Multi-tasking Agribot

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Abstract: The main purpose of making this agribot is provide affordable robot to farmers for their agricultural use. It is a Multi-purpose Robot use solar energy for various operations. It performs various operations such as grass cutting, fertilizers and pesticides spraying, plouging and seeding in farms. To detect obstacle and give indication to user, it includes ultrasonic sensor, if obstacle is detected it also gives beep sound indication at robot side. All operations are performed by using solar power so it does not need external power supply. This robot is control by joystick that's why human efforts would be minimize. It also sends message indication to owner via a GPS which makes it user friendly as well.

Keywords: Solar panel, Microcontroller, Joystick, Ultrasonic Sensor, DC Motor, GPS.

1. Introduction

In early days cutting grass, plouging is not an easy task. Moving the grass cutters and plough which was powered with a standard motor as well as animals was inconvenient. In old models grass cutter that is operated on engine created so much noise pollution and air pollution at the same time. Even though electric solar grass cutters and plough are environment friendly, but they include electricity charge.

Generally, plough is powered by motor along with that, electric grass cutters are also hazardous; it cannot be easily used by all. Solar based multi-tasking agribot is a robotic vehicle powered by solar energy that is capable of cutting grass, ploughing and sowing by a very high speed motor. As its name implies 'multi-tasking Agribot', so along with grass cutter it also provides fertilizer and pesticide spraying, ploughing and sowing.

The system uses 12V rechargeable battery to power the vehicle movement as well as to the motors those are used for all four operations. We also use a solar panel to charge the battery so that there is no need of external electric supply. The grass cutter motor, ploughing motor, seeding motor vehicle motors and even a motor to which a fertilizer tank is connected are interfaced with PIC18F4520.Here five relay modules are used for operating all motors. It is also interfaced with a wireless protocol called ZigBee. The vehicle is commanded to go forward, backward, left and right by using this ZigBee protocol to perform recommended operations from robot.

The advantage of this agribot is that it does not require any fuel to work in farm, as it works on the solar energy as well as circuit model is less complex.

2. Literature Survey

Due to autonomous robot, fields are gradually increasing productivity in agriculture. Some of the problems in the Indian agricultural are rising of input costs, accessibility of skilled labors, lack of water resources and crop monitoring. To overcome all traditional farming problems, the automation technologies were used in agriculture. The automation in the agriculture could help farmers to reduce their efforts and increase the productivity [2]. The robot performs only two operations like digging hole in field that is ploughing in the field and then planting a seed to cover the plough area with soil. Stepper motor is used for drop a seed at particular distance and to dig a hole it uses spike wheel. [6].

In terms of economy and time traditional harvesting method is highly labor intensive and inefficient. Reduce the harvesting cost to about 40-45% of total production cost this robot is designed to reduce harvesting cost and increase the productivity [8].

Main objective of automating the seeding operation is making it more efficient and accurate in its working. Distances between two crops and two rows can be interpreted as row and column distance.

3. System Overview

The system is designed for the increases the accuracy in the agricultural work and also increase the productivity. For Description of overall model block diagram is given below-
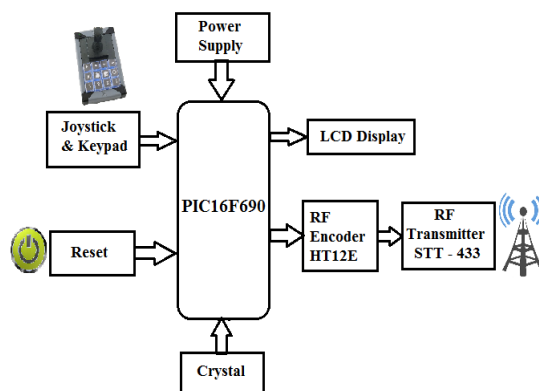

Fig. 1. Block diagram of remote

Remote: Figure 1 shows the block diagram of remote. The system is designed for the automation of agriculture. PIC16F690 is use for controlling all the functions of remote or

transmitter. 9V rechargeable battery connected for the power supply. Joystick interfaced with PIC for moving the robot particular direction along with joystick keypad is developed that is use for select the particular function. Reset switch is use to start the robot functioning from initial condition. External crystal is connected for increased frequency range from 8 MHz to 32 MHz; crystal material is use because of its well-known for stability and durability. It produces stable output for prolonged time. LCD display is the output device it is use to display the message. Here it uses for display the present function of the robot i.e. ploughing, seeding, grass cutting and fertilizer spraying. It also displays the message transmitted from ultrasonic sensor if obstacle is detected. For transmission and reception purpose as a RF encoder and decoder ZigBee CC2500 is used. It offers duplex communication between remote and robot.
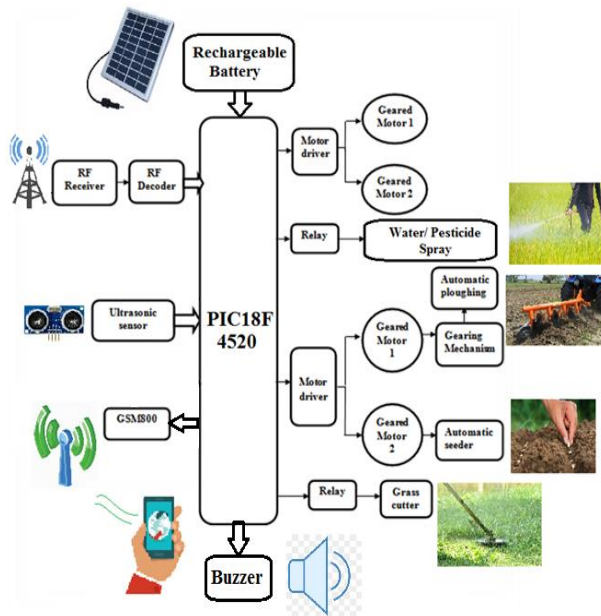

Fig. 2. Block diagram of robot

Robot: Figure 2 shows the block diagram of receiver (Robot). PIC18F4520 is use for controlling the robot functioning according to the remote command. The solar panel of 10 Watts and 12V DC battery is connected for power supply. The solar energy is stored into the battery for performing the operations. Once the energy is stored, then this energy is transferred to each and every device of the circuit continuously. As a RF decoder ZigBee CC2500 use to receive the signal which is transmitted from the transmitter side and also it can transmit the signal of present function of robot and ultrasonic sensor indication. According to remote signal robot do its functioning. GSM800 is use for give the real time indication of robot functioning to the user on mobile. Robot performs four functions that is very important and time and capital consuming according to agriculture point of view that is grass cutting, ploughing, seeding and fertilizer or pesticide spraying. When robot is moving in farm area for moving purpose four wheels are connected with DC motor the movement of wheels controlled through joystick. If any obstacle is detected in robot path the

indication is send to the remote and display on LCD display, at the robot side buzzer also gives indication. All four functions of robot can do by using motors and different mechanisms. Controlling each motor relay circuitry is use.

A. Analysis of the parameters for all parameters

Table 1
Grass-cutting Function

S. No.	Parameter	Values obtained by proposed model
1.	Torque of the motor	4 kg-cm
2.	Speed of the blade connected motor	7500 RPM
3.	Distance covered by the model	11.4m
4.	Time taken by the proposed model	1 min

Table 2
Ploughing Function

S. No.	Parameter	Values obtained by proposed model
1.	Torque of the motor	4 kg-cm
2.	Speed of the motor	10 RPM
3.	Distance covered by the model	11.4m
4.	Time taken by the proposed model	1 min

Table 3
Pesticide & fertilizer spraying function

S. No.	Parameter	Values obtained by proposed model
1.	Torque of the motor	4 kg-cm
2.	Speed of the blade connected motor	10 RPM
3.	Area covered by proposed model	5.2m x5.2m
4.	Time taken by the proposed model	1 min

Table 4
Seed Sowing Function

S. No.	Parameter	Values obtained by proposed model
1.	Torque of the motor	4 kg-cm
2.	Speed of the motor	10 RPM
3.	Area covered by the model	5.2m x 5.2m
4.	Number of seeds sowed for minute	30

From the above tables it is analyzed that the prototype model of proposed system can be used to perform all the operations covers 11.4 m distance and 5.2m x 5.2m per minute.

4. Applications

1. *Nursery:* By using this Robot row to row spacing can be adjusted.
2. *Farm:* In farm it is used for planted seeds. Some crops need fertilizers and water when the seed germinates and the plant begins to grow.
3. *Greenhouse:* In greenhouse the Irrigation and Fertilization operation performed easily.

5. Conclusion

Multi-tasking agribot has successfully implemented and tested for various functions. It was developed for integrating agricultural robot using programming. The advantages of Multi-tasking agricultural robots are reducing human effort, ensuring proper irrigation and efficient utilization of all resources. The proposed system is mainly used solar power supply for working for plant care and selective harvesting. In

future, it can be extended by using soil monitoring and cameras for performing the same operations without human operator for measuring the various parameters like soil condition.

Table 5
Comparison

S. No.	Parameter	Traditional	Tractor	Robotic
1.	Speed	Slow	High	Very high
2.	Man power	More	Moderate	Less
3.	Time required	More	Less	Less
4.	Sowing technique	Manually	Manually	Automatically
5.	Required energy	High	Very high	Less
6.	Yield of crop	Low	Moderate	High

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