ISSN No:-2456-2165

Low Cost Agribot for Precision Farming: Focused Spraying on Agri-land

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Abstract:- This is the age of technology and in the 21[1st]century; modern farming techniques will be used for healthy farming and plantation. Till now traditional farmers have used handmade techniques and tools to spread pesticides on their crops to kill the pests infecting the agriculture land. Now a day some farmers have started using new technologies like drones, small planes and tractors to spray pesticides on their crops, but in this procedure they waste more than required pesticides on their crops, because machine like drone, plan and tractors cover a wide area instead of focused spraying, resulting in purchased of more pesticides by the farmers, which result in financial loss for them. With the proposed Agribot we are trying to achieve focusing pesticides spraying, which will be more cost efficient than the existing methods and it will also be integrated with machine learning for decision making purpose and solar panels as a perpetual power source.

Keywords:- *Precision Farming, Machine Learning, Pesticides Spraying, Solar Panel, Digital Image Processing.*

I. INTRODUCTION:

In the current generation most of countries do not have sufficient skilled man power in agriculture sector and it affects the growth of developing countries. So it's necessary to automate the sector to overcome this problem. In 'India' there are 70 % (approx.) Peoples depends on agriculture. Robotics is the branch of technology that deal with the design, construction, Operation and application of robots, as well as computer system for their control, sensory rover will often will often incorporate agriculture efforts, thought it may not look much like a human being or function in human like manner.[1]. Precision farming can be define as, the application of modern information technologies to provide, process, analyze multisource data of high spatial and temporal resolution for decision making and operations in the management of croups production, etc. Agribot is a robot designed for agricultural purposes. It is designed to increase the speed and accuracy of The work. It performed the elementary function concerned in farming. Pest detecting is .previously they can performing inspection based on regular or normal methods which is observing the plants with eyes, which is quite harder because some time the infected part of the leaves are not visible in eyes. The early stage detection of disease is a major task. So to overcome this kind of problem and solving issue by automating the monitoring process by using Digital image processing [12]. and machine learning based techniques. Our aim is to making the automated system which is having low-cost, simple to operate and easily available for farmers. With the help of this technology they can early detect diseases in the plants, leaves, or crops.

With help of this system, anyone who knows to operate the system can do their task, they just need to do monitoring on the system and robot will perform defines work. In agriculture such robot are needed to performed operation such as inspection [2-3]. Spraying [4] and many more other operations. Some of the applications of the agriculture environment are still in development stage. [5-6]. the basic reason behind this delay is the lack of robot implementation in the real agricultural environment as most of the invention were tested in the lab or simulated environment. Therefore, the implementation of the mobile robot is needed to reduce the delay of producing a commercial agricultural robot.

We design robot which can performs basic function like planting, spraying, etc. The application of agriculture machinery in precision farming (Agriculture) has experienced an increase in investment and research due to the use of robotics Application in the machinery design and task execution. The Autonomous precision Agriculture is the operation, guidance, and control of Autonomous vehicle to carry out Agriculture related tasks. The goal of the Agribot technology is more than just the application of the robotics technologies to agriculture. Most of the vehicles are used for detection, agrochemical dispersal, levelling, irrigation, harvesting, etc.

II. LITERATURE SURVEY:

Proposed an approach using Markov chain theory. This model focused on cotton yield and the prediction of diseases and pests related to these crops. This method gives better result than the regression model. Predicting Disease and pests is done using the sensors based approach. The Naïve Bayes Kernel algorithm is used to compare the pattern from the crop data. A sample dataset of crops is given as a training set of Naïve Bayes Kernel algorithm and the raw dataset of soil sample and temperature [7].

ISSN No:-2456-2165

In [8] a wireless sensor is implemented for sensing data related to soil. This wireless sensor node can be used in application like infield soil moisture collection and other site data will also be collected machine learning model is Build for predict the parameters. SVM and RVM machine learning techniques are used in this model. These parameters were used in crop yield predicting models. In [9] the model used soil dataset, rainfall dataset, and previous year prediction data to create the model which created using SVM, KNN, & Decision tree algorithm. But only sugarcane crop data is taken and only of Karnataka state data this model not is useful places or for other crops. In [10] this they developed a multipurpose pesticide spraying machine based on solar panels. It gives maximum work output with minimum effort. The arrangement of nozzles is adjustable according to the crops and this alone pump can used for multiple crops. In [11] this Command based self-guided rover for digging, precise seed positioning and sowing has been proposed to reduce the human effort and also to increase the yield is presented.

2.1 Agribot Design Challenges:

Today the Agricultural robots are being classified into several groups like: harvesting or picking, planting, weeding, pest control and maintenance. The main obstacle to this kind of robot is that the farm is a part of nature and nature is not uniform. Robots on farm have to operate in harmony with Nature This Agribot is not a like robot that works in a factories building cars or other manufacturing working thinks. So following are some challenges in design Agribot:-

- It is difficult to drop only one seed at a time, so control the flow of seed tank is difficult task to only one seed.
- Difficult to design spraying it is necessary to control the flow of air pesticides from the nozzle, otherwise only the Air or pesticides will be out from the nozzle and proper spraying is not done.
- Difficult to design seeding technique with plough in the farm and cover with soil again.

III. METHODS AND MATERIAL USED:

In 1st section our design mainly were focusing on detecting disease and help with this system we maintain regular checking over a large field of crops. So we create Agribot based on MATLAB Software. Such robot automatically detects the various diseases and after the completion they will sprays the pesticides. 2nd sections we discuss about system architecture, 3rd section discuss about image processing and information about detection technique and 4th section is pesticide management.

A. Proposed System:

This Agribot is basically for agriculture as you know by name. Our objective is to reduce the efforts of farmers by increasing the speed, accuracy, crops safety and many more. It is doing some function based on precision farming and focusing on precise spraying for managing Yield crops and identification and monitoring of croup disease and pesticides. They increase agriculture production and accuracy in application and also enhance working safety. In this proposed system the captured image was being processed by using image processing technique, the obtain result was converted and transfer through Wi-Fi, Bluetooth or other frequency based module and sanded it to the microcontroller unit.

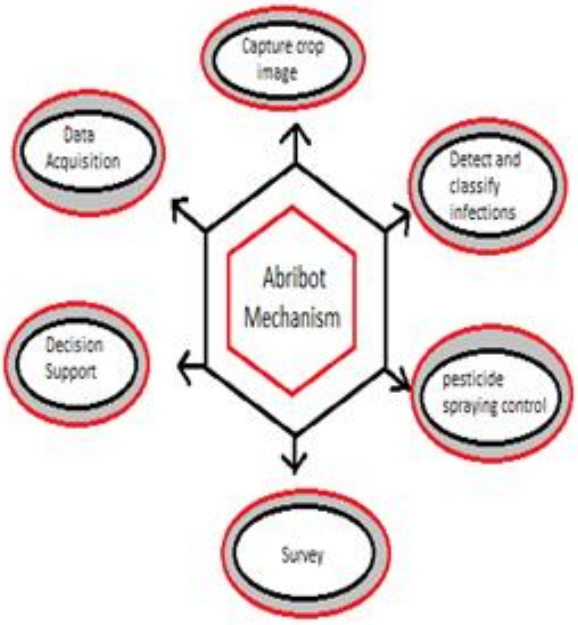

Figure 1. Agribot Mechanism

This controller unit is programmed to control the Agribot. For mixing pest in the tank motors we used. With this multiple motors we spray pesticide by sprayer mechanism fig. (1). the sprayer system having a container for pesticides, with the help of this they direct the robot to spray the pesticides in required area. Some motors helps to doing basic farming work and other are using to perform the other application such as spraying water, seeding weeds, checking soil based on sensors.

B. Agribot Architecture:

Here we discuss about this Agribot design and other specification. Hence it is a completely autonomous robot. These have different features like multiple DC Motors, solar panels, and many others. These systems consist of digital camera. Fig. (2). This Agribot is design and performing his work on moving around the farm or field, in space between two rows of crops and camera start his work which is clicking images of plants. The camera is connected to Control the Area though wireless connection where the inspection and supervising being performing. And our main system is connected to robot through wireless models from define distances. After the detection of disease a Spraying system is doing his work and automatically sprays the pesticides for precise amount and speed where it required.

ISSN No:-2456-2165

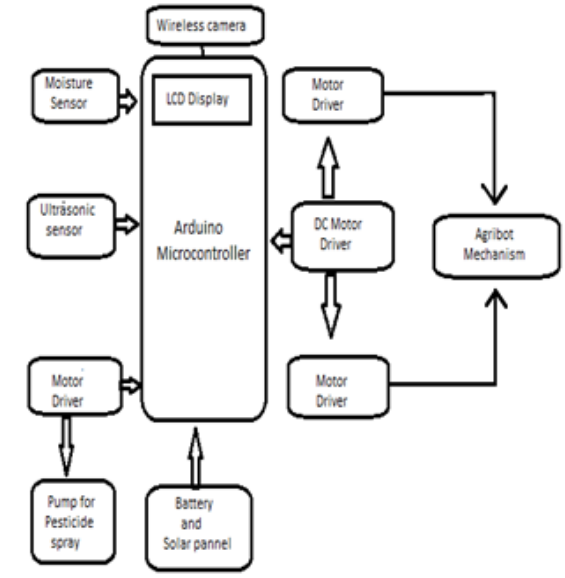

Figure 1. System Architecture

Fig. 2 Digital Camera

From fig. (1) The robot module is powered by battery and also connected through solar panel to operate the system. As you see in the design, the system is having wheel which get connected to arms and rear wheel are running by DC motors. At the end of the frame the cultivator is Attached which is driven by DC motor for digging, the seeds are dropped through some linked mechanism which we can attach in this robot .A water sprinkler is also we use for water spraying in new seeds or required crops. The microcontroller gives the following instruction and also controls the parts which are attached through them and on the basis of requirement they responds accordingly to process the programs for collecting data's or performing other instructed works. .

C. Machine Learning Algorithm:

SVM (support Vector Machine) is a classification algorithm. Detection of infected of unhealthy part of plants or crops. Using texture features is being proposed by S, Arivazhagan, *et, al. [13]*. in this classifier, the processing is done in different phases. for example; we given an input of animal's images, and we previously gives some proposed data's to the classifier based on the input data. So now the classification task is to decide whether an image is belonging to which animals. The images, before being use as input into the support vector machine, might have go through some image processing filters so that some features might be extended. Image processing is mostly done prior to SVM. So based on this example we apply this process. So then the system is being trained. Then next section is using MATLAB software to process and find infected part from it. Then we perform these following steps for image processing system:

- ✓ Capture the images.
- ✓ Improving the image quality.
- ✓ Transfer the image.
- ✓ Masking of green-pixels
- ✓ Removal of masked green pixels
- ✓ Image segmentation.
- ✓ Image feature extraction.
- ✓ Compare the image with predefine images.
- ✓ Representing the obtain image.
- ✓ Sending the type of disease.

In Image processing, sometime we need to perform conversion of image from one colour space to other. MATLAB software contain predefine tools for image processing which covers all Colour space transformation. Input colour images have primary colour like GREEN, BLUE, and RED. It may quit hard or some time impossible to implement the application using RGB because of their range, which is having (0 to 255). Hence they convert the RGB images into LAB colour space. It consist of L*, a*, and, b* layers.

L* ← Luminance or brightness of the image. Values are in the range the range [0,100], where o specifies black and 100 specific white. As L* increases, colours becomes brighter.

a* ← Amount of red or green tones in the image. A large +ve a* value corresponds to red. A large a* -ve value corresponds to green. Value are in the range [-100,100] or [-128,127].

b* ← Amount of yellow or blue tone in the image. A large + ve b* value correspondence to yellow. A large –ve correspondence to blue. Value are in the range [-100,100] or [-128,127.]

Converting RGB to L* a* b*
Syntax ← lab = rgb2lab (RGB)
lab = rgb2lab (RGB, Name, Value)

In (Masking) image process some pixel intensity out the Zero pixel value and other are non-zero. Threshold value is set for

Detection of disease. In computer vision, image segmentation is the process of partitioning a digital image into multiple segments. The goal is to simplify and/or change the representation of an image into something that is more meaningful and easier to analyze. So here doing same work to the obtained image. The resulted image is segmented into a number of small segments of same size. The segment must be selected in such a way that the proper information is not lost. From above steps, the infected part of the crop is been found out. After that process, the infected parts are extracted to describe the infection region. Final stage is a classified and then represent obtained and compared result. It identifies a rule according to selected features and assigning each disease to any one the predetermined classes. Once the feature extraction was complete, two files obtained.

Now we doing perform some work based on software routine which was predefine in MATLB that would take in .mat files representing the training and test data. With the help of train file Trained the classifier, and then use the obtained file to Perform the classification task on the test data. MATLAB software loads all the data files and makes modification to the data according to the proposed model. Both files are compared and corresponding disease is detected. How the detection is done is explained in fig. (3).

D. Spraying Mechanism:

In our proposed system the image get from vision sensor (camera) is processed through correspondence system using image processing technique and the process of detecting disease has been done. In the microcontroller unit some programming methods are being perform to control the robot and sensors are also we used in this system for moisture and temperature for seeding, water sprayer, pump motor, etc. are used. According to disease the injection mechanism work along with motor connection. These motor are used to take the pesticides in the injection when rotate in clockwise direction. When DC Motor rotates in counter clock wise direction; pesticides are mix with water in tank.

Spraying is performed by sprinkler motor. The microcontroller unit will do control on it. The DC motors are electrically controlled by microcontroller which gets Input through wireless modules and also from the sensors for performing some other feature tasks. DC motor are getting on and off by receiving signals from wireless module which we used in proposed system.

IV. FINAL RESULT/DISCUSSION

So here in our proposed system we can see, the image processing technique for recognizing the infected part and perform precise spraying on it. The technique we used is SVM. robot modules performed some precision farming function like: seeding, Digging, and sprinkle water, etc. we attached some sensors on it to get information. On The basis of collected data of the surrounding environment by sensors. The seed is sown into the soil by drilling components. A pump, one for water and one for pesticide for sprinkle is installed in module. Based on machine learning techniques the classifiers are using to perform image processing based on the obtain data (images), the type of pesticide to be used and particular disease is loaded into the modules. And the robots sprinkles the describe amount of pesticides on the infected area.

V. CONCLUSION

This proposed robot is working on the automation. The defined method has set of vision for the crops. We think it is Helpful for the farmers to performed their agriculture activities and efficient disease detection. The disease identification and classification of the crop is very important for the successful cultivation of crop and this can be done using Agribot. It can perform sprinkling the pesticides on the infected area only. According to the obtained result from the algorithm, a quick decision will be taken as which type of pesticides will be spraying on crop. From above discussed various techniques for finding the disease with précised pesticides spraying is done.

VI. FUTURE WORK

In this paper, the techniques which we used for detecting the unhealthy and infected part of the leaves or crop. leaf disease detection was only confined to a specific disease. Number of disease to be identified can be extended in future. We also adding additional equipments in future based system. We try to make real time systems who work on real time location and detection based on machine learning techniques and using GPS, GUI, etc. other navigation system to get the real time result through remotely. In future we try some WSN (wireless sensors networks) for monitoring and controlling pests. We also extends the machine learning techniques which we us in this system. We Work on controlling the system through your smart phone or any other smart devises. The reviewer suggests that this disease detection technique shows a good potential and having some limitations. Therefore, there is scope of improvement in the existing research.

ACKNOWLEDGMENTS

I wish to thank various peoples for their contribution to this paper my principal, Head of Department and my co-ordinator and guide Asst. Prof. Narayan sahu sir. For professional guidance, valuable advice and support with technical assessment.

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