcomings by creating machines that perform one operations and automating it to increase yield on a large scale.

Keywords : *Buzzer,Lcd,ultrasonic Sensor , Ploughing, AVR, GSM module, Domain, Humidity*

I. Introduction

"Farmers today spend a lot of money on machines that help them decrease labor work and increase yield of crops. There are various machines that are available for ploughing, harvesting, spraying pesticides etc., however these machines have to be manually operated to perform the required operations and moreover separate machines are used for every functions. The yield and profit returns from employing this equipment are very less as compared to the investment. Another issue is the growing demands of the world's population. The World Health Organization estimates that Earth's population will touch 9 billion in 35 years which will lead to a staggering demand in increase of growth of food crops. Automation is the ideal solution to overcome all the above mentioned shortcomings by creating machines that perform more than one operation and automating those operations to increase yield on a large scale."

II. Literature Survey

Amritansh srivasatava [1] etal, these worked on DTMF Based Intelligent Farming Robotic Vehicle. The main objective of machine can also be used to reach the places where farmers make harder efforts for farming such as hill areas, mountains etc. where land is not plane. This is how we can use this robot in different fields as well as for research purpose by further manipulation in programming it can be modified accordingly.

R.suresh [2] etal, this extensive work on automatic feeding device in rotary cultivator blade shaft welding equipment. It can achieve automation of grab, feeding and placement of all blade holders and assures that the blade holder feeding device and other devices in welding equipment work coordinate automatically. it can replace a universal robot to realize welding automation of the shaft weldment. Moreover the biggest advantage of it is easy to operate and low cost.

Amrota sneja [3] etal, in this research paper agricultural robot for automatic ploughing and seeding. The concept of fruit picking and pesticide spraying is described under the process domain. Farmers today spend a lot of money on machines that help them decrease labor and increase yield of crops but the profit and efficiency are very less. Hence automation is the ideal solution to overcome all the shortcomings by creating machines that perform one operations and automating it to increase yield on a large scale.

Simon balckmore [4] etal, in this paper robotic agriculture the future of agricultural mechanisation. Developed agriculture needs to find new ways to improve efficiency. One approach is to utilise 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.

Sajjad yaghoubi [5] etal, autonomous robots for agricultural tasks and farm assignment and future trends in agro robots. This article is the logical proliferation of automation technology into bio systems such as agriculture, forestry, green house, horticulture etc. Presently a number of researches are being done to increase their applications. Some of the scientist contributions are mobile robot, flying robot, forester robot, Demeter which are exclusively used for agriculture. A brief discussion is being done about the types of robots which increase the accuracy and precision of the agriculture.

III. Scope Of Objectives

The major concept of fruit picking and pesticide spraying is described under the process domain. Farmers today spend a lot of money on machines that help them decrease labor and increase yield of crops but the profit and efficiency are very less. Hence automation is the ideal solution to overcome all the shortcomings by creating machines that perform one operations and automating it to increase yield on a large scale.

IV. Present Work

4.1 Algorithm

- Initialize the buzzer and lcd display
- Read digital sensor values
- Motion control
- Node identification
- Gripper function

4.2 System Architecture

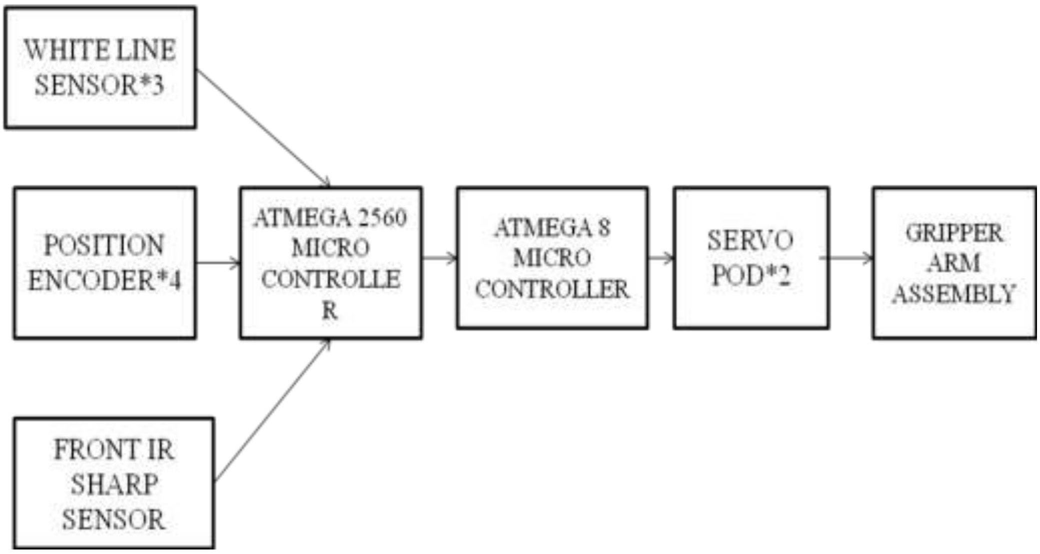


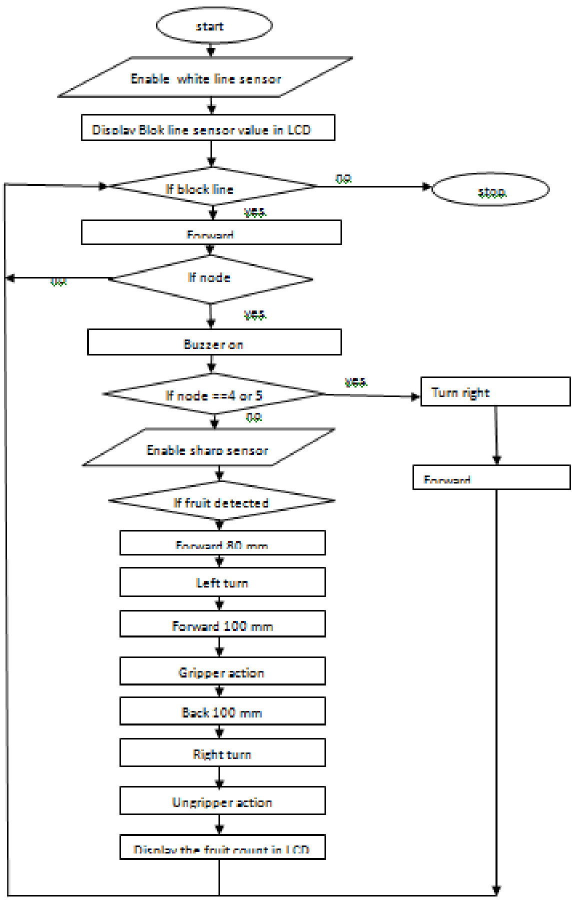
Figure 4.1: System architecture

The farming using this kind of device is called precision farming. The main parts of the robot are the tiller, plougher and the wheels section. Three cameras are present for praying pesticides and for fruit picking. The tiller is a horizontal bar with a number of jagged teeth's fixed on it to aerate or loosen the soil bed. Cong Ming, in Ligang and Fag Bo [4] published a paper titled "Intelligent robot Mowers: A review", Robot, Vol. 29, no 4.From this we can say that the plougher is similar to a tiller but has sharper and longer blades to turn over the soil. Both the tiller and plougher are crafted of sheet metal for the prototype model. The robot section consists of 7 motors out of which 5 are dc motors and 2 are servo motors.

Four dc motors are attached to wheels strung on either side such that each side is driven by two motors each. The plougher is attached with another dc motor which aids polar movement in the plougher. However the tiller is fitted with more sophisticated servo motor for precise angular movement of the tiller. The servo motor serves its optimum purpose in the speed dispensing box where it is placed to slide the opening exactly for few inches in order to let the seeds fall in the soil. The AVR microcontroller and the other interfacing hardware are all mounted on the robot for convenience.

On the field navigation mechanism of the robot is guided by the signals being sent out from the AVR microcontroller in coordination with ultrasonic sensor placed on the robot. The ultrasonic waves are emitted and received continuously by the sensor which on encountering a wall or any obstacle sends signals to the microcontroller that further conveys the robot to stop, else keeping moving. They help in determining how much more distance is yet to be covered by the robot, this is done with the help of echo pulse which in simple terms means measuring the time taken for the pulse to leave and return to the sensor. If the waves come across a boundary wall then it immediately takes 180 degree turn to proceed to the next column of the field and so on till the last boundary all is reached. The distance to be covered is shown on a LCD display that is mounted on the robot. In this manner the entire field is ploughed and seeded.

PROCESS FLOW:



4.2 AVR Microcontroller

The AVR has Harvard Architecture where program and data memory are separately placed with an 8-bit RISC single chip microcontroller. It is the heart of the agricultural robot here. It is one of the first microcontroller families to use on-chip flash memory for program storage while other controllers used programmable ROM, EPROM or EEPROM. RISC-Reduced Instruction Set Computing, this is a CPU designed strategy based on the insight that simplified instruction can provide higher performance. AVR is most appropriate for battery powered appliances. The main advantages of using this ATmega16 are its 8-bit high performance with low power consumption and that it is based on enhanced RISC architecture with 131 powerful instructions of which most of the instructions execute in one machine cycle. For the applications, Atmega16 can work on a maximum frequency of 16MHz.It has a programmable flash memory of 16Kb and a digital to analog comparator. The controller is interfaced with the motor, water sprinkler, camera, display, Bluetooth and GSM and functions these devices.

4.3 Servo Motor

Servo motor is commonly used as an error sensing feedback control which is used to correct the performance of a system. They are equipped with a servo mechanism for precise control of angular position. These motors usually have a rotation limit from 90 degree to 180 degree or to even 360 degree. But servos do not rotate continually. Their rotation is restricted in between fixed angles.

A servo motor primarily consists of a DC motor, gear system, a position sensor which is a potentiometer, and some of control electronics. The DC motor is connected with a gear mechanism and provides feedback to the sensor which is the potentiometer and from the gear box, the output of the motor corresponds to the current position of the motor. So the change in resistance produces an equivalent voltage from the potentiometer. The pulse width modulated signal is fed through the control wire where this pulse width is then converted into an equivalent voltage that is compared with that of signal from the potentiometer using an error amplifier.

4.4 Humidity Sensors

Humidity is defined as the presence of water in air. The amount of water vapor in air can affect human comfort as well as many manufacturing processes in industries. The presence of water vapor influences various physical, chemical and biological processes. In agriculture, measurement of humidity is important for plantation protection, dew prevention, soil moisture monitoring etc.

Fig 4 humidity sensor

With the development of science a chemical technology, the humidity sensor begins to use a thin piece of lithium chloride or other semiconductor devices and measuring the resistance which will be affected by water vapor. The resistive humidity sensor can use this feature to gather the humidity information. The main advantage of this sensor is that it can work in the high temperature up to 212 degrees Fahrenheit. Fig 4 shows a humidity sensor with its circuit connections.

4.5 Fire Bird V ARM7 LPC2148

The Fire Bird V robot is the 5th in the Fire Bird series of robots. First two versions of the robots were designed for the Embedded Real-Time Systems Lab, Department of Computer Science and Engineering, IIT Bombay. Theses platforms were made commercially available form the version 3 onwards. All the Fire Bird V series robots share the same main board and other accessories. Different family of microcontrollers can be added by simply changing top microcontroller adapter board. Fire Bird V supports ATMEGA2560 (AVR), P89V51RD2 (8051) and LPC2148 (ARM7) microcontroller adapter boards. This modularity in changing the microcontroller adapter boards makes Fire Bird V robots very versatile. User can also add his own custom designed microcontroller adapter board.

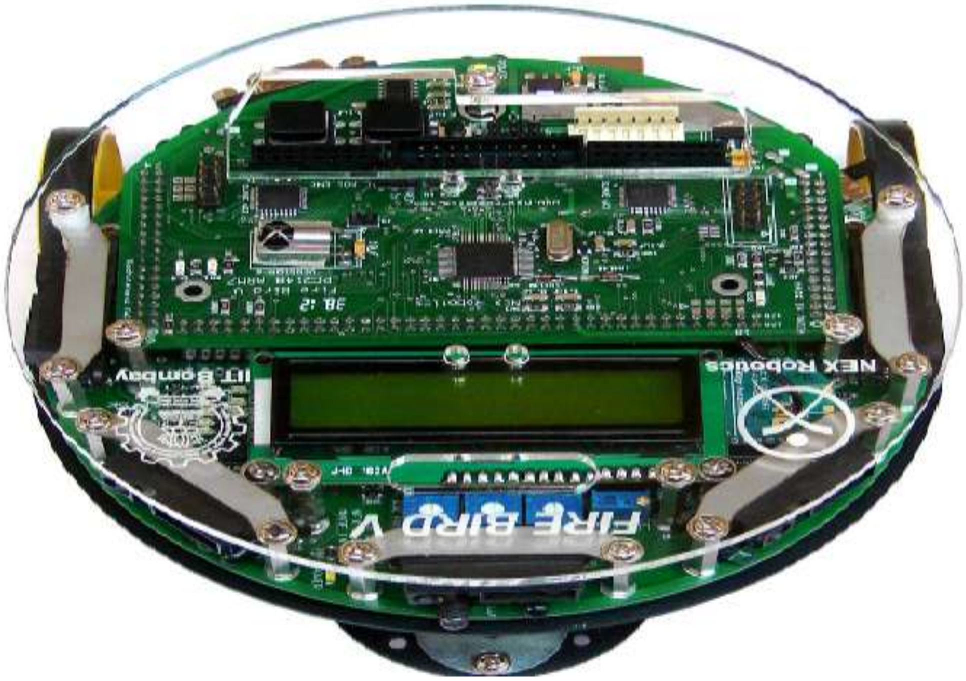


Figure 4.2 Fire Bird V LPC2148 robot

V. Future Works

This paper is a small scale effort but the same can be implemented with enormous results in a large scale that benefits all farmers of the world. Apart from ploughing, seed dispensing, spraying pesticides and fruit picking other farming process like harvesting, irrigation etc. can also be implemented in one robot thus making the machine capable of multi-tasking. Also looking forward to learn about and implement agricultural based agrobots like Nursery bot, Herder bot, Wine bot, Bee bot, and Hamster bots that would qualify the standards from the current precision to autonomous farming methodologies.

VI. Results and discussion

- Four dc motors are attached to wheels strung on either side such that each side is driven by two motors each.
- The AVR microcontroller and the other interfacing hardware are all mounted on the robot for convenience.
- The waves come across a boundary wall then it immediately takes 360 degree turn to proceed to the next column of the field and so on till the last boundary all is reached.
- The distance to be covered is shown on a LCD display that is mounted on the robot. In this manner the entire field is ploughed and seeded.

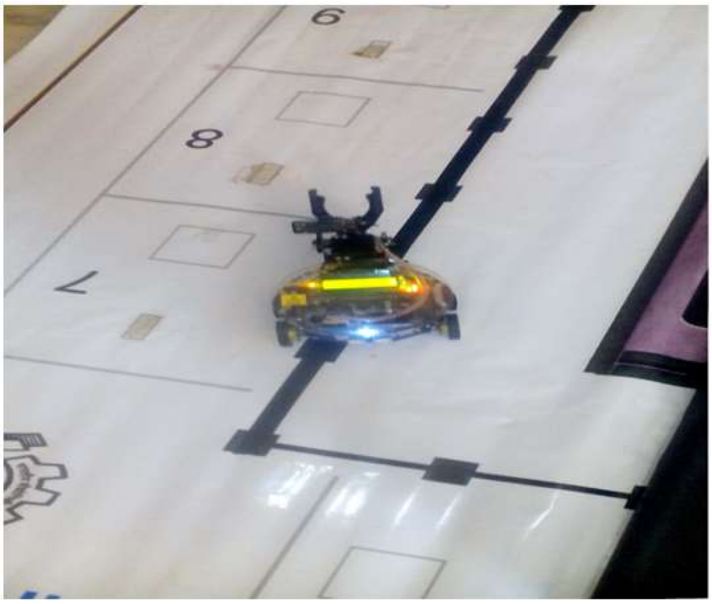


Figure 5.1 fruit picking robot

VII. Conclusion

An initial outcome of this paper indicates that most of these systems that which work autonomously are more flexible than traditional systems. The benefits of reduction in labor costs and restrictions on the number of daily working hours significantly improved. Thus it has made possible to automate the most significant working routines. However some have failed due to the requirement of accuracy of specific tasks. In addition, at this stage of development, the initial investment and annual costs of expensive GPS system are still relatively high but it seems possible to design economic viable robotic systems for grass cutting, crop scouting and autonomous weeding. Findings show that there is a significant potential for applying these systems if it's possible to impose adequate control and safety regulations systems at reasonable costs. Moreover, a comparison between different European countries indicates that labor costs, cost rotation and farm structure may have a tremendous impact on the potential use of these systems.

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