Automatic Pesticide Sprayer Robot

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Abstract: *India being the farmland with a population of three-fourths engaging in agriculture. According to the climate and other resources accessible to them, farmers will grow multiple plants in their field. But some technical abilities along with technological assistance are required to achieve high output and excellent quality to practice agriculture. The management of food crops includes very close surveillance, particularly with regard to the treatment of illnesses, which can cause severe effects after harvest, like making the crops sick and not growing properly or dying. Disease is recognized in crops as the shift or deficiency of the plants ordinary functions that will generate certain symptoms, which are usually visible on the leaves, stems, and branches of the crops. The main goal is to diagnose the disease and the proportion of disease produced in crops is compulsory for effective and successful plant cultivation so the plant can grow healthily without any problems. This can be done by taking input images using a camera, analyzing them using a machine learning process which is somewhat complicated, but once you get the hang of it, it gets easier. It also displays the exposed area to disease and predicts the remedies, turn on the pesticide sprayer which sprays the respective pesticide on the exposed area to disease. This is very necessary and vital for effective spraying of the pesticide to make sure the plants are healthy and growing well. The movement of the robot is done with L293d motor driver and the processor or embedded system is done through Raspberry pi3 to make sure everything works correctly. We use a python code for machine learning which helps train the robot with pre-defined images, so it can identify problems and take the right actions. Since this can be controlled from anywhere without working in the field and being exposed to pesticides, it will be a profit for the farmer and he will stay unaffected by his health condition which is good for everyone involved including the environment.*

Keywords: Bluetooth Module, Image Classification, Disease Detection, SVM

I. INTRODUCTION

Farming is India's cornerstone for a long and needs to be managed properly to be successful. In our nation, approximately 215.6 million acres of soil are for irrigated crop regions which is a huge amount of land to take care of and look after properly. The Economic Survey says that there is a need to improve farm mechanization in the nation to ensure everything runs smoothly. Increasing pest infestation productivity control plays a significant role in making sure everything is healthy and growing well. The farmers are facing significant issues in managing pest infestation and need all the help they can get to get rid of pests that damage their crops. Pests are undesirable insects or germs that interfere with human activity and can bite, ruin food plants, or make life more hard than it needs to be for farmers trying to make a living. A key point in crop management is early detection and prevention of pests so they don't ruin the crops. Effective control of pests needs some understanding of pests and their habitats, which is very important.

Farmers are currently spraying pesticides around their fields which can be dangerous if not done properly. Pesticides can harm the farmers if they come in contact with it during spraying, it can trigger skin cancer and asthma illnesses which are bad for their health and wellbeing, therefore, should be avoided. Increased pesticide spraying can impact consumer health as it enters the food chain and can harm people's health if not done correctly. Pesticides are also sometimes sprayed on non-affected crops resulting in the same waste which is not good for the environment and a waste of resources that could be better utilized.

Therefore, we have designed this robotic system that sprays pesticides in a particular quantity that is beneficial for plants. Not only does this save the farmer from life-threatening illnesses and physical issues, but it also saves his cash

because of restricted pesticide use, which is a win-win situation for everyone involved. That is why it helps farmers, in turn, the nation, to develop economically and grow properly. Time consumption is decreased in vast quantity and it also helps the farmers to decrease the workload and conditions to do the job well, which is perfect for this type of work.

In India, farming is performed using worldly methods which have been effective but need to be modernized. The absence of adequate understanding for most of our farmers makes it even more erratic and difficult for them to manage properly. The projections are based on a big part of farming and agricultural Operations, which sometimes fail due to lack of knowledge

II. LITERATURE SURVEY

Julian Se nchez- Hermosilla, Francisco Rodriguez Ramon Gonzalez, Jose Luis Guzman2and ManuelBerenguel ,1 walk 2010. A mechatronic portrayal of an independent versatile robot for agrarian assignments in nurseries The mechanical plan of the portable robot has been carried out utilizing CAD/CAE advances in which the most highlights of nurseries, the electronic components have been considered Gives as it were a depiction of forms carried out in green houses.[1]

Tony E. Grift, 5 June 2003. Advancement of Independent Robots for Agrarian Applications, The adaptability of the robot was not really utilized, since straightforward front wheel controlling demonstrated adequate for between- row direction. The Debilitated laser unit given As it were utilized for scouting of push edit operations. Exceptionally bulky and costly setup.[2]

Vijaykumar N Chalwa, Shilpa S Gundagi, 7 JULY 2014. Mechatronics Based Farther Controlled Agrarian Robot The robot for agricultural purpose an Agrobot may be a concept for the close the execution and fetched of the item once optimized, will demonstrate to be work through within the agrarian showering operations.The Sprayer does not have any degrees of opportunity. Totally subordinate on network control. The setup stature is as well moo. The fetched is tall.[3]

Yan Li, Chunlei Xia, Jangmyung, Lee 5 Admirable 2009. Vision based bother discovery and programmed splash of nursery plantIn this paper, a profundity estimation strategy for recognizing bugs on takes off is proposed. And it gives bugs position for naturally showering pesticide on the takes off where the bug demonstrate stuck on. The method of bug location is time expending and this setup can as it were be utilized in nursery plants.[4]

Philip J. Sammons, Tomonari Furukawa and Andrew Bulgin ,9 September 2005.The comes about appeared the robot was able to effectively the physical details laid out by NCGH so as to be able to operate inside their nurseries. The robots movements is as it were constrained to the tracks orchestrated around the green house.[5]

Harshit Jain, Nikunj Gangrade, Sumit Paul, Harshal Gangrade, Jishnu Ghosh, Walk – 2018.Design and fabrication of Sun based Pesticide sprayer. It is watched that, this show of sun powered fueled pesticide sprayer is more taken a toll successful and gives the successful comes about in splashing operation. Because it runs on the non- conventional vitality source i.e. sun oriented vitality, it is broadly accessible at free of cost. The chasis setup isn't automated so it has got to be moved physically. [6]

III. METHODOLOGY

It has initiated plant infections a colossal post-effect situation because it is conceivable. The quality and amount of rural items diminishes essentially. Early detection of bugs may be a major issue for planting. To begin with stage incorporates the edit being carefully and intermittently observed. The influenced plants are at that point distinguished and photos are gotten for the influenced edit component utilizing scanners or cameras. At that point these objects are pre-processed, changed and gathered. At that point these pictures are sent to the processor as input and pictures are compared by the processor. On the off chance that the picture is contaminated, an programmed sprayer of pesticides is utilized to splash. Within the region of the seed, pesticide.

For the taking after reasons, a pesticide sprayer can be utilized:

TASK1: Distinguishing imperfect and non-faulty clears out in crops.

TASK2: Classification of the sort of illness ambushed by the takes off.

TASK3: Sprinkling of pesticides in flawed areas

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601

Programmed splashing of pesticides is utilized to infuse the pesticide into the focused on zone of the crops sullied. This plot is based on two cylinders filled with pesticide then again. Solenoid valves are beneath exact control of the gulf and outlet valves. This offers a steady pesticide stream and exactness that varies liquid characteristics and stream conditions don't influence. The format is culminate for spray application of pesticides
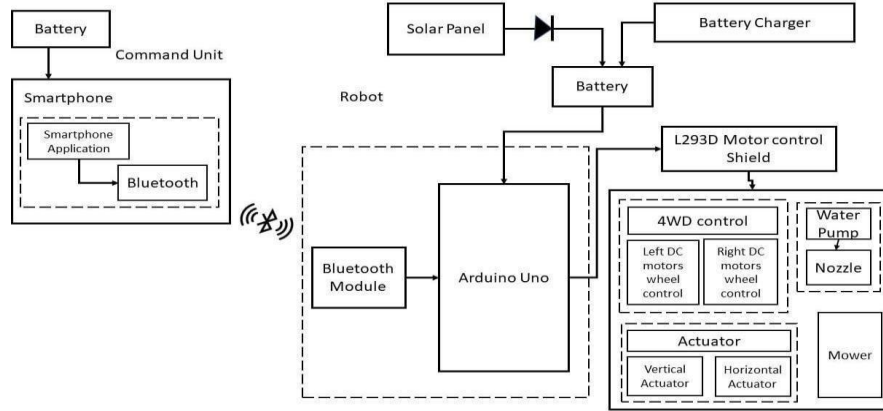

Figure 1: Basic Block diagram of Pesticide Spraying Robot

As appeared in Figure 1, the robot show Web camera looks the crops up to a tallness of 3 feet. This live bolster from the procured plant is sent to the Video processor by means of Wi-Fi, which forms the video utilizing the Video preparing calculation in Raspberry pi 3[2]. Raspberry Pi 3 is utilized for live video preparing. The calculation analyzes naturally the sum of bugs on the plant, especially the leafy region, utilizing video handling strategy.

In arrange to improve its characteristics, the video experiences pre-processing and division by smothering undesirable twists and removing noise, it is additionally part into different components to recognize the obtained picture. Commotion expulsion takes put in two disintegration and expansion steps. Disintegration is performed to expel the undesirable pixels identified as pests. To recoup the pixels of bugs within the video, expansion is performed. The calculation code demonstrates the time to shower pesticide based on the number of plagues.

Processor data over is provided to the Arduino Microcontroller board with an ATmega328p chip by means of Bluetooth. The instructions for controlling robot movement are provided through the L293D Engine Control Board, which is utilized as a driver circuit for the Robot DC Engine and Peristaltic Engine. DC Engine is utilized for wheel movement and Peristaltic Engine is utilized for pesticide showering. To distinguish pesticide levels, a Drift sensor is connected to the Arduino Uno Microcontroller board. On the off chance that the sum of pesticide within the showering bottle is over the edge level, the spraying of pesticides is performed on the premise of the number of bothers and in case it is underneath the edge esteem, a Buzzer alerts the rancher. The robot is at that point halted for the pesticides to be refilled.

IV. PROPOSED SYSTEM

This framework could be a robot planned for rural and don areas support reason. Agro robot is created with Arduino, L293D Engine control Shield, HC-05 Bluetooth Module, 4 Wheel drive with 4 DC Engines, Water pump, Spouts, Cutter setup, Battery and Sun powered Board. This Agrobot with Manual Sun Following Sun powered Board performs a number of concurrent operations. Nowadays, the man control to do the cultivating is major concern, this machine expels the obstacles of farming laborers. Their proficiency and working speed enormously influence the efficiency. The distinctive electrical components are associated to the combination of Arduino board and Engine Shield.

HARDWARE REQUIREMENTS:

ESP32 Cam And Arduino:

The ESP32-CAM could be a little measure, moo control utilization camera module based on ESP32 WIFI advancement board. The ESP32-CAM appropriate for domestic robotization and keen gadgets, mechanical remote control, remote

video observing, QR remote distinguishing proof, WiFi picture transfer, remote confront acknowledgment and other IoT applications. It is an perfect arrangement for IoT applications.

Highlights

ESP32 Cam

Figure 3: Arduino UNO

Arduino reference plan employments Atmega 8, 168 or 328. Show models utilize ATmega328. The stick arrangement is appeared underneath. Greatest dimensions of Uno are 2.1x2.7 inches. USB and control jack connectors are expanded exterior the prior estimation. The board can be connected to base Four screw gaps are given. Hole between the pins 7 and 8 is 0.16".

DC Motors:

DC engine is any of a lesson of rotational electrical machines that changes over coordinate current electrical vitality into mechanical vitality. The foremost common sorts depend on the powers created by attractive areas. About all sorts of DC engines have a few inner component, either electromechanical or electronic; to intermittently alter the course of current stream in portion of the engine. DC engines were the first sort broadly utilized, since they may be fueled from existing direct-current lighting control conveyance frameworks. Little DC engines are used in tools, toys, and machines. The universal motor can work on coordinate current but may be a lightweight brushed engine utilized for convenient control instruments and machines. Bigger DC engines are used in impetus of electric vehicles, lift and lifts, or in drives for steel rolling plants. The coming of control gadgets has made replacement of DC engines with AC engines conceivable in numerous applications.
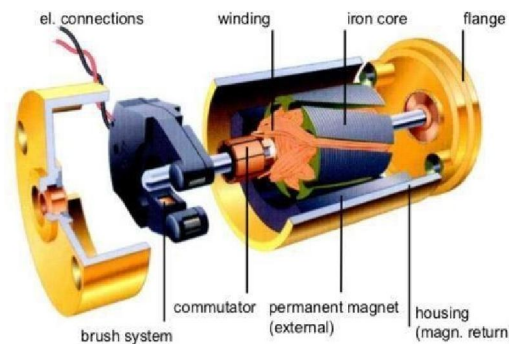

Figure 4: DC Motor

SOFTWARE REQUIREMENTS:
ALGORITHMS USED:
Disease Detection Algorithm:

The primary arrange of calculations bargains with isolating the solid plants from the affected one and the moment arrange of calculations centering on finding the malady on the leaf of the plant. Utilizing PYTHON program, an viable and fast reaction algorithm was made. The elemental steps for picture handling classification are appeared underneath,

- **Image Acquisition**: The picture obtainment stage is the primary stage of any vision framework. Distinctive preparing methods can be connected to the picture after the picture has been procured to execute the numerous shifting vision capacities required nowadays. Be that as it may, on the off chance that the picture was not gotten palatably, the anticipated errands may not be attainable, indeed with the help of a few sort of change of the picture. The picture captured will be RGB-shaped (ruddy, green and blue). We need to change pictures from one frame to another in some cases. PYTHON incorporates all the picture handling rebellious required that cover all colour space changes.

- **Image pre-processing:** In order to progress the differentiate, distinctive pre-processing strategies are respected to kill commotion such as trimming, picture smoothing and change. Improvement may be a strategy of makingstrides picture visual quality owing to a non-ideal conspire of acquisition. Some of the strategies for enhancement are edge upgrade, sifting of clamor, honing. The picture is handled here to create the result more suitable for a specific usage than the introductory picture.

- **Image Segmentation**: Division of the picture is related with apportioning the picture into its constituent components. Division parts the picture into components or areas of centrality. Noteworthy parcel can be a full or portion of an thing. Division calculations are utilized to extricate regions utilizing picture characteristics. More often than not utilized for division are edge discovery, thresholding, border extraction, locale development, separating and combining. Here the picture of the leaf is part into a few areas, not all segments are accommodating sums of information. The patches containing more than 50% of accommodating information are in this manner used for assist appraisal.

- **Feature extraction**: Extraction work a sort of diminish in dimensionality that viably reflects curiously components of a picture as a compact vector.

- **Colour co-occurrence Strategy:** This method takes into thought both colour and surface to get particular characteristics for that picture. The RGB picture is changed to the HSI interpretation for this reason.

- **Discovery and classification of illness**: After extraction of the work, the values obtained are differentiated with the values of solid clears out pre-loaded. Classification of illness is performed on the premise of contrast within the values obtained by comparison.

Support Vector Machine:

SVM is a administered learning calculation in which the processing is done by partitioning into two stages. The first handling stage is the offline stage or Training Phase. In this stage, a set of input pictures of leaves (diseased and typical) are prepared by image analyzer and certain highlights are extricated. Then these highlights will be given as input to the classifier, and along with it, the data whether is that of a ailing or a typical leaf. The classifier then learns the connection among the highlights extracted and the conceivable conclusion approximately the nearness of the disease. Hence the framework is prepared. In the proposed system, Python is being utilized for the image processing

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604

V. RESULTS AND DISCUSSION

Figure 5: Pesticides Sprayer Robot

Figure 6: Diseased Leaf Image

VI. CONCLUSION

'Internet of Things' is distant and wide castoff in relating gadgets and gathering insights. This horticulture checking framework serves as a solid and proficient framework and remedial activity can be taken. Remote observing of field decreases the human control and it moreover permit sestertii distinguish gatecrashers causing inconvenience in the field. It is cheaper in taken a toll and expends less control. The keen horticulture framework has been outlined and synthesized. The created framework is more effective and advantageous for ranchers. It gives the data almost the interlopers in agrarian field through an alarm message to the agriculturist, if the android phone is noiseless or is in vibrate mode, a voice caution message is sent declaring the disturbance caused in the field to the rancher. The framework can be utilized in the current situation of covid-19 to sprinkle sanitizing chemicals over the city without manual intercession. The application of such framework in the field can unquestionably offer assistance to secure crops from gatecrashers. In this venture, IOT controlled robot, named, Agribot has been planned, built and illustrated to carry out showering pesticides in an farming field. The agribot will help the ranchers in expanding trim yielded and secure them from hurtful chemicals of pesticides with security alarm framework.

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