

Hong Kong Student Science Project Competition 2022

Template of Extended Abstract (Invention)
(Word Limit: 1,000 words, Pages: 2 pages only)

Team Number: SAPE170

Project Title: Plants Diseases Detector

Project Type: Invention

To our best knowledge and after thorough literature research, as at 30/6/2022, there are / are no similar works.

Background

In the past few decades, there has been steady development of agriculture in Hong Kong. Vegetables and livestock production produced in small intensive areas has gradually replaced traditional rice crop production. According to the statistics of the Agriculture, Fisheries and Conservation Department, there are currently about 2,500 farms in Hong Kong, which have about 4,300 farmers and workers. At the end of 2020, the areas of arable land used for the production of vegetables, flowers, grain crops and fruit trees were 347 hectares, 128 hectares, 7 hectares and 273 hectares respectively. In 2020, local agricultural products supplied 1.6% of the vegetables required in Hong Kong.

In recent years, in addition to the development of local agriculture in Hong Kong, many people have also advocated their own rural life and cultivated their interest in planting. Topics like organic farmland, organic farming have become common and popular research topics for several years. However, insect pests are problematic and cannot be underestimated, especially to these “beginning farmers”.

I. Objectives

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There are many types of pests in Hong Kong. A lot of farmers that lack knowledge of agriculture find it difficult to identify some uncommon pests. Farmers must know the types of pests in order to use the correct treatments and take suitable precautions to get the pests off in the garden.

The 'Plant Diseases Detector App' aims to provide a simplest way for farmers to upload pictures or directly scan with a camera, and distinguish the pests by themselves, so as to prescribe the right medicine.

Also, the current method of pest control is to spray a large number of pesticides, but this method is ineffective and expensive, and it cures the symptoms but not the disease. The World Health Organization estimates that there are 3 million cases of pesticide poisoning every year, and the latest pesticide residue report of the Environmental Working Group (EWG) alleges that around 70% of traditional agricultural samples are contaminated with pesticides.

We hope that Farmers can reduce the use of pesticides, they can increase their knowledge of nature and get to know the habits of pests by using this app, and use natural and simple methods to increase the growth of crops. As a result, the occurrence of diseases and pests is inhibited, the reproduction and damage of pests can be directly or indirectly reduced.

II. Methodology

In this application, we develop an AI pest identification program. It can help farmers identify types of pests, it can identify plant diseases as well, and it is easy to operate with a mobile phone.

Also, this app will provide daily feed information. It provides suggestions of physical control to pest rather than the use of pesticides as well as different method for different pests. Our purpose is that farmers can reduce the use of pesticides, they can increase their knowledge of nature and get to know the habits of pest by using this app, and use natural and simple methods to increase the growth of crops. As a result, the occurrence of diseases and pests is inhibited, the reproduction and damage of pests can be directly or indirectly reduced.

For the research and development process, we use google colab to download a large number of pictures of diseased leaves and pests. We use three types of pests as our sample : Aphid, *Ricania simulans*, *Aulacophora femoralis*. Then we use label studio to label different types of pests (*Aulacophora femoralis*, aphids, and *Ricania simulans*), and train AI so that it will be able to identify pests, disease. At last we use MIT App Inventor to design the layout of the app, which we hope the app can be user-friendly.

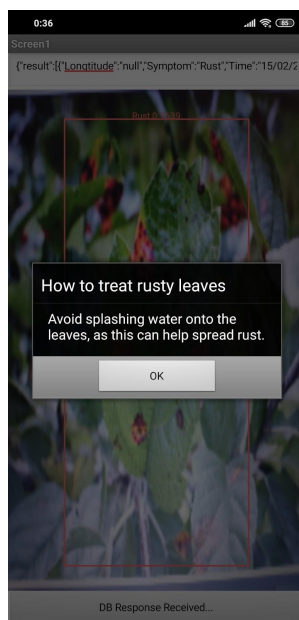
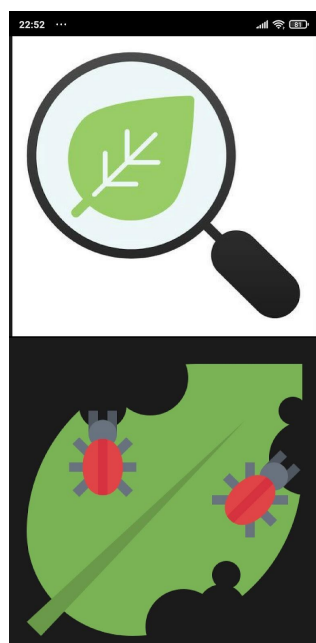
III. Design of Invention

The operating instructions of 'Plants Diseases Detector' as follow:

First, insert the photo of pests, rusty leaves or plant diseases or simply take a photo. There are two buttons on the main page: detect pests and detect plant diseases.

Then, after successfully detecting the object by AI recognition, the app will provide relevant suggestions. For example, you take a photo of rusty leaves, and it will show a suggestion of 'Remove all infected parts and destroy them. Remove and destroy all the infected plants and replant the area with resistant varieties.'

Finally, the app connects to spreadsheets for more information such as time and previous records.



IV. Application / Market Need

For commercial benefits, we hope to lower the death of crops due to lack of knowledge of citizens, help to improve the productivity of natural crops, and increase farmers' income, and provide a way to maintain the healthy growth of crops without pesticides, which can also enhance the quality of crops, thereby increasing the income. And this can also become an environmental advantage which can lower the use of pesticides.

For the social contribution, providing daily feed information can increase citizens' interest in planting and reduce the chance of making wrong decisions. It is convenient for farmers. It is no longer necessary to remember a lot of crop information and methods to deal with pests. Even for the 'household farmers', who do planting at their house without professional knowledge in preventing pests or diseases, can know the correct ways to treat plant diseases.

V. Conclusion

In the future, We will add a database platform to the system to connect to the official pest information website, so that the pest information can be continuously updated. By achieving a more flexible change, citizens and farmers can get the latest information easily.
