International Journal of Modern Science and Technology, 2021;6(9):154-156.
ISSN: 2456-0235.
www.ijmst.co

Research Article

Solar energy powered multitasking agriculture robot

P. S. Vinishya, A. Caroline Fancy*, A. Aarthi, P. T. Santhiya

Department of Electronics and communication Engineering, Arasu Engineering College, Kumbakonam - 612501. Tamilnadu, India.

*Corresponding author's e-mail: carolinefancy13@gmail.com

Abstract

The concept of the present work is to design a multitasking robot for agriculture which could run automatically. It is designed to minimize the labour and to increase the accuracy of work. The control and monitoring are based on IOT due to which the actual status of the robot can be monitored and controlled from any part of the world using internet. In field control the soil moisture, temperature and humidity is sensed using suitable sensor. In robot control, the whole system is switched to automated mode for complete control of the farm by the robot. The batteries are often recharged by the solar battery kept above the vehicle. This ensures the using of eco-friendly energy source and prevents frequent charging of the vehicle.

Keywords: Multitasking robot; Agriculture; Sensors; Automation.

Introduction

India may be a land of agriculture. Quite 70 you look after the people in India perform farming as their primary occupation, especially in rural areas. This caters to the food demand created by the ever-growing population. The economy of the country is greatly hooked [1] in to the income from it.

Agriculture in India is still administered using the old crude methods that are labor intensive. This leads to low yields, food shortage and low profits. This may also directly affect the folk as food commodity prices increase rapidly [2] because the demand does not match the availability. Hence, automation is required within the field of agriculture which reduces the manpower to a particular extent to hold out time-consuming and repetitive jobs.

The concept of automation within the field of agriculture may be a couple of decades old. Several robots are developed for autonomous plugging, vegetable picking, tree climbing, farmbot, hortibot, beebot, rice planting robot etc. which will or may not need human support. Tobring complete automation without manual intervention in agriculture will take quite some time. This regulates water usage and reduces water [2] wastage. Several other abovementioned features are often added and make it more user friendly in future versions.

The utilization case of this will be several ranging from cheaper but more intensive commercial farming, growing crops on a small-scale for research purposes and also small-scale backyard garden with plants of your choice. Several other functions like plugging, weeding and pesticide spraying are often administered by these bots as an extended function. The overall objective is to create an indigenous low-cost semiautomatic [1] robot prototype that carries out a few of farming processes.

Existing system

This concept tries to determine crisis that a farmer might be separated from a machine's field operation where initially there was only little progress within the semi automation of Agri robots or indeed an automotive sector [8].It was after this gradual development within the field of agriculture began to require place. Also unlike within the present scenario which needs large manpower and investment for seeding, plugging process. Drawbacks of existing system are lack of man power, trained workers essentially needed, more time consumption, labours struggle in hazardous environment to complete the given task.

Received: 12.07.2021; Received after Revision: 16.08.2021; Accepted: 18.08.2021; Published: 20.09.2021.

Proposed system

The farming using this sort of device is known as precision farming. The main parts of the robot are the Plough, seed spraying and shutting the mud etc., Ultrasonic sensor is used to detect the sting cutting [5] of the Agri land which it supports to vary the robot direction. Temperature sensor, humidity sensor is used for weather monitoring and result's updated simultaneously on web server. The entire system is monitored and controlled by Arduino Uno Micro controller which is powered by solar energy. Advantages are no man power mandatory, time consumption is less, speed of action, highly trustworthy, sustainable for all type of agri lands.

Block diagram

Block diagram of the proposed system is shown in fig. 1.

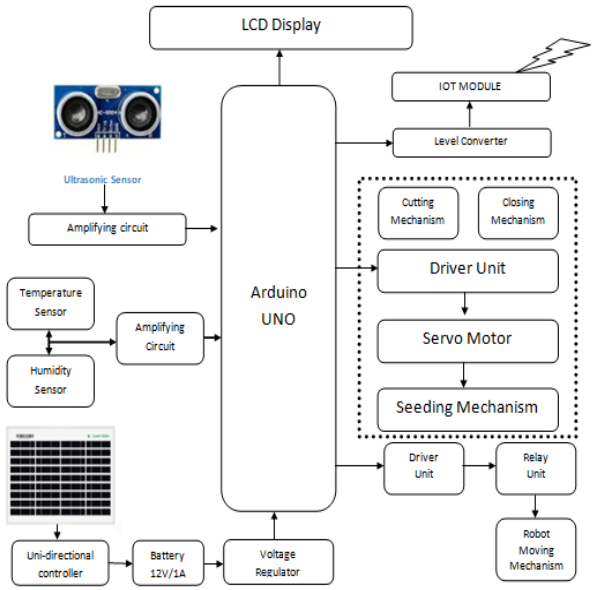

Fig. 1. Block diagram

Description

Ultrasonic sensor

Ultrasonic sensors measure distance by using ultrasonic waves. The sensor chief emits an ultrasonic wave and receives the wave reflected back from the thing. Ultrasonic Sensors [10] measure the space to the target by measure the time between the giving out and response.

An optical sensor incorporates a transmitter and receiver, whereas an ultrasonic sensor uses one ultrasonic element for both emission and reception. During a really reflective model ultrasonic sensor, one oscillator emits and receives ultrasonic waves alternately. This permits miniaturization of the sensor head.

5.2 Arduino Uno

The Arduino Uno R3 could also be a microcontroller board supported a removable, dual-inline-package (DIP) ATmega328 AVR microcontroller. it's 20 digital input/output pins (of which 6 are often used as PWM outputs and 6 are often used as analog inputs). Programs are often loaded on thereto from the easy-to-use Arduino bug. The Arduino has a thorough support community, which makes it a very easy because of start working with embedded electronics. The R3 is that the third, and latest, revision of the Arduino Uno.

LCD display

An LCD is an electronic display module that uses liquid to supply a clear image. The 16×2 LCD display may be a very basic module commonly utilized in DIYs and circuits. The 16×2 translates a display 16 characters per line in 2 such lines. During this LCD each character is displayed during a 5×7-pixel matrix.

Battery

It is used to operate the robotic mechanism [9]. Its operating voltage is 12/1A. The electrical energy is received from solar panel to charge battery.

ESP8266 (IoT module)

Node-MCU is open-source firmware and development kits that help you to prototype or build IOT products. It includes firmware that runs on the ESP8266 Wi-Fi SOC from Espresso if Systems, and hardware which is based on the ESP-12 MODULE. The firmware uses the Lua scripting language. It supported the Eula project and built on the Espresso if Non-OS SDK for ESP8266.

Servo motor

A servo motor may be a sort of motor which will rotate with great precision. Normally this sort of motor consists of an impact circuit that gives feedback on the present position of the motor shaft. This feedback allows the servo motors to rotate with great precision.

Sprayer

Sprayers are most ordinarily used for the projection of water [2], weed killers, crop

performance materials, and/or pest maintenance chemicals (herbicides, fertilizers, pesticides, insecticides).

Circuit diagram

Circuit diagram of Solar Energy Powered Multitasking Agriculture Robot is shown in fig. 2. The robot contains components ATmega 328P microcontroller, RF Transmitter, RF Receiver, dc motor, battery, solar panel. The hardware and sensors are successfully interfaced with the Atmega 328P microcontroller.

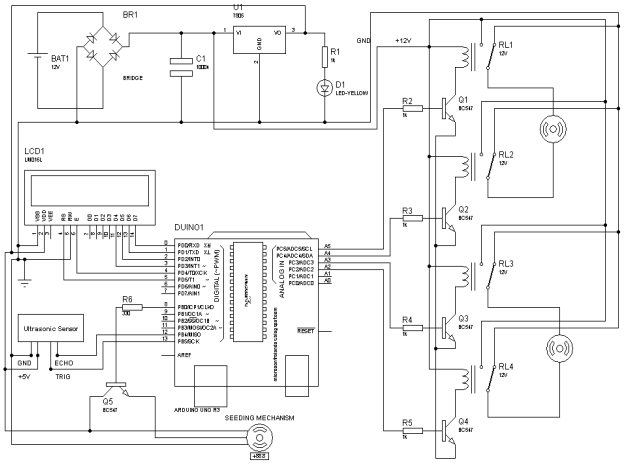

Fig. 2. Circuit Diagram

Conclusion

Hence, we've developed an autonomous robot and field control system which is employed for overall functioning of the farm with least use of manpower. Nowadays, the people involved in agricultural sector are decreased due to the influence of the modernization and intervention of IT sector. This work makes to manger the farm during a modern way. The utilization of IOT in agricultural field enhances the advantage of this work. Also, this is often more eco-friendly tool as it is travel by solar energy.

Conflict of interest

Authors declared no conflict of interest.

References

[1] Blackmore B, Stout B, Wang M, Runov B. Robotic Agriculture- the future of agriculture mechanisation?. Agriculture Economics 2005;47:621-28.

[2] Martines JL, Mandow A, Morales J, Pedraza S, Garcia-Cerezo A. Approximating kinematics for tracked mobile robots. Int J Rob Res 2005;24(10):867-78.

[3] Billingsley J, Visala A, Dun M. Robotics in agriculture and forestry. Handbook of robotics, Springer, 2008.

[4] Teruaki M, Toshiki K, Akio I, Shinya O. Verification of a Weeding Robot. Journal of Robotics and Mechatronics 2008;20:228-33.

[5] Bakker T, Bontsema J, Muller J. Systemtic design of an autonomous platform for robotic weeding. J. Terremechanics 2010;47(2):63-7.

[6] Yan L, Chunlei X, Jangmyung L. Vision based pest detection and automatic spray in green house plant. IEEE International Symposium on ndustrial Electronics, 5-8 July 2009. Seoul, Korea (South).

[7] Aljanobi AA, Al-hamed SA, Al-Suhaibani SA. Aset up of mobile robotic unit for fruit harvesting. 19th International Workshop on Robotics in Alpe-Adria-Danube Region (RAAD 2010). 24-26 June 2010. Budapest, Hungary.

[8] Xu J, Xu L. Autonomous Agriculture Robot and its row guidance. IEEE,International Conference on Measuring Technology, 2010.

[9] Gollakota A, Srinivas. Agribot: A Multipurpose agricultural robot. Indicon 2011;1(4):16-8.

[10] Ayaz M, Uddin MA, Sharif Z, Mansour A, Aggoune EM. Internet-of-things(IoT) based smart agriculture: Towards making the fields talk. IEEE Access 2019;7:129551-83.

****

