2U-07

Implementing a Malaysian Cuisine Recognition System Considering Other Country's Similar Looking Foods

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1 Introduction

Malaysia is famous because of the variety of choices of its food. However, for tourists who is travelling to Malaysia for the first time, it is hard for them to recognize Malaysian food. This will prevent them from searching more about the food from the internet. While asking the local will be difficult because of language barrier. Other than that, there are also other country food that has similar look as Malaysian food. This may cause confusion among tourists. Existing research [1] only focusing on recognition of Malaysian food without considering these similar looking food. In this paper, we proposed a Malaysian food recognition system that can be used to detect a Malaysian food, give out its name and also differentiate between similar looking food of Malaysian food and other country food correctly.

2 Malaysian Cuisine Recognition System

The proposed system can be seen in Figure 2. Firstly, the system has two types of recognition method as the input to the system. The first recognition method is the real-time recognition. In this method, users will use the camera to recognize the Malaysian food in real-time. The second recognition method is the image recognition. Users can select the image from the gallery for recognition by using this method. Next, the input will go through three recognition models for recognition. We are using cascade classifier of three recognition models. The first recognition model is food or non-food recognition model. The second one is Malaysian or non-Malaysian food recognition model, and the last one is 13 types of Malaysian food recognition model. Lastly, the result of the recognition will be given to the users.

2.1 Recognition model

For the recognition of Malaysian food, existing research [2] is using CNN and transfer learning to build

Figure 1: Example of similar food of Malaysian nasi goreng and Japanese chahan

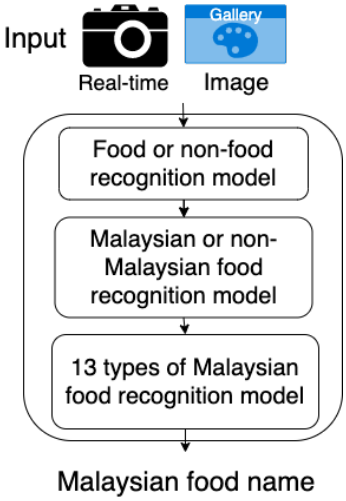

Figure 2: The system design

the recognition system. In this work, we used an Apple tool which is Create ML to create all the recognition models. Create ML is a framework from Apple for machine learning. It allows the creation and training of machine learning models within the Apple ecosystem.

The first recognition model is food and non-food recognition model. This recognition model has two classes which are food and non-food class. 21,647 images of food and non-food images are used to train the model. Only images that are recognized as food by this model will go through the second recognition model.

The second recognition model is Malaysian or non-Malaysian food recognition model which has two classes, Malaysian food and non-Malaysian food class.

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6,401 images of Malaysian food and other country food are used to train the model. Only images that are recognized as Malaysian food by this model will go through the third recognition model.

The last recognition model is 13 types of Malaysian food recognition model. It has 13 classes which consists of 12 classes of specific Malaysian food and one class for the other Malaysian food. 938 images of Malaysian food are used to train this model. The result of this recognition model will be the result of the whole recognition.

2.2 Similar looking foods recognition

To be able to recognize similar looking Malaysian food and other country food, we improved the training dataset of our second recognition model, Malaysian or non-Malaysian food recognition model. Firstly, we recognized and listed all the Malaysian food and other country food that has similar look. There are 18 types of similar looking food for both Malaysian food and other country food. After that, we collected the dataset of all these similar looking foods and used them to train the second recognition model. In fact, half of the training dataset that was used for training were the similar looking food images.

3 Evaluation experiments and discussion

In this work, we have done three types of evaluation which are (1) the evaluation of each recognition model, (2) the evaluation of whole system, and (3) the evaluation on training dataset. In every evaluation, we used accuracy as the evaluation metric.

In (1), we tested all three recognition models with a specific testing dataset. We used testing dataset of 2,000 food and non food images for first model. Two testing dataset for second model which are normal food dataset contained 1,900 Malaysian and other country food images, and similar looking food dataset contained 798 images of similar looking food. Testing dataset for third model is 562 images of Malaysian food. The evaluation result can be seen in Table 1.

Next, in (2) we evaluated our system and other two systems which are system a): system that used the same recognition models as our system but the placement of second and third model has been switched and system b): system that only used one recognition model. For the evaluation, we used two testing datasets which are 662 images of normal Malaysian food and 798 images of similar looking food. The result can be seen in Table 2. From this result, we can see that our system and system a) obtained similar accuracy while system b) obtained lower accuracy. This shows that by using three recognition models, we can obtain higher accuracy result when recognizing Malaysian food and also similar looking food.

In (3), we evaluated our system, system a), and system b) when only half of the training dataset is used to train the recognition model. The objective is to evaluate the systems when less training dataset is used. We used the same testing dataset as evaluation (2). The result can be seen in Table 3.

Table 1: Evaluation experiment (1) result

Model	accuracy	normal food	similar food
First	99%	-	-
Second	80%	84%	75%
Third	80%	-	-

Table 2: Evaluation experiment (2) result

System	normal food acc	similar food acc
Our system	64%	64%
System a)	64%	64%
System b)	61%	63%

Table 3: Evaluation experiment (3) result

System	normal food acc	similar food acc
Our system	66%	51%
System a)	66%	51%
System b)	60%	63%

From this result, we can see that when building a Malaysian food recognition system with smaller training dataset, it is better to implement the system with only one recognition model. As for comparison between normal system and half-training dataset system, we can see that our system obtained a high accuracy result in recognizing both normal food and similar looking food compared to our system with half-training dataset that only excel in recognizing normal food while system b) with half-training dataset, only excel in recognizing similar food.

4 Conclusion

We proposed a Malaysian food recognition system with two recognition methods, real-time recognition and image recognition. Then, we used a cascade classifier of three recognition models to recognize Malaysian food and differentiate between similar looking Malaysian food and other country food. Lastly, we also have evaluated our system to determine that our system has the best accuracy of 64% for both normal food and similar food recognition than the other two systems. The system helps users search for suitable Malaysian food from similar looking cuisines on the Internet.

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References

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