ISSN (Online) 2395-2717

International Journal of Engineering Research in Electrical and Electronic Engineering (IJEREEE)

Vol 9, Issue 1, January 2022

Solar based multi-functional Agricultural Robot using Arduino

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Abstract*— Horticulture robotics has thrown a consistent boost with the innovative automation into an entire substructure, for example, farming, pursuing crops, rover service, cultivating, workshop. By considering the importance of robots, yielding of professional's are being done in order to elaborate the robot applications. Flying robot, lettuce bot, robot milker, versatile robots are some of the sincere dedication done by the researchers towards the agriculture and even for mankind. Horticulture robot consists of an instrument called as an end effector at the end finish of a mechanical arm which is used for various farming and agriculturing activities. Robots are used as an alternative to the human activities in the various field including agriculture such as driverless tractor, sprayer, seed sowers, sheep shearing etc. The alternative utilization of robots can be done in the symbolization of greenery for example showering, checking, weeding, pruning etc. Here the main purpose of our tender Setup is to assist rancher in furrowing, reaping, soil dampness checking etc. This assessment expected to investigate an establishment using a keen framework which utilizes an inserted framework with solar panel and smart phone for horticulture and basic reasoning using an Arduino mega. The disclosures of this examination found that the structure could screen enveloping soil conditions relying upon that watering will be finished. The casing work was seen to be pleasant for ranchers to use and they can feasibly control the bot realizing cost decline, asset saving and productive organization in horticulture.

***Index Terms*— Arduino mega, Inserted framework, End effector, Tender setup, Solar panel**

I. INTRODUCTION

Agribusiness is the foundation of Indian economy. In any case, the condition of horticulture is in its diminishing pattern. This is because of absence of automation. Also, there is requirement for a mix of electrical and agrarian researchers cooperating for the advancement. This expands the per hectare efficiency of the horticultural land. This task work portrayed here is very helpful in the farming fields [1].

The undertaking points on the plan, improvement and creation of the show unit of the task. "Remote Controlled Agricultural Robot for gathering, cutting and so forth". More than 42% of the complete setting of the sphere has picked agribusiness as their essential occupation. As of late, the advancement of self-ruling vehicles in farming has encountered expanded intrigue. This improvement has driven numerous analysts to begin growing increasingly balanced and versatile vehicles. In the sector of farming independent vehicles, an idea is being created to research if numerous little self-governing machines would be more effective than conventional vast tractors and human power. These vehicles ought to be equipped for working 24 hours every day throughout the entire year, in most climate conditions and have the insight inserted inside them to act reasonably in a semi-regular habitat over significant lots of time, unattended, while doing a helpful assignment. There are various field tasks that can be executed via independent vehicles, giving a larger number of advantages than regular machines [2].

These days with the headway of innovation in the unit of miniaturized scale controllers, every one of the exercises in our everyday living have progressed toward becoming an indispensable section of data innovation and we find small scale controllers in every single application. Hence, the pattern is coordinating towards controller-based undertaking works. Besides, for the development the agrover, it is planned by utilizing DC engines, which will be driven by the driver IC, contingent upon the guidelines of the smaller scale controller [3].

As this is a model module the detachment betwixt the transmitter and the beneficiary, (i.e., smart phone and agrover) which have been associated with one another by Arduino correspondence interface. While working for genuine applications colossal power emanating transmitter ought to be utilized for longer separations. The required power supply for the module is gotten from the battery that is furnished with the agrover. Here DC engines are favored as the present utilization will be lesser contrasted with some other kind of engines [4].

II. LITERATURE REVIEW

An autonomous soil surveil rancher to quicken the data amassment. Autonomous navigation of the pasture is terminated by the rover including the bypass of hurdles. Congregation of data over soil dampness and its temperature at an extremity is done and impart the documentation back to the farm gaffer. The rover is furnished with a Stevens hydra probe II manipulated to discern the soil dampness and humidity. Pasture is navigated through global positioning

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system. [2] The digital image processing technique were fruits are been sorted and graded. Fruits standard are assessed by computer [5]

Vision technique. This tract proffers the aptness of digital image processing as well as computer vision system to gauge the standard of outcome in the segment of horticulture. Computer vision which is a pioneering technology for extracting and anatomizing a facsimile using computers to restraint gadget. It comprises of click, process and analyzation of facsimile to ease the standard tait in horticulture and food products. The limited approach manipulated in image analysis comprise acquisition of image, pre-processing of image and interpretation of image, assist to quantification and differentiation of facsimile and entity of choice within the facsimile. Facsimiles are earned via physical image sensor and earnest forecasting hardware and encompasses of software manipulated to survey the facsimile with the intent of dispatching a predefined pictorial task. [3] A multi-purpose horticultural rover to administer accurate irrigation, augmentation of fertilizer and de-weeding aside from constant surveil of soil and crop circumstances. This encompasses efficient manipulation of aqua support, strenuous flora and soil surveiling context predicted on the manipulation of fertilizers and the aptness to employ in unstructured domain. accurate horticulture comprise the moderate and flawless practice of resources drew on assorted criteria governing crop flex [6]. The portray of accurate horticulture express that the censorious facet that strike the flex are discerned and the unevenness in soil, crop in the pasture of horticulture are resolute. The linear robots execute assorted potency and assists the farmers to shrink the input fare and the manipulation of aqua support. [4] A proposal that agrover is a rover depicted for horticultural intend. This rover dispatch fundamental obligation like, harvesting, picking, pruning, weeding, grafting, planting. It is depicted to diminish the exertion of farmers in augmentation to expand the sharpness and precision of the task. The chief facet of the rover is the potential to spot the turf in the pasture using digital image processing. Web cam installation is done to snap out the facsimile inside the pasture. And if the turf is spotted the client will sophisticate the rover to trim the turf in the crop pasture and mean while trimmed turf is picked up by the client. The height analyzation of flora is carried out by digital image processing. The cutting mechanism of the rover is activated when the height of the crop is massive than the credential height. A vision-based row counsel technique is proffered to escort the rancher plan of action driven mutually crops are cultivated in row.[5] Outlined a sovereign intelligent farming rover stipulate vegetation health by the tint of the bud and the height of the flora. Noting of habitat circumstances such as temperature, dampness and humidity. The verdure of the flora is disposed on the LCD. Rancher is also specialized with the watering mechanism. watering mechanism is activated based on the observation of soil dampness and humidity. The rover is chiefly known for the aptness to discern the verdure of flora manipulated through digital image processing. Facsimile is clicked via webcam inside the pasture and analyzation of the growth according to the extension, tint of the bud, etc. Vision based row counsel technique is manipulated to assist the rover plan of action driven mutually crops are planted in row. [6] An Advanced horticulture rover Weed restrain practice System. The development made towards attaining a future accurate sovereign farming technique. The congregation is succeeded for weed constrain technique in ploughed space automatically i.e. no manual work involvement. The forecast comprises of two distinct mechanism. Assembly of rover and its gesture exists in the first mechanism, weed trimming betwixt the crop line is the second mechanism. The gesture of the rover is controlled by the microcontroller. The process is governed with the assist of servo motor and DC motor. infrared sensors embedded are to detect the hurdle present in the track of rover. Also utilized for changing the direction of rover at the end of the pasture. Further expansion in this field is seen, since there is no manual work employed. [7] In order to eliminate challenges in horticulture, the sudden increase in industrialization affecting the workers belongs to villages and planning to shift well developed area. This results in worker related issues in horticulture. Worker is getting more income. As the fare of artefact such as day to day essentials rapidly raising workers prefer comparatively more wages from the managers. Due to this reason rancher will be affected and pasture will be left uncultivated. Administrating this article in the pasture will help out the rancher to execute ranching with ease. Fertilizing and sowing operation carried out as a substitute for human. This article tends to profitable for ranchers who are pursuing ranching operation with problems of labor [7].

III. OBJECTIVES

The important concern of this article is to effectively perform horticulture and resolve difficulties which is faced by ranchers by using a smart framework that uses an embedded system with Arduino mega in it and smart phone. A smart framework experiment and relative inspection was applied in this research on a cultivating land. The experimental yield of this work will continuously track soil conditions, so as to on water pump spontaneously.

This framework is very much convenient for rancher to operate, as they could effectively perform ploughing, sowing, pruning, harvesting and watering using simple smart phone application. This framework implementation will lead forward value decline, stock saving, and beneficial management in horticulture [8].

IV. METHODOLOGY

The soil moisture sensor is interfaced to the Arduino. As in proposal frame work of block diagram in Figure 1. The microcontroller used in the proposed framework is Arduino

ISSN (Online) 2395-2717

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mega. Sensor value is given to the Arduino, then this value is passed to the server, where it is stored. This robot can monitor the soil conditions through smart phone application. The major hardware elements utilised in this framework are Arduino mega which is based on AT mega 2560. Soil moisture sensor used to examine the condition of the soil, depending upon that water pump will on automatically. Motor drivers are used to control the motors. Motor 1,2,3,4 are used to move robot forward, backward, left and right. Dc water pump is used for watering the crops. Motor 5 is used for ploughing or harvesting operation. Pruning operation is carried out by motor 6. Servo motor is used as valve for sowing operation. ESP8266 is used to establish internet connection. Rancher can operate smart phone application to perform different operation [9].

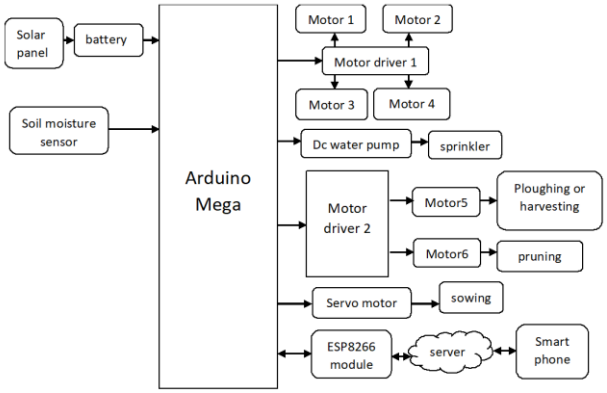

Fig. 1 Block Diagram

Power is given from the battery and solar panel is used to charge the battery.

V. COMPONENTS

A. Chassis

Basic Framework, normally metallic in nature. Chassis is Major part on which other components of vehicle are mounted. Mainly Used in the Industry of automobile.

B. Hopper

Hopper is a huge, normally inverted pyramidal molded holder, utilized in mechanical procedures to hold particulates. Normally steel is used for construction. Provided the seeds in the hopper and made to fallen down to the ground surface.

C. Wheels

A discoid like ring structured, set to go around on an axis, as on in machinery or automobile. Automobile movement dependent on Wheels.

D. Digging or collecting arm

Digging arm is used to dig the land to create the rows for seeding purpose. Collecting arm is used for collecting the crops

E. Cutting Arm

Crops are being slashed by the use of Cutting arm.

F. Dc water pump

DC water pumps utilizes direct current from battery to move fluid in a different way.

G. Dc gear motor

It is familiar to normal Dc motor Which utilize Dc supply to rotate, but here assembly of gear is inserted in it. This assembly will reduce the speed but increases torque [10].

H. Motor driver

This engine driver board is perfect for mechanical applications and appropriate for association with a Micro controller requiring only a few control lines for every engine. It can likewise be interfaced with basic manual switches, TTL rationale Gates, Relays and so on. This double bidirectional engine driver depends on the extremely used Motor Driver Integrated Circuit i.e. L293D. The circuit will enable effectively and autonomously control two engines each in the two headings.

I. Solar panel

Solar panel is a get together of photo-voltaic cells mounted in a structure for establishment. It utilizes sun light to produce DC. An assortment of Solar modules is known to be solar Panel and an arrangement of Panels is an Array. Varieties of a photovoltaic framework gracefully sun oriented power to electrical hardware.

J. Battery

Collected Charge from the solar panel is used to charge the battery. Supply is passed from the battery to framework.

K. Servo motor

Servo motor can be rotated for any angle using Controller. In this framework servo motor is used below the hopper, for seeding purpose. It can act as on-off valve.

L. Soil moisture sensor

This decides the measure of soil dampness by examining the opposition between two metallic tests that is grounded into the soil to be checked. It is utilized in a programmed plant watering framework or to flag a caution of some sort when watering is needed by plants.

M. Wi-Fi module

The ESP8266 Wi-Fi Module is an independent System on Chip with coordinated TCP/IP, any microcontroller access to Wi-Fi. Facilitating an application or offloading all Wi-Fi organizing capacities from substitute application processor is done by this module. ESP8266 module are pre-modified with an AT order set firmware which means Arduino gadget is essentially attached and get greater Wi-Fi capacity. It is an incredibly financially savvy board with an immense and ever developing network.

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N. Server

Database servers are utilised to reserve and oversee databases that are put away on the server and to serve information access to approved clients. This sort of server maintains the information in a focal area that can be normally backed up. It permits clients and applications to access the information over the system.

O. Wireless router

Wi-Fi router is another word for Wireless router. The systems administration elements of a remote passage and a switch is joined. Interfaces neighborhood systems to other nearby systems or to the Internet. A remote switch alluded to as a WLAN gadget.

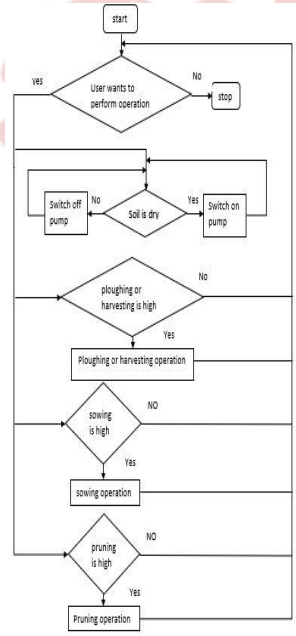
P. Arduino

Controller with open source that has a working voltage of 5.5 volts, inexpensive and less power taken. C / C ++ codes were comfortable for this progress. Arduino can interface with PC using Extended Serial Bus (USB) strategies. The Arduino could be an organized microcontroller placed on a board that feasibly connects to major PCs. It allows the customer to program the featured at mega chip to do a variety of tasks with the programming dialect on wanders called graphics.

Q. Smart phone

Cell phone with an incorporated PC and different highlights. These features are not available in telephones for example a working framework, web perusing and running of programming applications.

VI. FLOWCHART



VII. RESULTS AND DISCUSSIONS

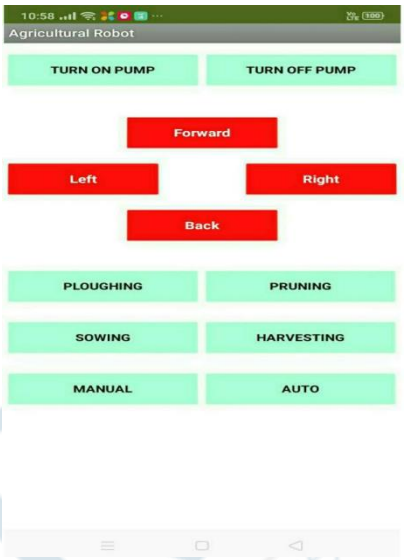


Fig. 2. Application showing control switches

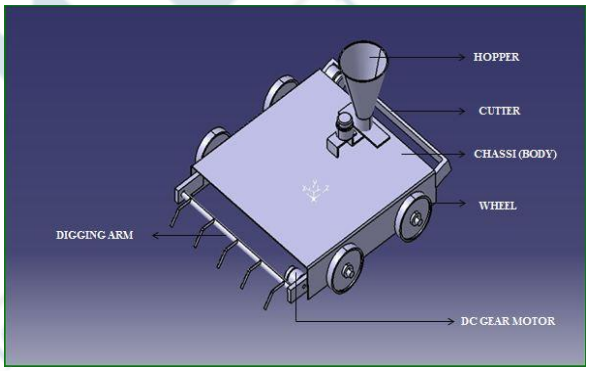


Fig. 3 3D model view of basic model

Fig. 4 Basic testing prototype

The framework can run on two modes. In manual mode user can turn on pump and turn off the pump. In auto mode the

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framework itself automate the process depending upon soil condition. Soil moisture sensor value varies from 0 to 1023. If value is greater than 900 then it's dry. If it's less then it is wet. If user press and holds ploughing operation, motor will rotate in clockwise direction which results in downward movement of digging arm and when user releases motor will stop. Similarly, when user press and holds harvesting operation, motor will rotate in anti-clock wise direction which results in upward movement of digging arm. Here digging arm as well as collecting arm both are same.

VIII. ADVANTAGES, LIMITATIONS AND APPLICATIONS

A. ADVANTAGES

- By the improvement of these framework physical work diminished.
- Reduce the task of rancher and it is simpler to operate by using a smartphone.
- The robot does not get worn-out or wiped out.
- Fully smart phone controlled through Arduino.
- Easy to actualize.

B. LIMITATIONS

- Framework should be inside the specific range.
- Robots could change the way of life/enthusiastic intrigue of horticulture.
- Experts are required to examine framework failure.

A. APPLICATIONS

- Agriculture.
- Industrial.
- Commercial.

IX. CONCLUSION

This venture endeavored to conquer few issues in horticulture the quick development in this venture is affecting the individuals who are arranging in the village to relocate to the built-up areas. As the cost of waves, for example horticulture grains, fabrics and different basics of the day by day life is expanding quickly the work interest for the more wages from the proprietors. This component impacting the ranchers who are keen on ranching movement to leave their property uncultivated. By actualizing this task of agribusiness this framework will help the ranchers in the underlying phase or ranching amid the seeding and treating.

X. FUTURE SCOPE

The framework can additionally be changed for estimating various boundaries in ranching like yield development, weed commonness, its sort and so forth. One or numerous frameworks can be observed through GSM framework. Attaching GPS and GPRS. Flying small scale robot. Adding camcorder for live spilling.

REFERENCES

[1]. Piper, Patrick M., et al. "Designing an autonomous soil monitoring robot." 2015 Systems and Information Engineering Design Symposium. IEEE, 2015.
[2]. Mahendran, R., G. C. Jayashree, et al. "Application of computer vision technique on sorting and grading of fruits and vegetables." J. Food Process. Technol 10 (2012): 2157-7110.
[3]. Kumar, Satish, et al. CS Robots for Precision Agriculture." Electronic Proc. of 13th National Conference on Mechanisms and Machines. 2007.
[4]. Ankit Singh and Abhishek Gupta published a paper on “agribot” (IJARCCE-2015).
[5]. Fale, K. V., et al. "Autonomous farming robot with plant health indication,'." International Journal of Advanced Technology in Engineering and Science (2015): 248-251.
[6]. Kulkarni, V. A, et al. "Advanced Agriculture Robotic Weed Control System." J. Adv. Research in Electrical, Electronics and Instrumentation Engg 2.10 (2013): 5073-5081.
[7]. Shiva Prasad B S, Ravish Ankara M N “Design and implementation of seeding and fertilizing agriculture robot” (IJAIEM-2014).
[8]. Shaik, Kareemulla, et al. "GPS based autonomous agricultural robot." 2018 International Conference on Design Innovations for 3Cs Compute Communicate Control (ICDI3C). IEEE, 2018.
[9]. Ranjitha, B., et al. "Solar powered autonomous multipurpose agricultural robot using bluetooth/android app." 2019 3rd International conference on Electronics, Communication and Aerospace Technology (ICECA). IEEE, 2019.
[10]. Jerosheja, B. R., and C. Mythili. "Solar Powered Automated Multi-Tasking Agricultural Robot." 2020 International Conference on Innovative Trends in Information Technology (ICITIIT). IEEE, 2020.