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Vision System for Item Recognition: Case Study Computer Peripherals

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Abstract

Vision System is part of Artificial Intelligence (AI) using the camera as a primary input. Over the past fifty years, the development of AI had achieved a great achievement such as the development of a Vision System. Implementation of the Vision System is not limited to industry but also as a solution to recognize an unknown object in various area. However, the availability of the current Vision System for personal usage is still limited in the market (such as Google Lens and CamFind) which is known to have a harsh requirement to whom able to use it or had limited functionality that result of unable to provide more information on the unrecognized item. Therefore, this research is proposed to create an alternate Vision System which enhancing user experience on the computer peripherals. A forum-like social environment is also develop as extra channel for the user to share information. The user will able to use this item recognition function to identify the computer peripherals that they are interested to find out and post their doubts to the forum in getting help from others.

Keywords

Vision System, Item Recognition, Social Forum, Computer Peripherals

Introduction

Over the past fifty years, the development of Artificial Intelligent (AI) had achieved a great achievement which show the potential of implementing the AI technology into computer system could bring a benefit to a company and society. According to the research "Race of IT Giants over AI", many corporations across different industry are trying to integrate the AI technology into their product (Figure 1) and one of the elements that has been looking into is the Vision System.

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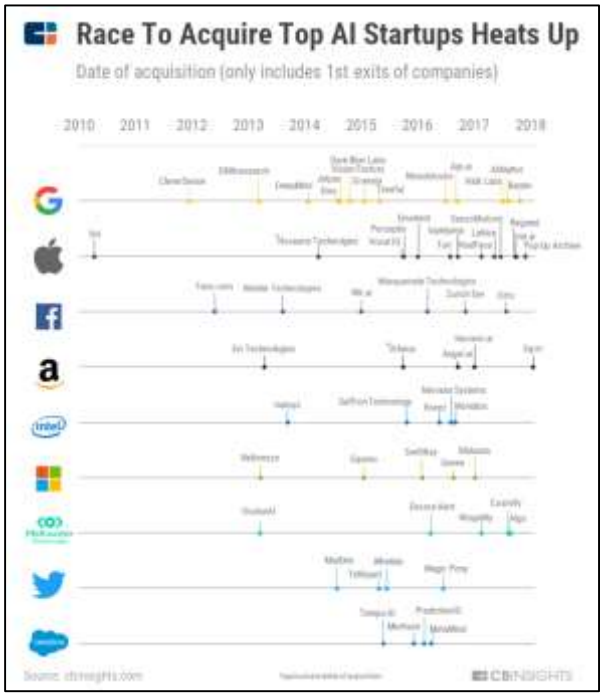

Figure 1. Race of IT Giants over AI (CB Insights Research, 2018)

The Vision System, or also known as Machine Vision, is a combination of hardware and software providing operational guidance to devices in the execution of their functions based on the capturing and processing of images (Cognex.com, 2018). It is a sub-tree of AI that uses the sensor or camera as a primary input, the system will perform a task when the sensor or camera has detected an item. For example, the CamFind, which was developed since year 2013, is using the mobile visual search technology in searching an item by only taking a picture on the item that intended to investigate without any typing, the search results will be saved into the user's profile which can share with their family and friends (Dove, 2015). In year 2017, Google has announced a Vision System product named as "Google Lens" to help in recognizing a flower, a restaurant phone number, reviews and other information. The Google Lens Vision System is developed using the Google's machine learning to give the user extra information on the image snapped with Google Lens (Figure 2).

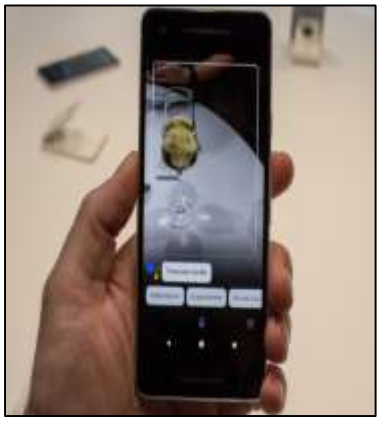

Figure 2. Picture of Google Lens in Action (Hall and O'Boyle, 2018)

However, even though the Vision System like Google Lens had appeared in the market, the function is still limited due to the requirements of the equipment selection that came along with the Vision System (The Verge, 2018), which decreases the potential usage of the Vision System as a supportive tool in education and other industrials. Therefore, the author would like to develop a Vision System in an Android platform which is accessible with the use of basic smart phone specification. A case study of computer peripherals has been selected as the project scope, with the intention to assist an IT native user to recognize a computer peripheral by taking a picture of a computer equipment, the proposed Vision System will then analyze the image and display the recognized equipment name to the user.

Methodology

The author designed the proposed system based on two main features: the image recognition feature developed with TensorFlow on Python platform, and an Android application with social forum feature which developed with Android Studio, in allowing the user to post their comments and doubts to the forum and to have better interaction with other users.

An image recognition model is required to develop the image recognition process which involved numerous processes and configurations. During the recognition model training stage, fifteen set of entries such as 3D printer, computer keyboard, monitor, mouse, router, switch, DVD disc, RAM chipset, speaker and others, had been successfully trained with about 800 to 1000 JPEG image samples per entry. This process took more than 10,000 iterative training and completed in about 8 hours training time which the TensorFlow will generate the result into a ".pd" file and a "txt" file. The author will convert the ".pd" file to a ".tflite" format, which the TensorFlow Library will integrate the image recognition model into the mobile application. To trigger the image recognition process, the image captured will be converted into "byte buffer", a variable container that used for the image recognition process. The TensorFlow Library will use the byte buffer, Image Recognition Model and the label text file as the image recognition process input to identify the scanned item and to produce a result.

Data collection are done thought distributing the questionnaire via Google Form to have their comments and opinions toward the proposed system. A social forum is created in allowing the user to post their doubts on unknown item in getting other user's comment as an extra channel for information sharing purpose.

Results and Discussion

With more than 500 automated testing and 30 manual testing, the image recognition model can recognize the trained items with more than 90% of accuracy, which improving the user experience with the help of the proposed vision system. The author had evaluated the accuracy test on the Image Recognition Model, which is achieving 90% of the accuracy on the scanned images. The product had been distributed to a group of tester in getting their comments based on the criteria of user-friendliness and the accuracy of the image recognition model. From the tester feedback, they

hope the interface design can be improved further to ease the usage, and also advised to have more recognition entries which will further improve the accuracy of the image recognition model. Majority of them are commented the current result is still in acceptable level.

Conclusions

The proposed system has successfully developed to recognize a computer peripheral that been trained and a forum for the user to interact and share their information with others. With the high accuracy of recognition, this proposed system can be a potential competitor with current systems in the market. With more entries train in future, it has a potential to be selected as one of the teaching and learning tools which will able to create an interactive and fun learning environment in the class.

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