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Seed Recognition and Testing System with Android Application

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Abstract: The demand for image processing for seed testing in industrial agriculture has been increased over time. This project focuses on developing a system to identify the type of seed and detect disease of seed. The system utilized anomaly detection technique which is available in Android application to capture the image of an object and then compare with images that are being stored library to generate test result. The test result would indicate the type of seed being tested and define the health condition of the tested seed. The test measurement indicates that the system is able to recognize the seed in the image being captured, correctly the name of the seed under test and indicate the type of disease for the unhealthy seed.

Keywords: Seed Recognition, Disease Detection, Android Application

1. Introduction

Since late 20th century, farmers were struggling to get to know what type of seed did they just purchased [1]-[2]. Is it healthy or not? Is it safe to plant it with the other crops on the field? Even though nowadays, there are laboratory that were built specifically for seed testing [3], farmers still at loss since the seed testing will take time to complete around 2 weeks before they finished sending the seeds result back to the farmer.

This project helps the farmers to instantly know the type of seeds they just bought to avoid being deceived by traders. Not only that they also can detect disease that may have on the infected seeds using the app that was developed in this project. The app further can give additional information on regarding the type of seeds and how to plant them in the optimal way as possible.

2. Materials and methods

The user has to capture the image of the seed using their phone camera for the application to be able to analyze and match it with images that are available within the app's library. Thus, give out the No anomalies detected in the image Anomalies detected in the image information of the seed on the phone's screen. If there are no matching image with the library database, the user can send a request to add new type of seed into the app's library database. Next, the app also will detect if the seed had any

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disease with the help of anomaly detection process. If there are anomalies detected, the screen will display information of the disease specifically.

2.1 Materials

The system is fully software developed with the help of android application software developer, Android Studio. Java and XML programming are required in developing this application with the aid of Tensorflow and Google Teachable Machine for image training.

2.2 Methods

Figure 1 shows the flow for Image Training to the deployment of the product. Android studio were used as a platform for developing the app where both java and XML code were used in the development process. The java are used for the program that manage the input and output of the app while the XML code used in managing the user interface. The image processing method application were possible to assimilate in Android Studio with the help of TensorFlow where we can train the app to identify objects and differentiate any anomaly to detect disease in the seed. Google teachable machine is a free-based website for transforming training object into java program code.

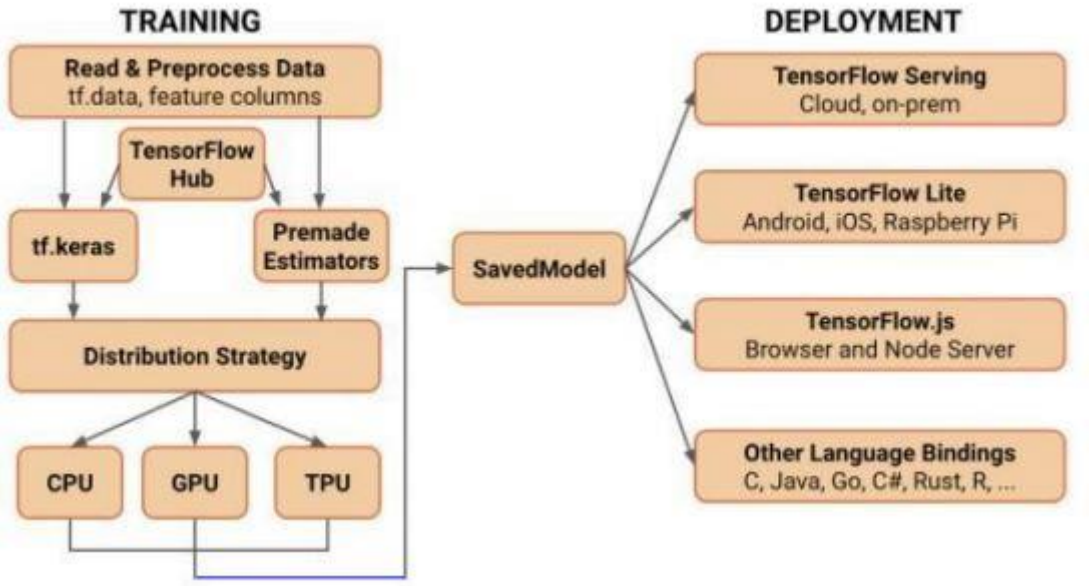


Figure 1: Flow for image training to the deployment of the product

2.3 Equations

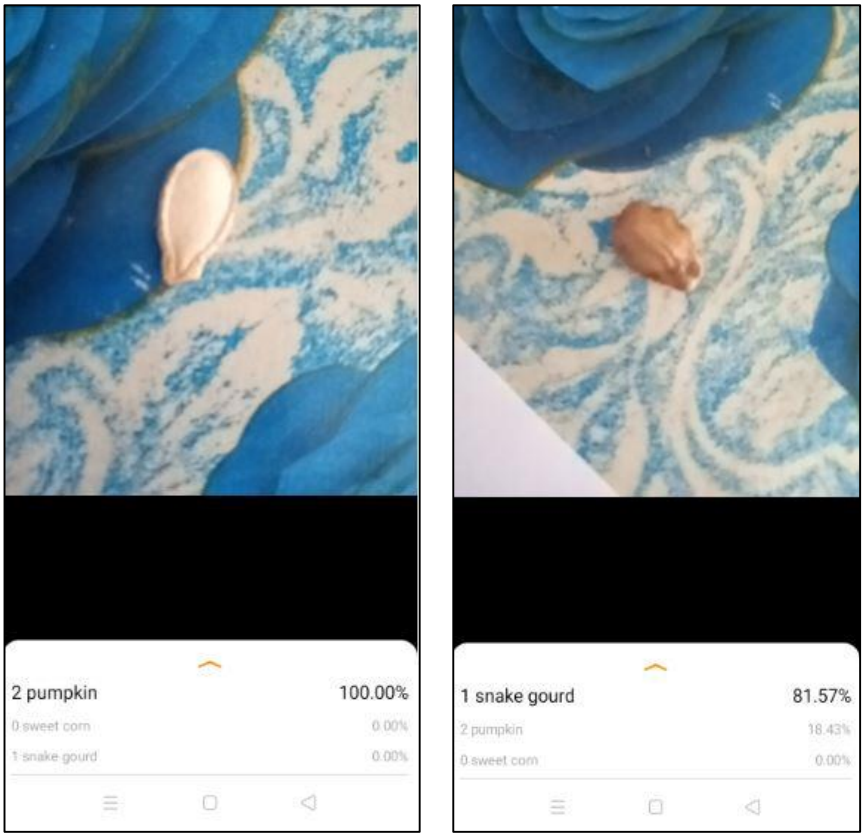
The distance was used to estimate density. These densities of point from other points will then be compared to determine whether the images had similar point to point density or not.

$$Reachability - Distance_{k}(A, B) = Max\{k - Distance(B), d(A, B)\}$$

Reachability distance of an object *A* from *B* is the true distance of the two objects, but at least the *k*-distance of *B*. Objects nearest to the *k* neighbors of *B* are considered to be equally distant.

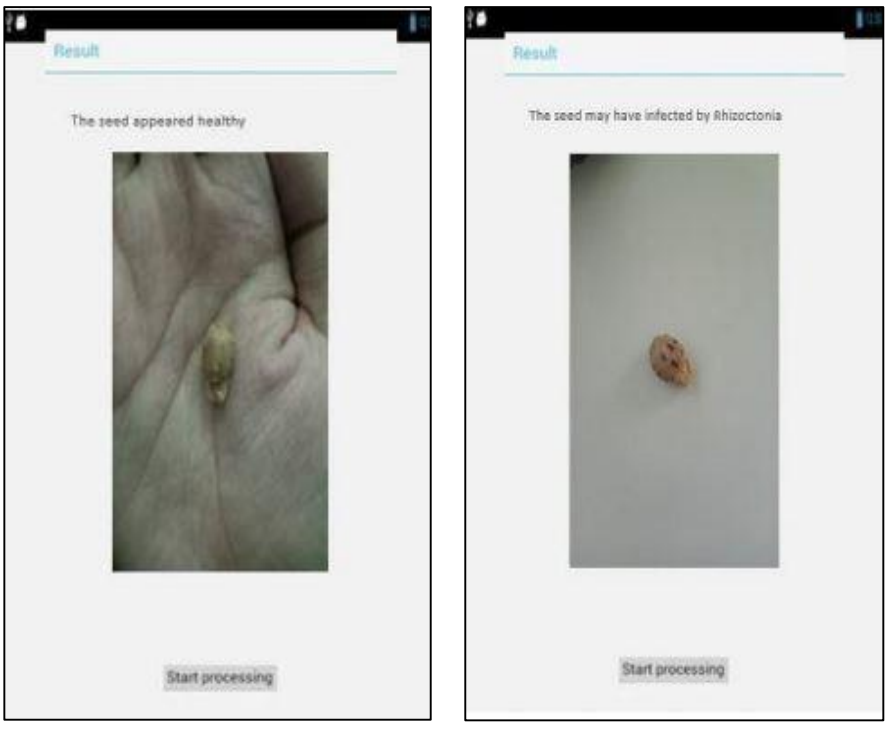
3. Results and Discussion

Figure 2 and Figure 3 show the sample of both seed identification and disease detection function from the app developed where Figure 2 shows the app managed to identify the seeds are pumpkin seeds and snake gourd seeds. Whilst Figure 3 shows the output for both healthy and infected seeds.



(a) Pumpkin seed (b) Snake gourd

Figure 2: Result of seed identifier



(a) Healthy seed (b) Unhealthy seed

Figure 3: Result of disease detector

The anomaly detection technique was used in the seed disease detector in the Android application. The app detects an anomaly on Figure 2(b) on the seed after comparing process from the image stored in library. Then, the app displayed the health status of the seed to notify the user. Table 1 shows sample of dataset of image label for each type of seed in the image training.

Table 1: Image label dataset

Item	Parameter Name	Image Label
1	Corn Seed	Yellow
2	Pumpkin Seed	White
3	Snake Gourd Seed	Brown

Figure 4 shows the graph for accuracy vs training dataset size for Image Training proving that the accuracy become higher as the trained model dataset increase.

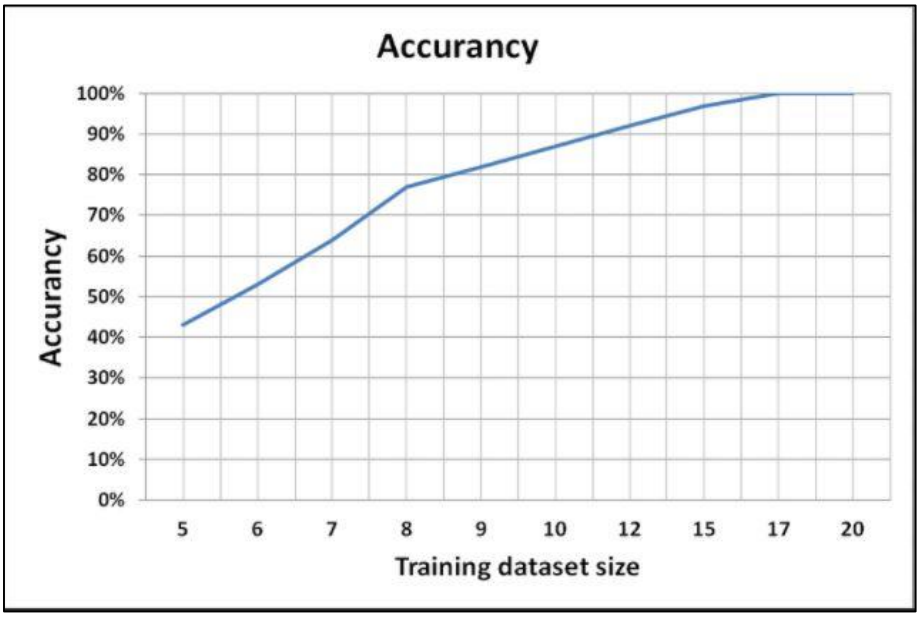


Figure 4: Image Training Graph for accuracy vs training dataset size

4. Conclusion

In order to help farmers in the country to save the time consumed of sending the seeds for testing in the lab, it is crucial to learn more about image processing and the methods to apply in identifying the seed type and disease detection. The seed identification function in the app were achieved by applying image recognition and object detection. The disease detection function was developed with the help of anomaly detection method. Farmers using this app can plan on how to plant their seed carefully thus can also predict how much the time consume for their plant to grow.

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