

Solar Operated Agrobot

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Abstract: The basic requirements for small scale cropping machines are, they should be suitable for small farms, simple in design and technology and versatile for use in different farm operations. A manually operated template row planter was designed and developed to improve planting efficiency and reduce drudgery involved in manual planting method. Seed planting is also possible for different size of seed at variable space between two seed. Also it increased seed planting, seed/fertilizer placement accuracies and it was made of durable and cheap material affordable for the small scale peasant farmers. The operating, adjusting and maintaining principles were made simple for effective handling by unskilled operators (farmers).

Keywords: Seed Sowing, Agricultural Sector, Solar Powered, Portable, sensors.

I. Introduction

Today the environmental impact of agricultural production is very much in focus and the demands to the industry is increasing. In the present scenario most of the countries do not have sufficient skilled man power in agricultural sector and that affects the growth of developing countries. Therefore farmers have to use upgraded technology for cultivation activity (digging, seed sowing, fertilizing, watering, spraying etc.). So it's a time to automate the sector to overcome this problem. In India there are 70% people dependent on agriculture. So we need to study on improving agricultural equipment. Innovative idea of our project is to automate the process of digging and seed sowing crops such as sunflower, baby corn, groundnut and vegetables like beans, lady's finger, pumpkin and pulses like black gram, green gram etc. and to reduce the human effort. Since we have lack of man power in our country, it is very difficult to do digging and sowing operation on time, Automation saves a lot of manual work and speed up the cultivation activity. The energy required for this robotic machine is less as compared with other machines like tractors or any agriculture instrument, also this energy is generated from the solar energy which is found abundantly in nature. Pollution is also a big problem which is eliminated by using solar plate.

The main objectives of this project are

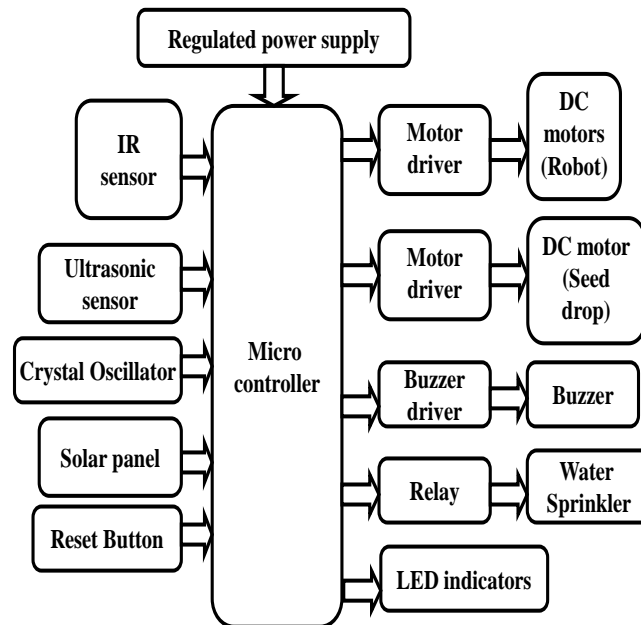
1. Autonomous controlling of Robot using ultrasonic obstacle sensor.
2. IR sensor based autonomous robot control
3. Capable to plough and level.
4. Watering the seeds after leveling the ground .
5. Solar based rechargeable battery to avoid pollution and saving energy.

II. Hardware

The hardware requires fewer components which reduces the cost of production. The advantage of this technology is that here a single microcontroller controls the entire unit and provides monitoring facility. Instead of using individual modules with its own controller, we use a single controller.

2.1 HARDWARE BLOCK DIAGRAM:

The hardware block diagram other than regulated power supply is as shown below



The hardware essentially consists of the above components which are discussed in detail further.

2.1.1 IR SENSOR

This sensor is a short range obstacle detector with no dead zone. It has a reasonably narrow detection area which can be increased using the dual version. Range can also be increased by increasing the power to the IR LEDs or adding more IR LEDs

In this project we are using IR sensor for calculating the number of rotations made by the wheel.

2.1.2 ULTRA SONIC SENSOR

Ultrasonic sensors emit short, high-frequency sound pulses at regular intervals.

These propagate in the air at the velocity of sound. If they strike an object, then they are reflected back as echo signals to the sensor, which itself computes the distance to the target based on the time-span between emitting the signal and receiving the echo.

As the distance to an object is determined by measuring the time of flight and not by the intensity of the sound, ultrasonic sensors are excellent at suppressing background interference. Virtually all materials which reflect sound can be detected, regardless of their color. Even transparent materials or thin foils represent no problem for an ultrasonic sensor.

Micro sonic ultrasonic sensors are suitable for target distances from 30 mm to 10 m and as they measure the time of flight they can ascertain a measurement with pinpoint accuracy.

Here we are using ultrasonic sensor for detecting obstacles in the field. This is placed in front portion of the robot.

2.1.3 BUZZER

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers.

Whenever an obstacle is detected by an ultrasonic sensor, the buzzer gives alarm.

2.1.4 DC MOTOR

A dc motor uses electrical energy to produce mechanical energy, very typically through the interaction of magnetic fields and current-carrying conductors. The input of a DC motor is current/voltage and its output is torque (speed).

The DC motor has two basic parts: the rotating part that is called the armature and the stationary part that includes coils of wire called the field coils. The stationary part is also called the stator.

Four DC motors are used in this project. Two DC motors are used for rotating the wheels and one for moving seed chamber and another for running water motor.

2.1.5 MICROCONTROLLER

The microcontroller used here is a 28 pin PIC microcontroller. PIC16F73 is a CMOS flash-based 8-bit microcontroller. The features of this controller are very accurate and also advantageous when compared to other controllers. Due to this reason, this controller is preferred in this case.

The reset button is used to reset the controller periodically. Crystal oscillator provides the required frequency for the controller.

LED indicators are used to indicate whether there is a power supply or not for the controller unit.

III. Software

Three softwares were used for coding and designing the circuit to check its performance. Express PCB ,PIC C Compiler and a Proteus 8 software are used.

Express PCB: Express PCB is a software tool to design PCBs specifically for manufacture by the company Express PCB (no other PCB maker accepts Express PCB files). It is very easy to use, but it does have several limitations.

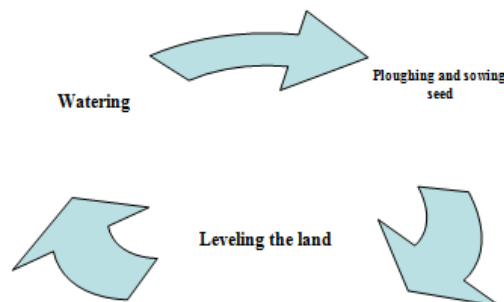
PIC C Compiler: it is one among all the C compilers that provides best speed and code size for all pic controllers

The work to be done in pic compiler is to write the code and debug it.

Proteus 8: this software is responsible for designing the circuit by selecting and connecting the respective components. The code from pic c compiler is saved and then dumped in the circuit in proteus software and then is made to run. Here the clock frequency of controller can be set by double clicking onto it. It can be checked after running the circuit whether there is a desired output or not.

The codes are written individually for each sensor for their respective functioning, integrated into a single code and then is dumped into the micro controller when it is coded perfectly i.e., when error free code is obtained.

IV. Sequence Of Coding Process



V. Prototype Of Solar Based Agrobot



VI. Result

It is a low running cost and pollution free robot. The Purpose of this project is to build an obstacle avoidance autonomous robot and is used for plough, seedsowing, leveling and watering. Agrobot has high efficient design and consumes low power.

VII. Conclusion

As we know that in our country about 70% of population lives in villages & their mainly income depend on the agricultural source. Hence my prominent aim of this project Solar operated automatic seed sowing machine is to fulfill the tasks like digging, seed sowing, water pouring and fertilizing by using non-conventional energy sources. Thus solar operated automatic seed sowing machine will help the farmers of those remote areas of country where fuel is not available easily. And also they can perform their regular cultivation activity as well as saves fuel up to larger extent. At the same time by using solar energy environment pollution can also be reduced. Thus aiming to save the revenue of government & also most demanded fossil fuel.

VIII. Future Scope

This project can be extended by introducing GSM module through which the DC motor can be operated from anywhere in the world and also the status of the rotating mechanism can be known. Also, IR module with LCD display can be used to know the exact speed and direction of the DC motor.

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