Solar Powered Remote Operated Multipurpose Agricultural Robot

MissP. Manasa Krishna[1]*, Prof. S. Vijayaraghavan*[2]*, Miss T. D. S. Anusha, Mr.S. Sundar Reddy*

Electronics & Communication Engineering,

SCSVMV,Andhra Pradesh, India

Email: vijayece@kanchiuniv.ac.in ,   manasakrishna.pasupuleti@gmail.com

ABSTRACT

The main aim of this paper is a development of solar powered multipurpose agricultural robot that which operated by infra red remote control. This robot can plow the soil, feeds the seed, cuts the grass and spray the water for crops in the agricultural field. As we already know that solar energy is a renewable resource of energy, it is freely available in nature. So that we are going to utilize this energy for agricultural purpose. By using this robot technology the farmer can save lot of money and time. In this project the solar power first converted into electrical power using solar panel then this power will be saved in a rechargeable battery. This saved electrical power will be used for powering the robot. This robot made up of the main components as microcontroller, motor driver, gear motors, water pump, grass cutter, lead acid battery and solar panel.

KEYWORDS: Solar Panel, Microcontroller Atmega328, L298N Motor Driver, IR Remote, Gear Motors.

1.INTRODUCTION

As we know Indian economics is based on development in agriculture field leads to raise the economic status of the country. Indian farmers are facing problems due to unavailability of labors and traditional ways of farming equipments take more time and increases labor cost. The idea of applying robotic technology in agriculture field could helps to the farmer to reduce the efforts and their working time. The automation in farming and in agriculture field could be more effective and efficient as compared to traditional methods of farming. And so that's why our focus will be on reducing labor cost, daily working hours, safety issues and environmental all impacts. The idea of robotic technology is very new. In agriculture field the opportunities for robot enhanced productivity are immense and the robot is appearing on the farm in increasing number.The operations are carried by a robot are plowing, seed sowing, unwanted grass cutting and watering to the crops. These all operations are performed by using the battery and solar power. This robot controls through infrared remote control. The farmer can operate robot very easily with the help of remote.

Seed Sowing Operation:

Seed sowing is the process of planting seed. Tradition method of seed sawing based on assumption of seed to seed sparing & depth of placement which is not efficient & it required lot of timed effort to. Some time it results in back ache of farmer.

Grass Cutting Operation:

To cut the unwanted grass we have attached a high rpm dc motor with stainless steel blade at the bottom of robot.

Plant Watering Operation:

To water the crops we have designed a water sprayer using mini water pump which is powered by dc 12 volt.

2.HARDWARE DESCRIPTION:

  The hardware part which are used in implementing robot as follows,

A. DC 12 V Gear Motors:

Fig.1

A gear motor is a specific type of electrical motor that is designed to produce high torque while maintaining a low horsepower, or low speed, motor output. Gear motors can be found in many different applications, and are probably used in many devices.

Gear motors are commonly used in devices such as can openers, garage door openers, washing machine time control knobs and even electric alarm clocks. Common commercial applications of a gear motor include hospital beds, commercial jacks, cranes and many other applications that are too many to list.

Gear motors are primarily used to reduce speed in a series of gears, which in turn creates more torque. This is accomplished by an integrated series of gears or a gear box being attached to the main motor rotor and shaft via a second reduction shaft. The second shaft is then connected to the series of gears or gearbox to create what is known as a series of reduction gears. Generally speaking, the longer the train of reduction gears, the lower the output of the end, or final, gear will be.
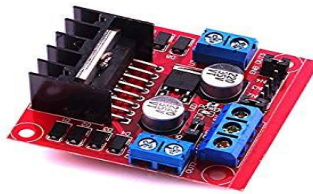
B. Motor Driver L298N:

Fig: 2

The L298 is an integrated monolithic circuit in a 15-lead Multi watt and PowerSO20 packages. It is a high voltage, high current dual full-bridge driver designed to accept standard TTL logic levels and drive inductive loads such as relays, solenoids, DC and stepping motors. Two enable inputs are provided to enable or disable the device independently of the input signals. The emitters of the lower transistors of each bridge are connected together and the corresponding external terminal can be used for the connection of an external sensing resistor. An additional supply input is provided so that the logic works at a lower voltage.

C. Solar Panel :

Fig: 3

A solar panel is a set of solar photovoltaic module electrically connected. A photovoltaic module is packaged, connected assembly of solar cells. The solar panel can be used as component of a larger photovoltaic system to generate and supply electricity in commercial and residential applications. Each module is rated by its dc output power under standard test conditions (etc) and typically ranges from 10 to 320 watts. The efficiency of a module determines the area of a module.

Photovoltaic Principles:

The photo voltaic effect can be observed in nature in variety of materials that have shown best performance in sun light is the semi conductors as stated above. When the photons from the sun absorbed in a semiconductor, that creates free electron with higher energies then the

created there must be an electric field to induce these higher energy electrons to flow out of the semi-conductor to do useful work. A junction of materials, which have different electrical properties, provides the electric field in most solar cells for the photo interaction in a semi conductor.
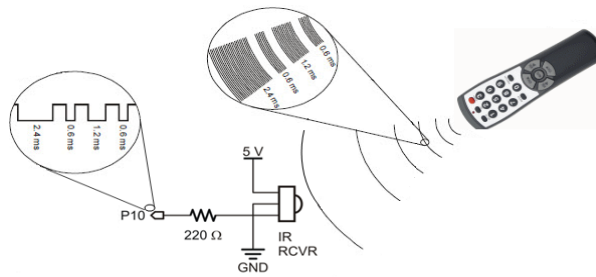
D. IR Remote &Receiver :

Fig:4

A transmitter is often a light emitting diode (LED) which is built into the pointing end of the **remote control** handset. The infrared light pulses form a pattern unique to that button. The receiver in the device recognizes the pattern and causes the device to respond accordingly.
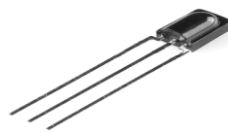
IR Receiverx^2:

Fig:5

The TSOPSensor is a miniaturized receiver for infrared remote control systems. PIN diode and preamplifier are assembled on lead frame, the epoxy package is designed as IR filter. The demodulated output signal can directly be decoded by a microprocessor.

F. MicrocontrollerATmega328

Fig :6

Key parameters for ATmega328 :

Flash (KBytes):32kBytes, Pin count :28, Max. Operating Frequency (MHz): 20MHz, CPU: 8-bit AVR, Touch channels: 16, Hardware touch Acquisition: No, Max I/o pins: 22, Ext Interrupts:24, SPI: 221, TWI(12c):1, UART:1, ADC Channels:8
ADC Resolution (bits) : 10, ADC speed (kbps): 15, Analog comparator:1, DAC Resolution:0, Temperature sensor: yes, Operating voltage: 1.8 to 5.5

3. SOFTWARE DISCRIPTION (ARDUINO IDE)

Arduino IDE is an open source software that is mainly used for writing and compiling the code into the Arduino Module. It is an official Arduino software, making code compilation too easy that even a common person with no prior technical knowledge can get their feet wet with the learning process. It is easily available for operating systems like MAC, Windows, Linux and runs on the Java Platform that comes with inbuilt functions and commands that play a vital role for debugging, editing and compiling the code in the environment. A range of Arduino modules available including

Arduino Uno, Arduino Mega, Arduino Leonardo, Arduino Micro and many more, each of them contains a microcontroller on the board that is actually programmed and accepts the information in the form of code. The main code, also known as a sketch, created on the IDE platform will ultimately generate a Hex File which is then transferred and uploaded in the controller on the board. The IDE environment mainly contains two basic parts: Editor and Compiler where former is used for writing the required code and later is used for compiling and uploading the code into the given Arduino Module. This environment supports both C and C++ languages.
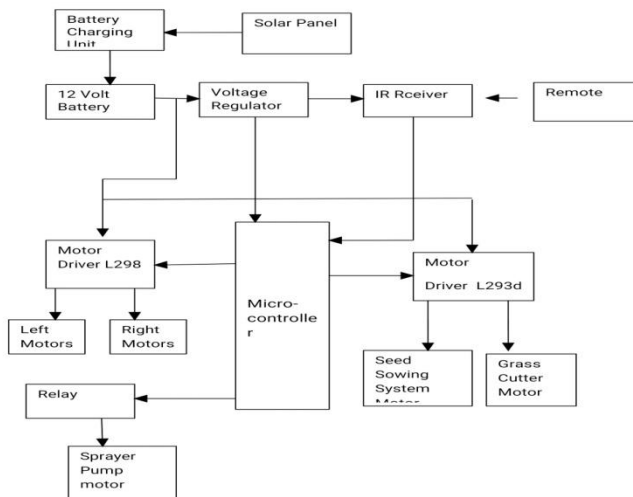
4. BLOCK DIAGRAMOF BLACK BOX

Fig: 7

OPERATION OF ROBOT:

In this system we have used Microcontroller Atmega328P for controlling the whole system. Working of this project is depends on IR Receiver Sensor and IR remote. In this system IR Receiver Sensor is used for receiving signals from IR Remote. Output of IR receiver sensor is given to A5 pin of microcontroller as input. The program in the microcontroller decodes the received signals from IR receiver and generates commands to operate robot operations.

The power from solar panel is stored to the 12 volt lead acid battery. This stored power then utilized for robot operations. The key's to control robot as follows.

Key **VOL**+: To move robot in forward direction
Key **VOL-** : To move robot in reverse direction
Key >|| : To stop the robot
Key 1 : To start seed distribution mechanism
Key 3 : To stop seed distribution mechanism
Key 4 : To start grass cutting motor
Key 6 : To stop grass cutting motor
Key 7 : To start sprayer pump
Key 9 : To stop sprayer pump

Microcontroller pin numbers D7, D8, D9 and D10 is connected to input of L298 motor driver IN1, IN2, IN3 and IN4 respectively. Pin number D6 is connected to base terminal of BC547 Transistor to control pump relay. Pin number D11 and D12 is connected to L293D motor driver IC for seed sowing motor and grass cutting motor respectively.

5. RESULT

The images of final implementation of robot as below,

Fig :Final Implementation

Fig: Seed Distributor

Fig: Grass Cutter

6. CONCLUSION

In agriculture, by using the solar operated multi-purpose robot. We can easily reduce the farmer efforts and time.

The machine required less man power and less time compared to traditional method. We hope this will satisfy the partial thrust of Indian agriculture.

So in this way we can overcome the labor problem that is the need of today's farming in India.

In future the robot also runs on PLC and SCADA with fully automation.

REFERENCE

1) Shiva kumara M C, Sunil Y S, Yamuna A S, Shruthi M,"Smart Phone Operated Multipurpose Agricultural Robot", InternationalJournal ofEngineeringResearch&Technology (IJERT), 2018.

2) Bagyaveereswaran V, Ankita Ghorui, R. Anita, "Automation of Agricultural Tasks with Robotics- Agrobot", IEEE International Conference on

    Technological Innovations in Power and Advanced Computing Technologies (IPACT),Vellore, India, 2019.

3) J.B. Han, K. M. Yang, D.H. Kim, K.H. Seo,"A Modelling and Simulation based on the Multibody Dynamics for an Autonomous Agricultural Robot",

   IEEE 7th International Conference on Control, Mechatronics and Automation,

   2019.

4) Akshay Y. Kachor, Ketaki Ghodinde, "Design of Microcontroller Based Agribot for Fertigation and Plantation", IEEE Proceedings of the International

   Conference on Intelligent Computing and Control Systems (ICICCS 2019), 2019.

5) G. M. Sharif Ullah Al- Mamun, Md Imran Hossain, Md. Rokib Hasan, "Performance Analysis of Multipurpose AGROBOT", IEEE International WIE

   Conference on Electrical and Computer Engineering (WIECON-ECE), 2019.

6) Chandana R, Nisha M, Pavithra B, "A Multipurpose Agricultural Robot for Automatic Ploughing, Seeding and Plant Health Monitoring", International Journal of Engineering Research & Technology (IJERT), 2020.

7) Ranjitha B, Nikhitha M N, Aruna K, Afreen, "Solar Powered Autonomous Multipurpose Agricultural Robot Using Bluetooth/Android App", IEEE

   Proceedings of the Third International Conference on Electronics Communication and Aerospace Technology [ICECA 2019], 2019.

8) Akshay Krishnan, Shashank Swarna, Balasubramanya H. S, "Robotics, IoT, and AI in the Automation of Agricultural Industry: A Review", IEEE Xplore

   UNIVERSITY OF WESTERN ONTARIO, May28, 2021.

9) Ms. Aditi D. Kokate, Prof. Priyanka D.Yadav, "Multipurpose Agricultural Robot", International Advanced Research Journal in Science, Engineering and Technology Vol. 4, Special Issue 2, January 2017.

10) P.V.Prasad Reddy, M. Yadi Reddy, "Development of

   Multi-Purpose Agricultural Vehicle by using Solar Power",International Journal of Engineering Research & Technology (IJERT) Vol. 10 Issue 04, April-2021.