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AI & ML Based Crop Disease Detection

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ABSTARCT - In the agricultural field, crop diseases and physiological disorders have a large impact on its yield and quality. Minimizing Pomegranate yield is highly affected due to various diseases. The diseases have a tendency to show signs on the plant that can be easily detected by the cameras. These diseases can be identified by collecting the image data of leaves over a period of time, applying the algorithm of segmentation, noise reduction, data extraction using mean pixel value of channels and canny edge detection. Further the study can be extended to design AI based hardware to implement the discussed algorithmic process of disease identification using fruit's disease detection.

This project will be succeed in detecting the diseases, which in turn helps the farmers to detect the crop diseases at their early stages.

Artificial Intelligence & Machine Learning powered by 4G has opened new doors of technology and innovations in the field of agriculture. There is a vast scope of application and development of the above mentioned technologies to detect any shortcomings that may lead to heavy losses for farmer. The use of Artificial Intelligence & Machine Learnings to analyze the data collected from fruits detection and identify the diseases that may affect the pomegranate yield.

Keywords:{Pomegranate, AI, Sensor, Image Processing, Edge Detection, Leaf detection, RGB, Segmentation.}

1.INTRODUCTION

Agriculture is the mother of all cultures. It has played a key role in the development of human civilization. The focus on enhancing the productivity without considering the ecological impacts has resulted into environmental degradation. Crop disease one of the crucial causes that reduces quantity and quality of agricultural product. Diseases are the major problem that threatens pomegranate cultivation. These requires careful diagnosis and timely handling to protect the crop from heavy losses. To avoid these shortcomings that may lead pomegranate yield and also farmer's income we use the technology which are artificial intelligence and machine learning.

Artificial Intelligence (AI) is one of the mainstreams of research in software engineering with its rapid scientific advancement and the tremendous region of Application. The fundamental idea of AI in agriculture is its adaptability, speedy performance, precision, and cost-viability. Artificial Intelligence in Agriculture not only helps farmers to use their farming skills but also shifts to direct farming to get higher yields and better quality with less resources. t. AI technology helps diagnose plant diseases, pests on this disease. s. The mythologies utilized for disease detection, segmentation of the affected part and classification of the diseases. Artificial Intelligence can offer an effective and practical solution for the problem and introduced Machine Learning (ML). Machine learning to train the large data sets available publicly give us a clear way to detect the disease present in plants in a colossal scale. The machine learning-based approaches, which will be used for detecting and classifying the diseases on agricultural products including various fruits.

Machine learning (ML) AI Application and have been successfully made in the present world for the diagnosis of diseases. Machine learning algorithms are fast and accurate to detect any diseases. The project employed to increase the recognition rate and the accuracy of the results by using machine learning and deep learning algorithm and detect the plant disease. The Support Vector Machine (Machine Learning Algorithm) is a better option for detection of diseases.

2. METHODOLOGY

The project was basically done for the company named Passenger Drone Research Private Limited (PDRL) situated at Nashik Road, Nasik. Technology can make our lives the simplest**,** easiest, and most comfortable if we remain the smartest and the wisest sapiens ever *evolving*. All we need are futuristically visionary leaders like Passenger Drone Research Private Limited (PDRL)**.** PDRL, Passenger Research Drone Pvt Ltd started its journey with a simple mission of creating more time to live. The very thought behind this mission was to deliver unique yet simple technology that makes everyone's life easy, saves time and effort and creates more time to live for real. PDRL has developed a one-stop solution. Thus, the key reasons for the undertaking of project can be summarized as follows:

- To Avoid the production loss.
- To avoid the spread disposed area.
- It will increase the pomegranate yield and also farmers income.
- We can easily determine the diseases.

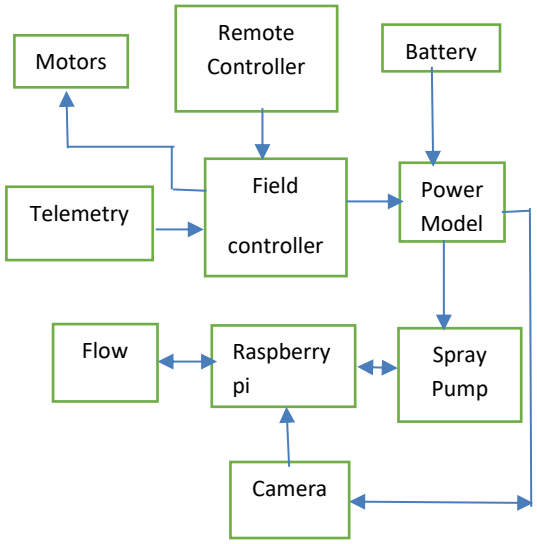

Fig-1: Block Schematic of AI & ML Based Crop Disease Detection

The Motors are connected to the field controller of the drone after that the telemetry is also connected to the field controller. The drone is ready then insert the Battery the model for flying is ready. The remote controller is the main part that is used to operate the drone for moving upper side to lower side for changing the directions. when the drone is flying on the field of the pomegranate the it captured the images and stored in the SD card. The raspberry pi use to train the drone for that we requires the operating system of Rabin and rufus software then we have to splash the operating system in the ds card and inserted the ds card into the raspberry pi then connect the pi camera to the raspberry pi. Insert the python code in the raspberry pi for the image capturing and solve the queries in it after that the camera is taking pictures the images are stored in that system after that it is compared with the data that have already in the pc and recognize the disease and remedy of that disease The remote controller is the main part that is used to operate the drone .for moving upper side to lower side for changing the directions. when the drone is flying on the field of the pomegranate the it captured the images and stored in the SD card.

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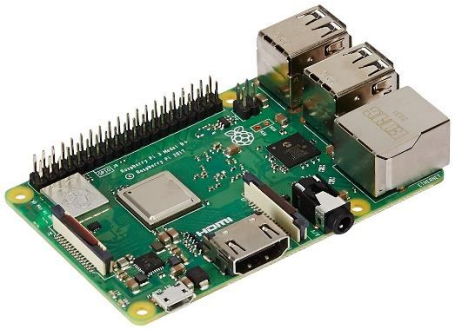
3. SYSTEM COMPONENTS

1. Raspberry Pi:



It's capable of doing everything you'd expect a desktop computer to do, from browsing the internet and playing high-definition video, to making spreadsheets, word-processing, and playing games.

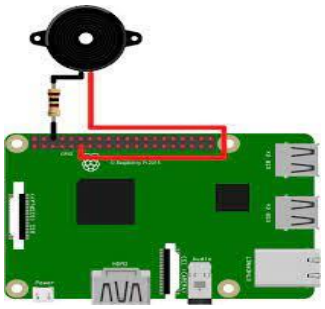
2. Pi Camera:

The Raspberry Pi Camera Board is a custom designed add-on module for Raspberry Pi hardware. It attaches to Raspberry Pi hardware through a custom CSI interface. The sensor has 5 megapixel native resolution in still capture mode. In video mode it supports capture resolutions up to 1080p at 30 frames per second.

3. Power Cable:

We need either a micro HDMI to HDMI cable, or a standard HDMI to HDMI cable plus a micro HDMI to HDMI adapter, to connect Raspberry Pi 4 to a screen. Raspberry Pi 1, 2, and 3 have a single full-size HDMI port, so we can connect them to a screen using a standard HDMI to HDMI cable.

4. Buzzer:



A buzzer is a device that is used to generate beep sound (generally a warning or alert in embedded system). It is a two leg device the longer leg is positive. If voltage is supplied it generates beep sound.

5. Flow Meter:

water flow meter aiming at the agricultural plant protection in view of the actual demand of modern precision agriculture, our intelligent flow meter and large-scale data management system is mainly used for farmland management. This platform can be compatible with a variety of plant protection equipment and can achieve the spray speed and flow of pharmaceutical precision matching, flexible adjustment, and can store and return real-time spray flow, operating area and operations Remote data, in the background of large data management platform for statistical analysis and massive data processing, so that end-users, plant protection services, management, monitoring and management of plant protection operations, Through mobile phones, computers and other terminals independent, real-time access to control the required farmland protection information.

6. Flow Sensor:

Accurate and precise measurement of liquid flow rate for optimal spraying performance.

Compatible with a wide range of agriculture drone models.

4. FEATURES, LIMITATIONS AND APPLICATIONS OF THE SYSTEM:

Features of the system

- It takes an appropriate images of a disease and also set the segmentation of the field.
- It design such system that can detect crop diseases using AI & ML technology.
- Also it provides Remedy for the disease that is detected.

Limitations of the system

- Resolution of pi camera and frame rate:

The display performance of the pi camera (5MP) is not vey good. The small frame also opposes the detection of the whole object body. Results may be better if web camera is used for better resolution and photography. However, this will not respond to our entire installation.

- Workload on Raspberry Pi:

A single processor of the Raspberry Pi handles image sensor. Detection of similar object. AAs we have not used any high level artificial intelligence, our computer faces problems on detecting similar objects.

Application

1. Farmers can integrate various payloads on the drones including thermal, visual, or other sensors for complete monitoring and assessment of crops
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3. The AI-powered drones by Folio3 can be programmed to performed tasks independently, thereby, significantly reducing the manual interventions required for farm management.
4. Another vital drone application in the agriculture sector is the use of the technology in monitoring of crops across vast swaths of fields.
5. Drones equipped with infrared and thermal sensors are widely used to get real-time imagery for analysis of crop health.

5. FUTURE SCOPE

The focus of the further research and development should be on how new innovative ideas can be implemented to challenge the pest infestation. The awareness and knowledge about new agriculture technologies are yet to be spread extensively in developing countries. Immense efforts will be required by all the stakeholders to mainstream the use of these technologies in order to capitalize on the benefits:

- Government Agencies: Policy support and resources to support the sector
- Private sector players can support effective business models
- Universities: Special program for training in the sector – graduate/PG programs
- NGOs: Capacity building of farmers
- Donor agencies: Supporting pilot initiatives
- Finance/Banking sector to support initiatives

6. CONCLUSIONS

Pomegranate yield is highly affected due to various diseases. The diseases have a tendency to show signs on the plant that can be easily detected by the cameras. These diseases can be identified by collecting the image data of leaves over a period of time, applying the algorithm of segmentation, noise reduction, data extraction using mean pixel value of channels and canny edge detection.
This project succeeds in detecting the diseases, which in turn helps the farmers to detect the crop diseases at their early stages.

ACKNOWLEDGEMENT

It gives us great pleasure in presenting the project report on **'AI & ML Based Crop Disease Detection**.'

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