iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 6 **Issue:** IV **Month of publication:** April 2018

DOI: http://doi.org/10.22214/ijraset.2018.4305

www.ijraset.com

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 6 Issue IV, April 2018- Available at www.ijraset.com

Solar based Automatic Harvesting Robot

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Abstract: In this contradictory world, plethora of paddy harvesting machines are available in the market featuring the manually operated ones to the fully automated machines but the major drawback is none of them finds to be useful for farmers having small fields because of various reasons from their whooping cost and their complexity in operation also the fact that they make the paddy being harvested useless for further sowing, our project eradicates the before said scenario by providing automated harvesting with simple design, our project incorporates a swinging sway arm fixed with cutter which is attached to the autonomously operated vehicle, which senses the presence of the crop in the field and moves accordingly to cut the crop and it is collected by the human after cutting operation is completely over.We are using ultrasonic sensor which is detect the obstacles coming front of the vehicle, PIR sensor used to detect the presence of humans and animals. DC motors are used for motion of the vehicle and servo motor is used for cutting operation. 40T blade is used for cutting operation.
Keywords: DC Motor, PIR Sensor, Servo Motor, Blade, Arduino mega

I. INTRODUCTION

In recent years, development of autonomous vehicles in agricultural applications has been received many interests which has led many researchers to start exploring the possibilities of developing adaptable farmer-assistant robots. Research for autonomous and intelligent vehicles in agriculture started in the early 1960s, mainly developing automatic steering system. Robotic applications in agriculture, forestry and horticulture have been developed for various applications.

There are a number of agricultural field operations that can be executed by autonomous robots, giving more benefits than conventional machines. These autonomous platforms would be used for cultivation and seeding, weeding, scouting, application of fertilizers and chemicals, irrigation and harvesting.

The objective of this project is to reduce the man power and to develop the farming techniques which are convectional. This robot detects the presents of crop in the field and performs the programed operations. The sensor used in the robot detects the crops in the field using sound waves and cuts the crops in the field. The robot is also designed to check the premises continuously when it comes to its operations.

II. LITERATURE SURVEY

Farming has traditionally been a very labour-intensive activity. Even with the advent about a century ago of motorized vehicles such as plows, combines, harvesters and such, a human driver was always required.

That day has now passed as robotics has arrived addressing all of such tasks as well as crop monitoring and even the very manual efforts such as fruit picking and milking. Agriculture is benefitting from efforts in other fields such as unmanned vehicles for military and security tasks, vision guided manufacturing, mobile robots and other autonomous robotic developments (Bloss, 2014). Researchers are taking advantage of the recent dramatic growth in intelligent computing power and sensor innovations that open new doors to previously what were considered impossible-to address agricultural applications.

Another driving factor is the need to address farm labour shortages. As an example, the Japanese Government has recently announced plans to fund the development of unmanned farm tractors.

Their support is based on research showing that more than 60 per cent of Japanese farmers are 65 years of age or older, and younger people are going into high-tech occupations and not farming. In the USA, data show that less than one per cent of the population is engaged in farming. Feeding the population is a growing problem around the world.

Robotics is answering the call.

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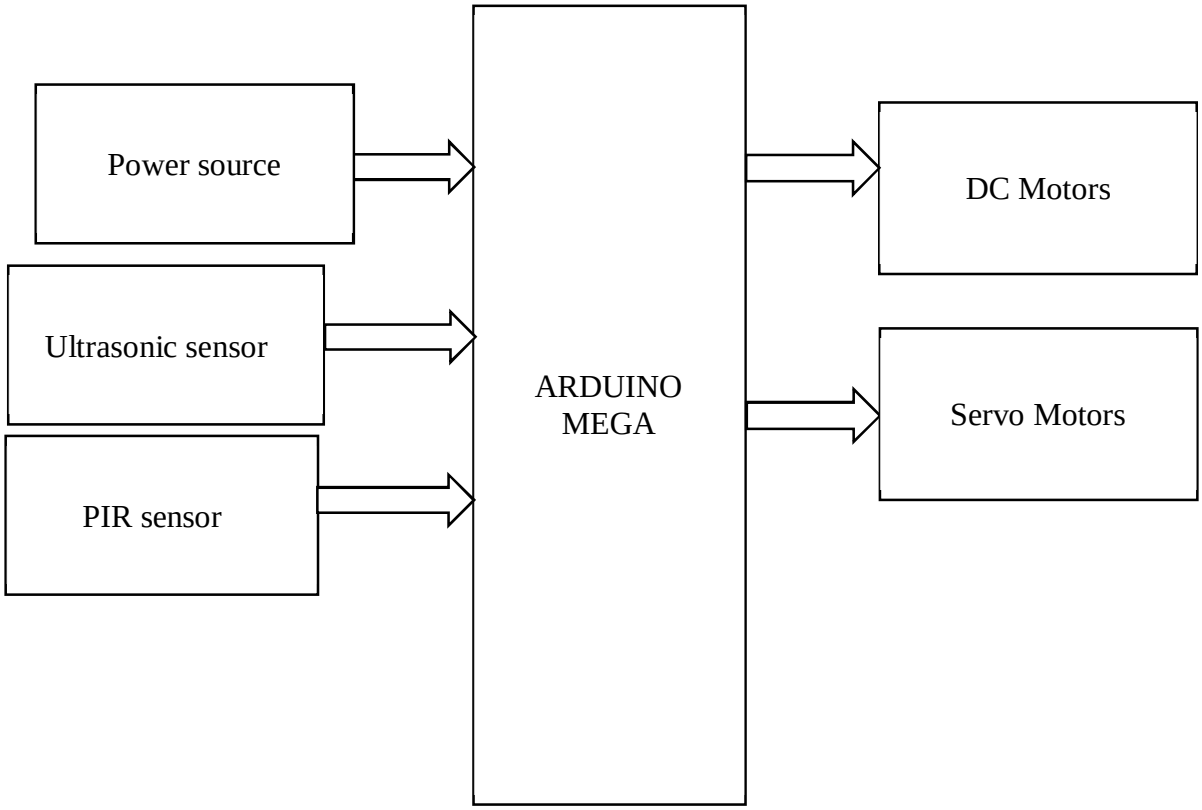
III. BLOCK DIAGRAM



The above block diagram is the solar based automatic harvesting robot. The block diagram consisting ultrasonic sensor, PIR sensor and 12v power supply are act as the input signal, motors act as the output of the device.

A. Ultrasonic Sensor

Ultrasonic sensor is an electronic device. That can be used sound waves using measure the distance of an object. It emits an ultrasound at 40 000 Hz which travels through the air and if there is an object or obstacle on its path It will bounce back to the module. Considering the travel time and the speed of the sound you can calculate the distance. The HC-SR04 Ultrasonic Module has 4 pins, Ground, VCC, Trig and Echo. The Ground and the VCC pins of the module needs to be connected to the Ground and the 5 volts pins on the Arduino Board respectively

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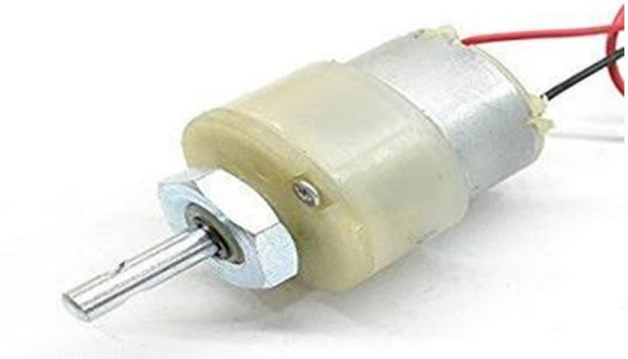
B. Specification

1) power supply : 5V DC
2) quiescent current : 2mA
3) effectual angle : 15 degree
4) ranging distance :2cm - 500 cm
5) resolution : 0.3 cm

C. Pir sensor

An electronic sensor that measures infrared (IR) light radiating from objects in its field of view. They are most often used in PIR-based motion detectors All objects with a temperature above absolute zero emit heat energy in the form of radiation. Usually this radiation isn't visible to the human eye because it radiates at infrared wavelengths, but it can be detected by electronic devices designed for such a purpose. The term passive in this instance refers to the fact that PIR devices do not generate or radiate energy for detection purposes. They work entirely by detecting infrared radiation emitted by or reflected from objects. They do not detect or measure "heat". . A PIR sensor (passive infrared sensor) based motion detector is used to sense movement of people, animals, or other objects. They are commonly called simply "PIR", or sometimes "PID", for "passive infrared detector".

D. Dc motor



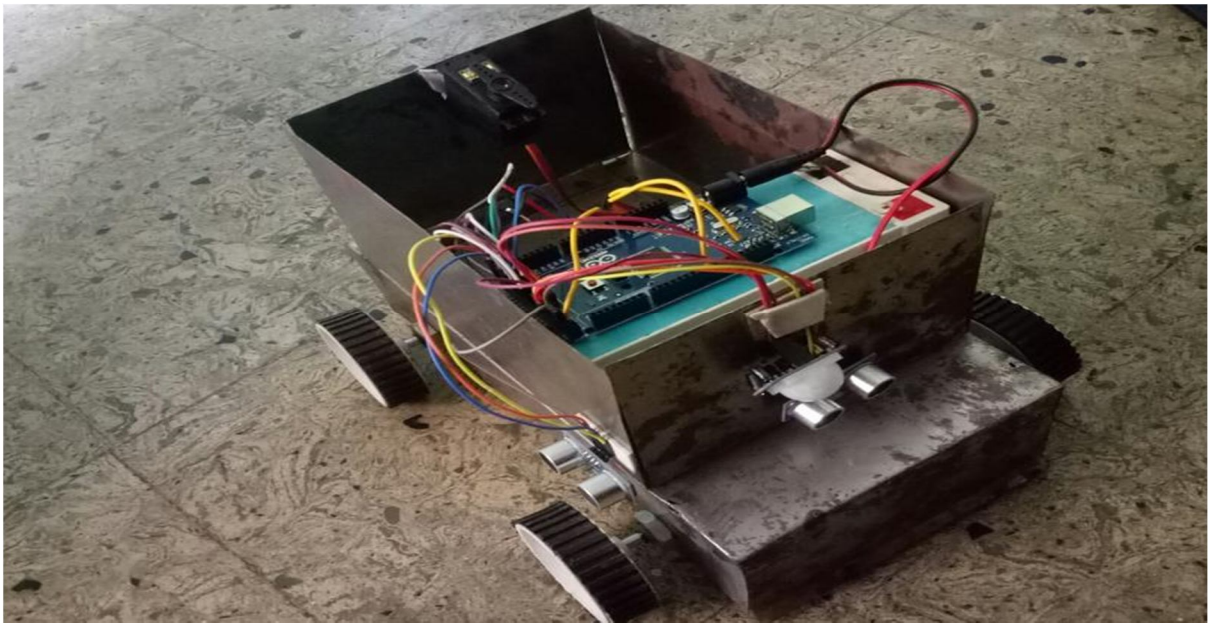
A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current flow in part of the motor. DC motors were the first type widely used, since they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and appliances. The universal motor can operate

on direct current but is a lightweight motor used for portable power tools and appliances. Larger DC motors are used in propulsion of electric vehicles, elevator and hoists, or in drives for steel rolling mills. The advent of power electronics has made replacement of DC motors with AC motors possible in many applications. Workings of a brushed electric motor with a two-pole rotor (armature) and permanent magnet stator. "N" and "S" designate polarities on the inside axis faces of the magnets; the outside faces have opposite polarities. The + and - signs show where the DC current is applied to the commutator which supplies current to the armature coils.

E. Dc servo Motor

A servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors. Servomotors are not a specific class of motor although the term servomotor is often used to refer to a motor suitable for use in a closed-loop control system. The servo motor is most commonly used for high technology devices in the industrial application like automation technology. It is a self-contained electrical device that rotate parts of a machine with high efficiency and great precision. The output shaft of this motor can be moved to a particular angle. Servo motors are mainly used in home electronics, toys, cars, airplanes, etc. There are some special types of application of electrical motor where rotation of the motor is required for just a certain angle not continuously for long period of time. For these applications, some special types of motor are required with some special arrangement which makes the motor to rotate a certain angle for a given electrical input (signal).

IV. HARDWARE DESIGN STRUCTURE



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V. CONCLUSION

The main objective was to make simple, compact, efficient and low cost small scale harvester for small land holders. It is concluded that machine was easy to maintain on the field.

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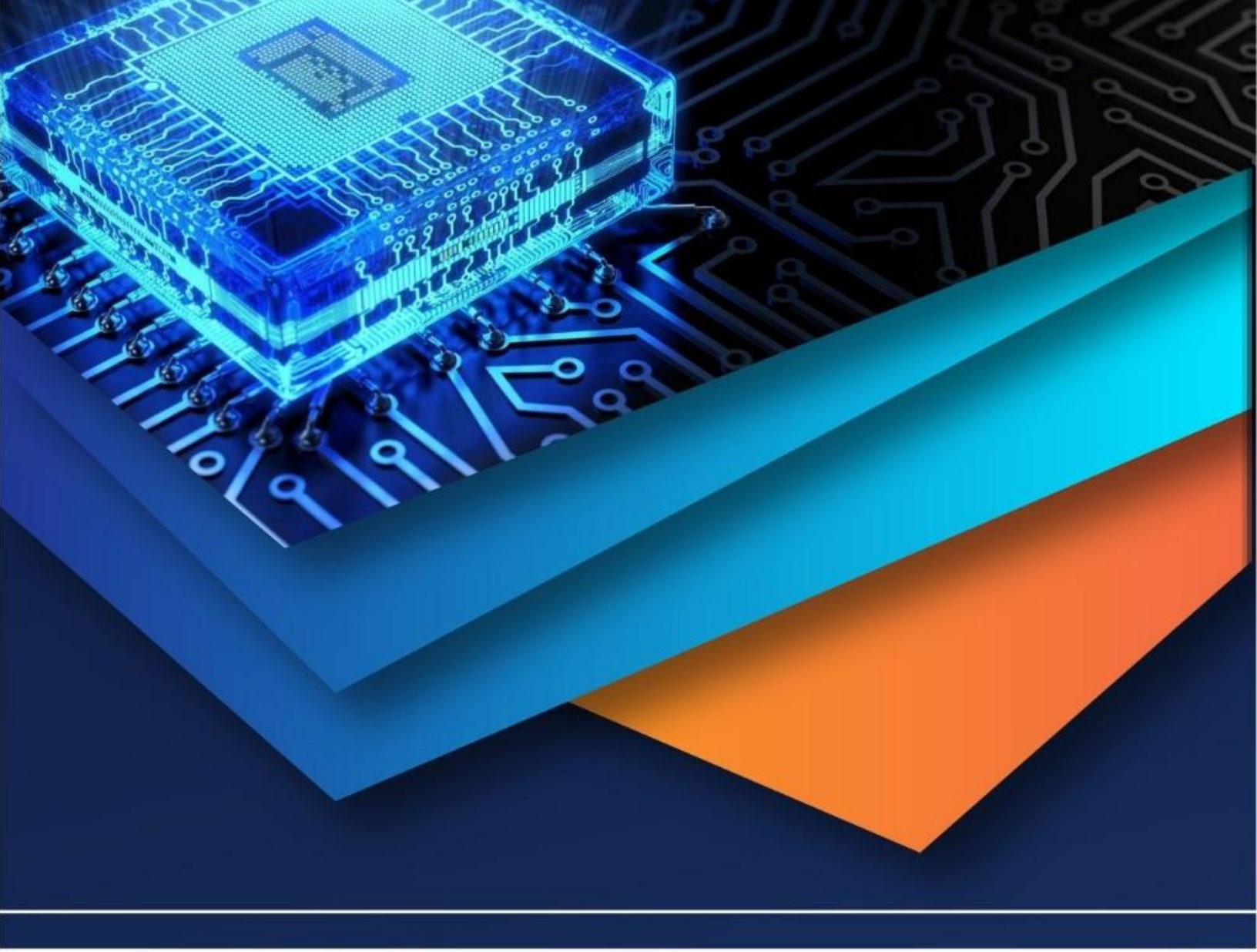

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