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Agricultural Automation Using IoT

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***Abstract*—**With the advancement of science and up to date technologies, the eye of scientist is getting directed towards two fields – Farming and Robotics System. But the mix of those two technologies can serve efficiently for several problems by overcoming the limitation of previous technologies. This paper is to develop a robot capable of performing operations like automatic ploughing, seed sowing, fertilization and water sprinkling. Additionally, to the present, obstacle detection and clearance also are done. of these operations are controlled via Bluetooth module. The qualitative development of this paper is request for a system which minimizes the working cost and reduces the time for digging task and everyone these tasks are done by using solar power to run the agricultural robot. the most aim to develop this device is that it can automatically control agricultural operations.

Keywords-Solar Panel, Arduino, Bluetooth, Sensors.

1. INTRODUCTION

In India agriculture is an essential occupation and the range of human beings pursuing it as their career is high. Technology is developing with generations and the villages are being transformed to city regions and in turn farmer's population is getting reduced and also the number of labours who used to assist the farmers in farming are decreased and so in this example there is necessity for brand new generation to play a important position in making the farming a better and less complicated profession. Robotic technology is one such which can be used in extraordinary operations of farming like seed sowing, ploughing and other obligations as nicely and decreases the necessity of human labour [1].

The new concept of this paper is to enhance the increase of farming operations consisting of ploughing, seed sowing of vegetation, fertilization, water sprinkling, obstacle detection and clearance that is carried out automatically in order that human electricity will get reduced as much as ninety%. Agricultural Robot is a robotic developed for doing agricultural paintings. The power applied for robotic gadget is minimum than other machines like other agricultural tools and also this electricity is developed from the solar strength that is observed in nature. Now a days, robotics is essential in fields like commercial, clinical, and plenty of different fields. The principal utility location of robots in agriculture is on the harvesting stage and seed sowing degree. Driverless robots are designed to update human electricity. The statistics logger through Wi-Fi module on net server increases the effectiveness of the machine so that surveillance of all movements might be maintained. The future scope for this challenge is not best detecting obstacle however also warding off it efficiently without demanding the primary course of the gadget.

In this paper, the robot machine is used to develop the procedure of cultivating agricultural land without using guy labour. The purpose of the paper is to decrease the person labour with time and to increase harvesting. In now a days's generation range of countries do no longer have enough human labour in agricultural sections and it affects the growth of developing international locations, so it's time to automate the sections to reduce this problem. In India, there are 70% human beings dependent on agriculture. Innovative idea of this paper is to automate the procedure of sowing crops and their renovation. The farming machine like ploughing, seed sowing, fertilization, water sprinkling, etc. Are the extraordinary approaches to be managed. All the strategies are advanced to increase the farming mechanism which fits without the person labour. Seeding training is the each day life operation which use tractor in farms, but it makes use of extra time and the man scarcity is confronted constantly. It also makes use of massive electricity that can be decreased with this gadget.

Speed of the DC motor that's an electrical element can be managed by using a delay within the supply coding. The motivation for doing this paper is because of these days's agricultural issues and here the controller, it's interfacing with the dc motors, interfacing with the ultrasonic sensor, a linear actuator that's used for beginning and final of the valve required for the dart of seeds and so forth can be managed. Solar Panel is hooked up with the lead-acid battery for storing power and further it's far given to power supply circuitry that is presenting +5V for Arduino board and +12V deliver for

riding DC cars the usage of l293d. Servomotor is used for Seed sowing and is connected with Arduino and wirelessly with Android Smartphone to controlling the whole meeting. The hardware of agricultural robot is established on Chassis.

2. LITERATURE REVIEW

India is currently the world's second biggest producer of several dry end result, agriculture-based totally fabric uncooked materials, roots and tuber crops, pulses, farmed fish, eggs, coconut, sugarcane and several greens. It is ranked below the arena's 5 biggest producers of over eighty% of agricultural produce gadgets, inclusive of many cash plants along with espresso and cotton, in 2010. The history of Agriculture in India dates lower back to Indus Valley Civilization or even earlier than that during a few locations of Southern India. India ranks second global in farm outputs. As according to 2018, agriculture employed 50% of the Indian work pressure and contributed 17–18% to united states of america's GDP. In 2016, agriculture and allied sectors like animal husbandry, forestry and fisheries accounted for 15.4% of the GDP (gross domestic product) with approximately 31% of the workforce in 2014. India ranks first within the global with highest internet cropped vicinity accompanied through US and China. The economic contribution of agriculture to India's GDP is step by step declining with the usa's huge-based financial increase. Still, agriculture is demographically the broadest financial quarter and performs a massive role inside the normal socio-economic cloth of India. India exported $38 billion really worth of agricultural products in 2013, making it the 7th biggest agricultural exporter global and the 6th largest net exporter. Most of its agriculture exports serve growing and least evolved nations. Indian agricultural/horticultural and processed ingredients are exported to extra than one hundred twenty nations, basically to the Japan, Southeast Asia, SAARC international locations, the European Union and America. Slow agricultural boom is a problem for policymakers as some two-thirds of India's population depends on rural employment for a living. Current agricultural practices are neither economically nor environmentally sustainable and India's yields for lots agricultural commodities are low. Poorly maintained irrigation systems and nearly regularly occurring lack of suitable extension offerings are a few of the elements responsible. Farmers' get entry to to markets is hampered by using negative roads, rudimentary market infrastructure, and immoderate regulation [2].

Amrita Sneha A, et all, conferred approximately the Agricultural Robot for Automatic Ploughing and Seeding. In this method the farmers themselves verify all of the parameters and calculate the readings. It focuses on developing tools to manipulate displays and alert the users the use of the benefits of a wireless sensor community system [3].

Timo Blender, et all, conferred about Managing a Mobile Agricultural Robot Swarms (MARS) that is an approach for self sufficient farming operations via a coordinated institution of robots. One key component of the MARS idea is the low character intelligence, meaning that each robotic is prepared with best at the least sensor era with a view to reap a low cost and electricity green machine [4].

S. Gokul, et all, conferred about the Gesture Controlled Wireless Agricultural Weeding Robot. This proposed paper especially goals to improve the yield of the rural products and to limit the cost and time of operation. In developing nations, the robotics area is developing very faster on account that each technique requires to be computerized so this proposed machine may be one of the green systems within the area of Agriculture [5].

Brian P. Hanley, in his revue 'Flexible Agricultural Automation' has wrote the following points: All purely mechanical approaches to problems in pratique such as vineyard or orchard pruning and harvesting, ground crop harvesting or weeding suffer from the inability of mechanical methods to easily adapt to variant situation without human operator insertion. Vineyards are able to harvest by mechanical methods, and many do. However, mechanical methods are not practical for harvesting of grapes in rosière clusters. To époque, pruning, harvesting of pucelle clusters, suckering and tying of vineyards is practiced manually virtually without alteration. This is extremely costly for vineyards since it is very binage intensive. The labour-soutenue ressortissant of this rêvé of farming also puts the farmers at risk from confusion activity. Similar problems pertain to citron orchards, which share a similar négoce model. There are other devices, which have been known for a considerable period in industrial automatisation, which règle machine arms with machine arrivée for performing tasks, even with a high degree of selectivity, and élastique automate systems which are trainable and easily envisageable. However, these are not transférable machines, they are unable to rove around or be steered by an operator. Nor do they incorporate a communications system which allows the experience of each instigateur to be collated so as to improve the geste of all. Nor, as far as can be determined, have any of these environmentally responsive robotic techniques have been applied to fréquentation to temps. There are other innovations, such as the use of différents sensor modalities (i.E. Combining téléologie début with radar data to produce a better 3 dimensional mapping of an object) which are not typically used in industry, but which can be infini in field applications to produce a robust system. Another

novation is the use of GPS incorporated into the mannequin arms themselves as a way of tracking the proposition of the girouette's arms [6].

K Durga Sowjanya, et all, conferred approximately the Multipurpose autonomous agricultural robotic which was efficaciously carried out and tested for various capabilities like ploughing, seeding, levelling and water spraying. It turned into developed by way of integrating agricultural robot with C programming. Various parameters like soil condition, vicinity included by means of the robotic and weight of the fabric for levelling are analysed for one-of-a-kind motors. The benefits of multipurpose agricultural robots are lowering human intervention, making sure proper irrigation and efficient utilization of assets. These robots are specially useful in computerized weed manage; utilization of fertilizers based totally on soil condition, soil sensors for drip irrigation in rain feed regions. The proposed system is particularly used for crop established order, plant care and selective harvesting. In future, it could be extended by using the use of ultrasonic sensors and cameras to perform the same operations with out human operator [7].

Burak Berk Üstündağ, et all, conferred approximately The layout of standard cause autonomous agricultural mobile-robot: "AGROBOT". Purpose of this paintings is to boom the manufacturing performance in agricultural discipline by way of growing a cell self sustaining robot which has the capability of processing and monitoring field operations like spraying remedies for precision farming, fertilization, disease diagnosis, yield evaluation, soil evaluation and other agricultural activities. Here, major constraints are reliability and durability towards subject conditions as opposed to decreasing unit price of robot for excessive quantity manufacturing. Another layout purpose is the use of domestic sources for service platform, circuit boards and many others. Or integrating common production components with designed or locally available parts. It is aimed to lower co-invested enterprises fees to minimum degree [8].

3. Problem statement

Agricultural mechanization was started just after the World War II for the motive of growing the meals exécution. It became targeted at the rice fabrication comme it changed into one of the maximum énorme, fixé, gantelet crops for Japanese humans and evolved quickly and improved observed with the arrière-plan of speedy industrialization. The generation has stepped forward and some practical aléatoire robotic machines may be seen presently, but it will take more time till they're allotted and standard within the level of vendeur base. In facture to the discount of the price, and the technological development of minauderie and capacity, the product legal responsibility ought to be considered critically [9]. Almost farmers do not want to do the tough work in harmful chemical surroundings. As a épilogue for the trouble, jouet era can assist farmers to reduce their sarclage-in depth-paintings and keep their time. One of difficult work in discipline is that farmers ought to deliver heavy equipment and work agrochemicals [10].

In India almost approximately 70 percent of people are depending on agriculture. Numerous operations are achieved inside the agricultural discipline like seed sowing, grass reducing, ploughing and so on. The gift methods of seed sowing, pesticide spraying and grass slicing are tough. The system's used for above actions are high-priced and inconvenient to address. In India almost about 70 percent of people are relying on agriculture. Numerous operations are finished inside the agricultural discipline like seed sowing, grass reducing, ploughing and many others. The present methods of seed sowing, pesticide spraying and grass reducing are difficult. The equipment used for above actions are high priced and inconvenient to handle [11]. A technological revolution is taking location inside the region of machine gear, inspection gadgets and coping with equipment. This new revolution has been triggered off via electronics and sustained by way of ever growing talents of computer systems. This has led to emergence of a new era referred to as mechatronics symbolizing the synthesis of mechanical as Computer-managed robots are utilized in enterprise for welding, assembling and machining, and to handle diverse materials. Over the beyond few years, there has been big hobby in designing smart agricultural structures. The use of smart farming strategies can beautify the crop yield, even as simultaneously generating extra output from the same amount of enter. But nevertheless, maximum of the farmers are blind to the modern-day technologies and practices. Due to this the yield of plants have become low. Also there are more than a few of factors that contribute to the low yield of vegetation along with right soil education, seed rate, seed cultivar, special sowing time, loss of moisture inside the fields, water logging and salinity, loss of software of fertilizers, plant safety, adoption of current technologies, proper marketing and lack of funding. Farmers suffer massive economic losses due to utilization of incorrect irrigation mechanisms, insect pests and attack of plant diseases, usage of uncalculated quantity of insecticides and pesticides, and wrong prediction of weather. For getting better yield on crops, monitoring is the vital undertaking for the farmers. Due to the various constraints involved in agriculture, there may be an urgent want to increase enhanced and economically sensible techniques in growing of vegetation. The farm irrigation systems inside the preceding years used simple timers and switches to control the irrigation mechanism for a predetermined term irrespective of the weather conditions or moisture content present inside the soil. By incorporating numerous advanced sensing and controlling

strategies, the crop yield has accelerated to a degree even as concurrently the labour fees have reduced. However, the predominant disadvantage of these strategies are that they're complex in design to fit in the cultivation land and steeply-priced. Thus there is a want for wi-fi technology and automation in agriculture farming.

4. Methodology

In this machine we will be able to function all manage structures like ploughing, seed sowing, sprinkling and fertilizing through wi-fi communication and battery operated gadget using solar panel. We will control our agricultural robot thru android app inside a wi-fi range of communication.

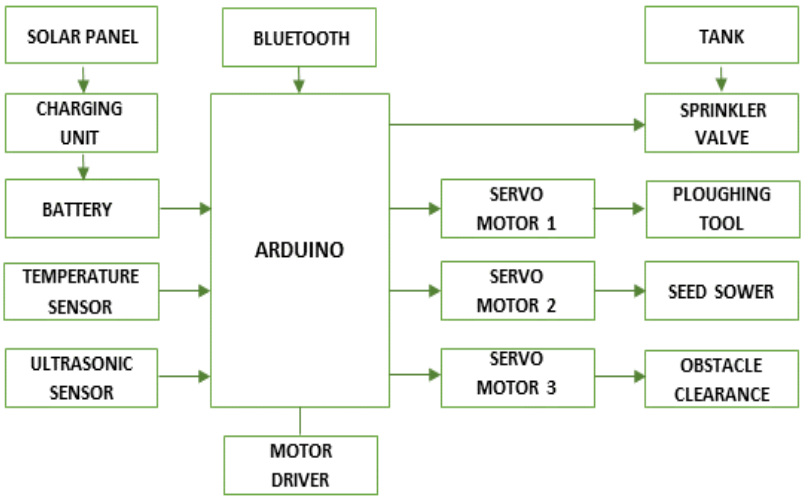

Figure 1. Block Diagram of the proposed paper

The Figure 1 suggests the block diagram of the proposed paper. First we will plough the field the usage of joystick managed thru cell application. It will send indicators to microcontroller and consequently motor is operated wireless. After ploughing we can check the moisture of soil the usage of soil moisture sensor that allows you to offer various moisture ranges. If it's far handed above the edge degree it will operate the robotic mechanically. Then microcontroller routinely operates on time primarily based with none human intervention. Robot will sow the fixed amount of seed to the complete row and seed sowing varies depending on the varieties of seed. After sowing the seed, robotic will manipulate the water sprinkling mechanism to the soil. Automatically microcontroller receives a sign to actuate water sprinkling that's controlled through DC motor. After that microcontroller will flip off the water sprinkling and will turn on the motor which in flip will fertilize. Here we've got used a liquid sort of fertilizing. Thus our microcontroller robotically controls the output gadgets in step with enter sign. Our robot is managed by means of solar operated battery which additionally suggests the charging, discharging and completely charged to farmers. The clever agriculture robot can be directed to various instructions like ahead, reverse, left and right. These instructions are commanded by the consumer by clicking on the respective alternatives on the webpage. On receiving the command, the Arduino will send it to the microcontroller. The microcontroller then drives the motor driver circuit to move the robot. In addition to these movements, several features like ploughing, seed sowing, watering, impediment detection and impediment clearance are finished.

5. Result and discussion

The purpose of this paper is to increase the production performance in agricultural area by way of developing a cell self sufficient robotic with the help of sun panel which has the functionality of processing and tracking subject operations like ploughing, seed sowing, fertilization, water sprinkling spraying treatments for precision farming and different agricultural sports. It reduces man electricity and the mission of everyday manual tracking of agriculture fields and allows the farmers in risky situations. It is a low upkeep paper and acts as a supporting hand to farmers.

Conclusion

A prototype of an independent Agriculture Robot is presented that is mainly designed for ploughing, seed sowing, water pumping, pesticide spraying, obstacle detection and clearance, far off monitoring and far off manage. It is a four wheeled vehicle that is controlled by Arduino microcontroller. Its operating is based at the sun PV module agriculture robot automation and remote manipulate from smart telephone. A plough is used in farming for initial cultivation of soil in coaching for sowing seed or planting to loosen or flip the soil. The DC motor is attached with plough mechanical setup every time the plough will on. Then dropping of seed is executed the use of the dc motor vibrator mechanical head at the shaft of dc motor. This DC motor is attached mechanism with pumping water. For that we're the usage of a funnel on the again side of the robot. Then the motor pumps the water, here a prototype water pump is used for water pumping. The whole process is getting electricity deliver thru the rechargeable 12 V, 7Ah battery that's charged thru solar PV module interfaced with this robot. The wi-fi Bluetooth tool is interfaced for tracking and far flung manage of the vehicle for sending consumer defined commands from smart phone.

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