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Solar Powered Automated Secured Multi Tasking Agriculture Robot

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A B S T R A C T :

The number one goal of this robotic task is to provide farmers with an economically possible and compact, multi-reason robot answer. Notably, the robot is designed to utilize solar power in executing various agricultural cultivation, fertilizer application, and pesticide deployment. This is done thru the mixing of an ultrasonic sensor which also permits obstacle detection and facilitates consumer notification through a beep sound. Additionally, a directional advice machine is applied to optimize the robotics' motion. Two key manage systems are employed within this assignment: the sphere manipulate system and the robot manipulate machine. The former includes tracking and controlling soil moisture, temperature, and humidity levels through an collection of sensors. This statistics is eventually up to date through an application to the farmer. To mitigate crop losses as a consequence of robbery and animal attacks, this robot is geared up with PIR sensors and photo processing abilities for detection. Furthermore, the danger not unusual to agricultural fields is addressed thru the incorporation of a fireplace extinguishing gadget. Meanwhile, the robotic control gadget functions a digital that provides a real-time, stay subject view, enabling the monitoring of operations. The tool can seamlessly transition between guide and automated modes, permitting farmers to workout complete manage over their farm. To counter pest and weed attacks, the robot is equipped with a pesticide and herbicide dispenser. An onboard solar panel enables the recharging of the battery, efficaciously supplying a sustainable and environmentally friendly energy supply.

Keywords: Solar panel, Microcontroller, control systems, PIR sensor, solar panel, microcontrollers.

Introduction

The demanding situations associated with early grass slicing era had been in most cases connected to the operational convenience and environmental sustainability of plough-powered machines. Initially, trendy motor-powered gadgets generated large noise and air pollution, while their manual operation became regularly uncomfortable. Notwithstanding these drawbacks, solar electric variations have emerged as environmentally friendlier alternatives, albeit providing analogous ergonomically barriers. However, engine and electric powered-powered grass cutters pose similarly dangers of twist of fate and usage headaches for sure people. Conversely, the solar-based multi-useful agricultural robot has addressed those issues by way of introducing an green and autonomous mechanism for grass cutting, plough lodge, sowing, and related agricultural responsibilities. This robotic utilizes a 12V battery-pushed device, incorporated with a solar panel to facilitate self-maintaining electricity harvesting. Additionally, a wireless verbal exchange interface through ZigBee protocol allows remote manage of the automobile, facilitating operation through precise instructions. In phrases of motor manage, the grass reducing, plugging, seeding, and fertilizer distribution operations are centrally managed through PIC18F4520 microcontroller. Specifically, this controller interfaces with five relay modules, making sure seamless motor operation via a complete and secure device design. The monitoring and control of the modern-day agricultural practices are facilitated thru far flung internet access, thereby permitting actual-time tracking from international locations. Our undertaking incorporates manage structures: discipline manipulate and robot manage. Field manipulate is executed thru ground moisture sensors, which transmit records to farmers thru mobile programs, thereby informing them of the moisture stages. Conversely, robot manipulate is facilitated by a stay video feed from a camera-set up tool, whilst robotic navigation and impediment avoidance are carried out through the utilization of an ultrasonic sensor system. The guide manage of thh robot and the farm can be seamlessly transitioned to an automatic made, presenting the farmer with entire control over the agricultural operations. Pest and weed manage measures are carried out via the robotic's pesticide and weed spray machine Moreover, an included solar panel serves as a renewable energy supply, thereby minimizing the environmental impact associated with traditional power resources.

Exiting system

A pretty efficient, green agricultural area necessitates the status quo of more effective farms and streamlined agricultural processing systems, specifically in island countries inclusive of the Philippines, characterized by using a geographically fragmented terrain. The united states of america's

agricultural distribution gadget is inherently susceptible to inefficiencies and local marketplace fluctuations, for this reason exacerbating existing troubles of agricultural product transportation. Specifically, the fee of transporting maize from Bankakha to Cotabato is frequently decrease than transporting it from Cotabato to Manila, underscoring the challenges related to a fragmented agrarian economy. Globalization has had a limited effect on the country's agricultural sector, necessitating sizeable progress in this region. Automation of the farming manner offers capability answers to cope with the modern barriers of agricultural manufacturing. Although a few researchers have proposed the idea of robotic farming, this method isn't always a feasible alternative for traditional farming methods because of its excessive degree of complexity. Agricultural automation is mainly driven by declining hard work prices, a phenomenon usually determined in developed nations. Agricultural automation generation can address numerous key challenges by making sure precision and adaptableness to various environmental situations. Key concerns for designing an agricultural robot include developing precision mechanisms capable of correctly appearing seeding obligations, and integrating manner sensors to mitigate the impact of soil moisture content on agricultural device overall performance.

Proposed Solution

A flexible agricultural robotic has been advanced for applications in farming and lawn preservation. Characterized with the aid of its wireless operability and guide manage competencies, this robot device encompasses lots of functions that may be finished via a push-button interface. For the a success implementation of this venture, critical additives consist of a sun panel, price controller, battery, sprinkler, relay, infrared sensor, and blades for grass and plant pruning. The tool harnesses solar energy to rate its battery, thereby powering its related system. Movement of the robot is facilitated thru a mixture of runner wheels operated remotely and idler wheels, enabling the robot system to execute seamless navigations.

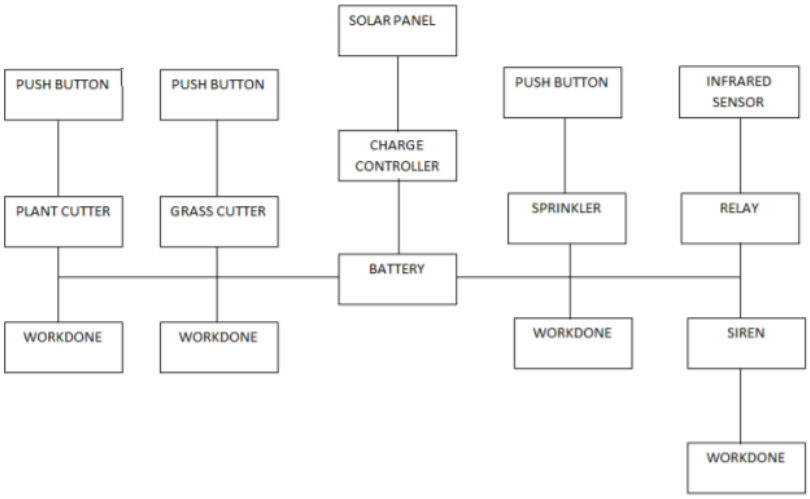

Figure 1: Block diagram

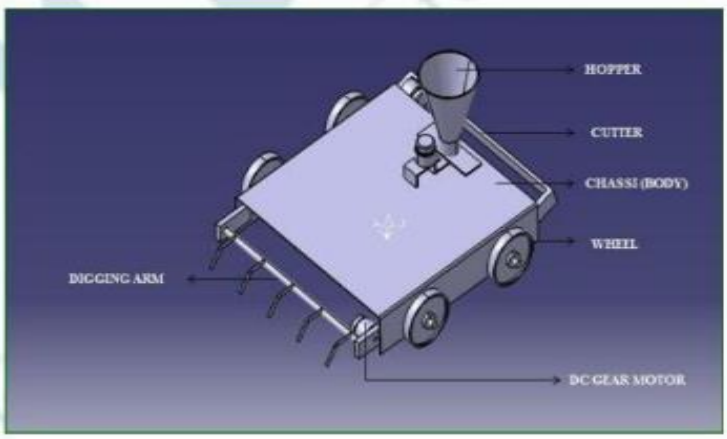

Figure 1.a. Autonomous agricultural system

The proposed self reliant agricultural gadget contains a sun-powered robotic unit that harnesses and shops solar strength, thereby facilitating the operation of numerous device thru a far flung manage interface. This machine, valued at about Rs. 8,860, has the potential for destiny wi-fi integration, thereby improving its versatility. As a prototype, it presents a platform for the incorporation of extra functionalities aimed at optimizing efficiency. Notably, the robot unit includes more than one features, which includes a 360-diploma rotatable IR sensor for obstacle detection, temperature and humidity tracking, and a PIR sensor machine for movement detection. Furthermore, an image recording and evaluation module has been implemented

to stumble on and identify potential intruders, thereby enabling the issuing of indicators to the farmer. This setup is complemented through an authorization verification mechanism, which ensures that warnings are not issued in response to the presence of legal people. A "Solar Powered Automated Secured Multi Tasking Agriculture Robot" is a farm robot that uses solar power to perform numerous agricultural duties like seeding, plowing, weeding, and pesticide utility. These robots are designed to lessen guide exertions, increase farming performance and productivity, and provide a sustainable solution through minimizing reliance on fossil fuels. They often characteristic self sustaining navigation, faraway control thru a mobile app or Bluetooth, and sensor systems for monitoring soil situations, enhancing protection and usual agricultural operations..

Methodology

Agriculture is the spine of rural India. Farmers face troubles which includes lack of timely availability of green staff, as many have migrated from united states aspect. Hence, to lessen the weight of farmers, automation within the subject of farming is essential. The primary cause behind automation of farming tactics is saving the time and energy required for performing repetitive farming responsibilities and increasing the productivity of yield via treating every crop in my view the use of precision farming concept. The robotic is capable of mechanically seed and water, spray insecticides in accordance the direction set by using the person the use of the GUI that became evolved..

i. Motion Control

Four DC gear engines (12V) can be used for motion control purposes. The driver circuit can be connected to the dc motors. The low input signal is converted into high input signal by the motor driver. For high torque, the dc gear engine is used. The raspberry pi, which in turn drives the motor, controls the motor driver. The picture processing algorithms can be used autonomously by the locomotion. They can also be controlled manually in app

ii. Seed sower

In this section, we are designing and production a completely automated sower that works while the consumer activates the sower button inside the utility. It has a collector in the shape of a funnel that leads the seeds to a wheel. The engine is related to the shaft containing a touch bracket to powder seeds on a wheel. The sower starts to implant seeds into the ground when the switch is enabled. That guarantees that seeds on the sphere are implanted lightly.

iii. Harvester

A rotational blade cuts the crop while the bot is transferring. It is a set-up. A excessive-pace engine is used to run the blade, ensuring that the crop is smoothly reduce. This setup is good for paddy and wheat for business plants.

iv. Monitoring

It has a digital camera that provides a stay view of the field so we are able to song the whole lot in and around the field even as it plays its simple operations. It serves as an eye for IoT device get entry to. For tracking and controlling the field, additional sensors like humidity, temperature and humidity sensor, PIR sensor and hearth sensors are used.

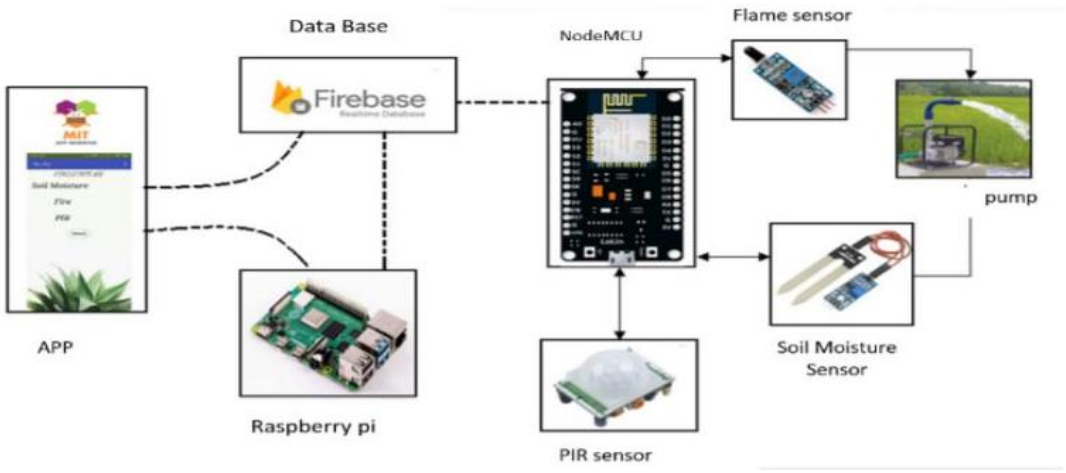

Figure .2. Field Execution Block

Proposed Model

The challenge execution block (fig: four) shows how the sphere manipulate method is carried out. The ESP8266 module that regulates problem configuration is the Node MCU. Three sensors within the area are to be had - PIR, soil humidity sensor and fireplace sensor. Field setup records is sent to the cloud and saved in a Google Firebase this is an internet database in actual time. Both the app and the robotic (raspberry pi) can use the values saved within the database to control them in addition.

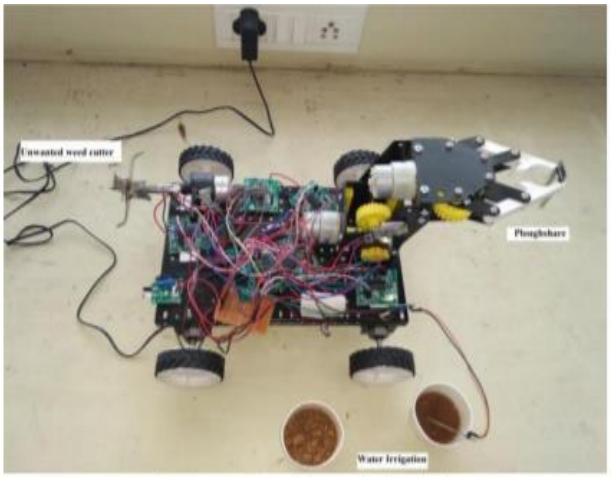

Fig 3: Working of the Agricultural robot

Figure 4: Multi-tasking robot

Conclusion

The Agro-Bot, an automatic agricultural robot, has been designed to augment meals production. Its efficacy surpasses manual strategies due to its potential to method and respond to variables together with trains, seed kind and length, and operational modes. Utilizing an set of rules for seamless manipulate and interfacing with a person-friendly interface, this robotic has the ability to convert the rural panorama from manual to automatic structures. Successful pilot applications, using programming languages like C, have tested the Agro-Bots' ability to carry out multiple responsibilities including seeding, mowing, and irrigation. The multi-tasking characteristic of this agricultural robot confers advantages in phrases of reduced human intervention, optimized useful resource allocation, and green useful resource usage.

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