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AGRIBOT WITH LEAF DISEASES PREDICTION

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Abstract

Agriculture has been chosen as the primary occupation by more than 42% of the total population in the world. It can also be seen that agriculture is called as the 'Backbone of India', since more than 70% of Indian population depends on agriculture. Agriculture is the process of cultivation of plants for producing food, fiber and other desired products. The main aim of Agribot is to apply robotics technologies on the field of agriculture**.** According to recent studies it has been found that farmers still follow traditional methods to carryout agricultural activities because of which labor force is increased and accuracy of the final outcome is decreased. Due to lack of knowledge sometimes farmer fail to identify the disease of the leaf. This project aims to solve agriculture related issues and increase accuracy of the final outcome by developing an agriculture robot which does agricultural tasks automatically such as ploughing, leveling, seeding, irrigation along with detection of leaf disease and indicating farmer with suitable pesticide.

Keywords -- Ploughing, Leveling, Seeding, Irrigation

1. INTRODUCTION

Agriculture is the process of cultivating plants for the production of food, fiber, and other desired products. Agriculture has been chosen as the primary occupation by more than 42% of the total population in the world. Since more than 70% of the Indian population depends on agriculture, it is called the 'Backbone of India'.

According to recent studies, it has been found that farmers still follow traditional methods to carry out agricultural activities, because of which the labor force is increased and accuracy of the final outcome is decreased. This project aims to solve agriculture-related issues and increase the accuracy of the final outcome by developing an agricultural robot that does agricultural tasks automatically, such as plowing, leveling, seeding, and irrigation, along with detection of leaf disease and indicating to the farmer a suitable pesticide.

The main aim of Agribot is to apply robotic technologies in the field of agriculture. Automation in agriculture is being developed to implement a number of agricultural activities without any man power.

Most of the countries follow the traditional methods for ploughing, seeding, leveling, and irrigation of plants. The traditional ploughing method includes animals such as buffalo or oxen that draw the soil using a tool called a plough attached to them, and some farmers plough using tractors. In most of the places, the seed sowing is carried out by scattering the seeds over the required area.

Leveling of soil is carried out by buffalo or oxen or a two-wheel tractor using harrows and leveling boards. These techniques are carried out on wet soil and require seven to eight days for a two-wheel tractor and twelve days using draft animals for leveling per hectare of land. The other method of leveling the soil is by using a four-wheel tractor; here it takes about eight hours to level one hectare of land.

These methods have the disadvantages of increased labor force; tractors can be expensive; and a tractor's work rate depends on the tractor's capacity and the amount of soil on which it works. Poorly maintained tractors can cause environmental pollution; well-trained and experienced person is required for maintenance and driving of the tractor.

There are different types of irrigation, including manual irrigation, surface irrigation, drip irrigation and sprinkler irrigation. In these methods, there may be inadequate or excess water supplied to the farm.

To overcome all these disadvantages, our project aims to build an agricultural robot that performs plowing, seed sowing, leveling, and irrigation functions automatically. All these functions can be controlled manually too. Robots that perform the operations manually as well as automatically are very useful to the farmers. Along with these functions, the project aims to build a leaf disease detection module that detects the disease of the leaf and indicates the farmer with the proper pesticide to be used for the disease based on the shape, color, and spots present on the leaf. The purpose of this project is to reduce the farmer's work load as well as increase the speed of work along with an increase in the yield of agriculture.

In today's modern digital world, researchers are continuously trying to increase the collectivity of plants [1]. This is being achieved by using the higher-breed seeds and plants. But the major problem concerned with the cultivation of crops is the crop disease and the pesticide used for the disease. Due to this problem, the cultivation of crops decreases. Many a times diseases need to be prevented at an early stage, and when this doesn't happen, it damages the plant.

Agriculture is changing the economy of the country day by day. Improper management of crops results in the loss of agricultural products. Kisan call centers are available, but farmers fail to communicate about the disease to the experts. Farmers are not able to explain the disease properly on call, and there will be a need to analyze the image of the affected areas. Images and videos of the crop provide a better view, and agroscientists can provide a better solution, but this is not reaching all farmers. The proposed prototype indicates that leaf disease can be detected in less computational time.

III.LITERATURE SURVEY

[1]. “Path recognition method of agricultural wheeled-mobile robot in shadow environment”
Authors: Zhao Bo ; Mao Wen Hua ; Song Zheng He ; Mao En Rong
Year of Publication: 2010
Description: This paper investigated the influence of the shadow environment on the path recognition for the vision navigation system of the agricultural wheeled-mobile robot. In base of path recognition in the ordinary environment, a new method based on the SOM neural network was applied to the path recognition in the shadow environment. Experimental results proved that the new method was effective in the shadow environment and could obtain the target navigation path rapidly, reliably and accurately.

[2]. Implementation of a four-wheel drive agricultural mobile robot for crop/soil information collection on the open field
Authors: Zhengqiang Fan ; Quan Qiu ; Zhijun Meng
Year of Publication: 2017
Description: This paper elaborates on the implementation of a new four-wheel-drive agricultural mobile robot for open field crop/soil information collection. As most existing agricultural mobile robots share the same platforms with industry mobile robots or commercial research robots, agricultural mobile robots greatly suffer from improper shape and insufficient traffic ability. To tackle this problem, the new robot is endowed with a compact structure and powerful engines. It has 4 driving wheels equipped with in-wheel motors and two steering motors connected to steering gears. An industrial personal computer is employed to control both the driving motors and steering motors through 4 motion drivers and 1 Arduino chip, respectively. To make the robot move coordinately, a steering angle estimation model for front/rear wheel pairs and an optimal linear velocity generation strategy for four wheels are proposed. Simulations and experiments were conducted to verify the mobility of it.

[3]. Intelligent platform design of agricultural robot inspired by farmer assistance (AGRIFA)
Authors: Young-Jae Ryoo ; Ki-Nam Lee ; Pil-Gong Choi
Year of Publication: 2018
Description: In this paper, a platform design of agricultural robots inspired by farmer assistance (AGRIFA) is described. The AGRIFA has functions of a automatic driving, a farmer following, and an automatic agrochemical job. It would replace farmers that have to work in a hazardous and harmful environment. The intelligent design concept, design of mechanism, and design of control system are described in this paper.

4]. Agricultural robot path tracking based on predictable path
Authors: Chi Gao ; Yougang Su ; Hui Ma
Year of Publication: 2010
Description: In order to realize the path tracking of an agricultural robot in a complex farmland environment and improve its speed and accuracy, a kind of agricultural robot path tracking method based on predictable paths was put forward in this paper. The definitions of predictable path and fitting were presented, and the positioning principles and methods were described in detail. The implementation method of path tracking and fitting was elaborated. The experimental results showed that the path-tracking method was of high accuracy, small absolute error, and so on.

[5]. GPS Based Autonomous Agricultural Robot
Authors: Kareemulla Shaik ; Edwin Prajwal ; Sujeshkumar B ; Mahesh Bonu ; Vamseedhar Reddy Balapanuri
Year of Publication: 2018
Description: Agriculture is chosen as the primary occupation over the majority population in the world. In recent times, the development of autonomous vehicles like robots has increased in the agricultural field. The existing agricultural robots perform basic elementary functions like harvesting, planting, and watering. This proposed system aims at designing a multi-purpose autonomous agricultural robotic vehicle that is controlled

by GPS and MAGNETOMETER for plowing, seeding, leveling, and message indication to start irrigation. This robot can especially be used in areas that are harmful for humans. These robots are used to reduce human work, ensuring efficient and proper utilization of resources. These robots are mainly used for fertilization based on soil condition and several tests.

IV.COMPONENTS OF AGRIBOT

1. **Hardware :** Robotic platform (e.g., tractor, drone, or autonomous vehicle)Sensors (e.g., GPS, camera, lidar, soil moisture, temperature) Actuators (e.g., motors, pumps, valves) Power source (e.g., battery, solar panel)
2. **Software :** Operating system (e.g., Linux, Android) Control algorithms (e.g., navigation, task management) Data analysis and processing tools **and** User interface (e.g., web, mobile app)
3. **Sensors and Perception :** Camera (visible, infrared, or multispectral)**.** Lidar (light detection and ranging). GPS and GNSS (global navigation satellite system)**.** Soil sensors (moisture, temperature, pH).
4. **Data Management :** Data storage (local or cloud-based). Data analytics and processing tools and Machine learning algorithms.

V. SYSTEM REQUREMENTS

HARDWARE TOOLS

- Arduino Uno Microcontroller
- Microcontroller
- DC Motor
- LCD Display
- Relay
- H Bridge

SOFTWARE TOOLS

- Arduino Suite
- PYTHON

ADVANTAGES

- Reduce the chemical usage.
- Cost saving
- Increased crop quality
- Less manpower required.
- Real time monitoring

VI.CONCLUSION

As agriculture has been chosen as the fundamental occupation, it is necessary to have an alternative method to carry out the agricultural activities. As to make the work of the farmers easier Agribot with leaf disease detection robot is built which performs all the agricultural activities such as ploughing, seeding, leveling, sprinkling of water, spraying of pesticides, and also detects the disease in the leaf using the healthy and unhealthy leaf database and indicates the disease to the farmer. It also indicates the pesticides to be used by farmer. The main objective of this project is to build a robot that carries out the agricultural activities which are as mentioned above and also to detect the disease in the leaf which may further damage the plant. Zigbee is used for the communication purpose and power supply for the manual working of the robot. This robot is moves

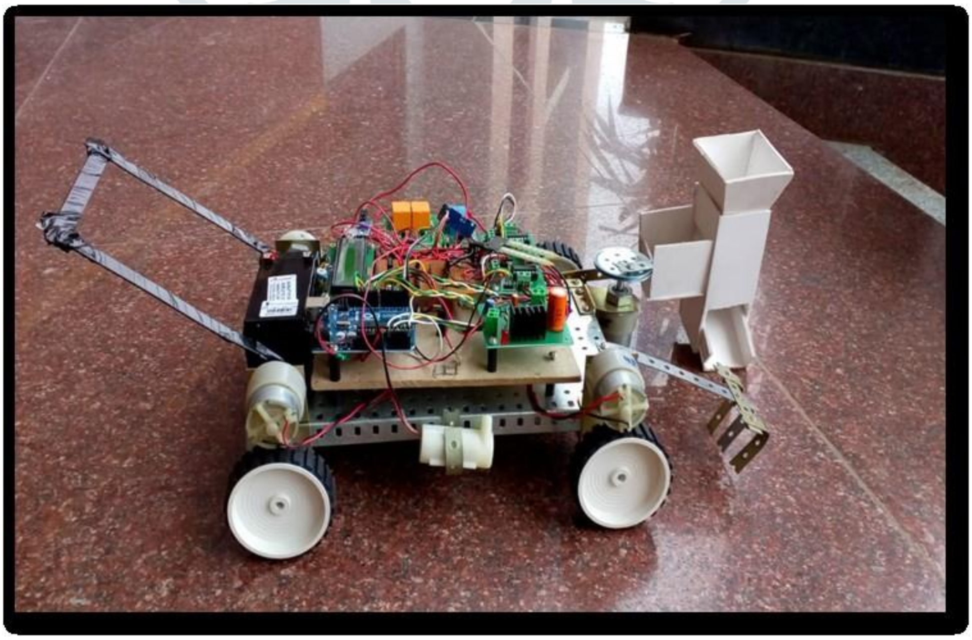
forward, backward, left and right during the activity. This robot is basically built for the small area purpose.
In this project, image pattern classification is used to identify the leaf disease depending on texture and color feature extraction. Initially the robot captures a digital image of the diseased leaf of a plant and these images are read in python and processed and classified based on Support Vector Machine and the results are indicated. The results of this project are to identify the leaf diseases of the plants depending on appropriate features. At first, normal and diseased images of the leaf are collected and pre-processed. Next, from these pre-processed images features like of color, shape and texture are extracted. Then, these images are classified as diseased leaf and healthy leaf by using SVM classifier. Depending on the type of input image, the disease is indicated using SVM classifier. Based on the type of disease, a suitable pesticide is also indicated.In this project we demostrate few types of diseases which are commonly found in citrus plant and it can be extended for more diseases in future.

VII.RESULT

A frame is used as a base for connecting and assembling everything in the agricultural robot, it consists of four motors. Two of which are gear motors and other two are toy motors. The robot encompasses following function.

- Digging
- Seeding
- Leveling
- Disease
- Detection
- Irrigation

These functions are done using different modes. Programming for different modes is done using different loops and functions.
When single feature is considered, like shape feature which gives the lowest accuracy of 51% because rust in sugarcane leads to various shape of lesion. So, this leads to difficulty in analyzing it by extent, minor axis length, solidity and kookiness of image. But, normally diseased and healthy leaf images have different shape. Generally healthy leaf has no lesion but rust diseased leaf has lesion, so system can recognize the pattern, in this way system recognizes the differences between healthy and diseased leaf.



Agribot working model

VIII.APPLICATIONS

This Agribot system, also known as an Agricultural Robot has various application in farming and agricultural, including:

- Live crop monitoring
- Automated harvesting
- Real-time soil sensing
- Livestock health monitoring
- Real-time weather monitoring
- Farm security monitoring
- crop spraying and fertilization
- farm robotics maintenance
- Green house management

IX.REFERENCE

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