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RESEARCHING AND BUILDING FRUIT IDENTIFICATION APPLICATIONS ON MOBILE PHONES

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ABSTRACT

In an era where hardware devices are developing rapidly, some applications are applied object identification and detection technology that has been widely applied in practice such as face identification, object detection, vehicle, fruit classification, handling cold fines with traffic cameras, and auto-driving systems of vehicles, etc. As a result, it shows the importance and practical application of AI in general and the field of computer vision in particular. The subject is focused on the SSD object detection method (Single Shot MultiBox Detector). The goal is to study and understand the basics of how object detection works. Then, applying the basic knowledge after learning to build an application to identify some types of fruit. After the research process, the achieved result is knowing how the method works, getting a complete model, and getting the most basic android fruit to identify the application.

Keywords: Object Detection, Artificial Intelligence, Computer Vision, Fruit Identification.

I. INTRODUCTION

In today's modern world, when it comes to electronic devices and smart devices, people usually refer to which technology is integrated into them, most of which is artificial intelligence (AI) [1], [2]. Artificial intelligence is applied in almost all areas of life, including education, health care, transportation, agriculture, commerce, etc [3], [4].

One of the important areas of AI is computer vision [5], [6]. Computer vision is a field that includes methods of acquisition, image processing, image analysis and identification, and object detection [7]. Object detection is probably the most used array in practice [8].

The application of AI, especially the application of computer vision to life, is an important part of digital transformation [9] with the industrial revolution 4.0 [10].

II. RESEARCH MODELS

Object Detection is one of the popular problems in the field of computer vision, with the outstanding development of science and technology, locating one or more objects in an image and classifying objects in the image. For the problem of object detection, there are many other methods such as YOLO [11], Convolutional Neural Networks (CNN) [12], [13], [14], [15], Region-based Convolutional Neural Networks (R-CNN), Viewpoint Feature Histogram (VFH), Fast Point Feature Histogram (FPFH). The objective of the study is to focus on the object detection method: Single Shot MultiBox Detector (SSD) [16].

Single Shot: This means that object positioning and classifying are done in a single stage from start to finish.

MultiBox: The name of the bounding box technique used by Szegedy.

Detector: This network can identify and classify objects

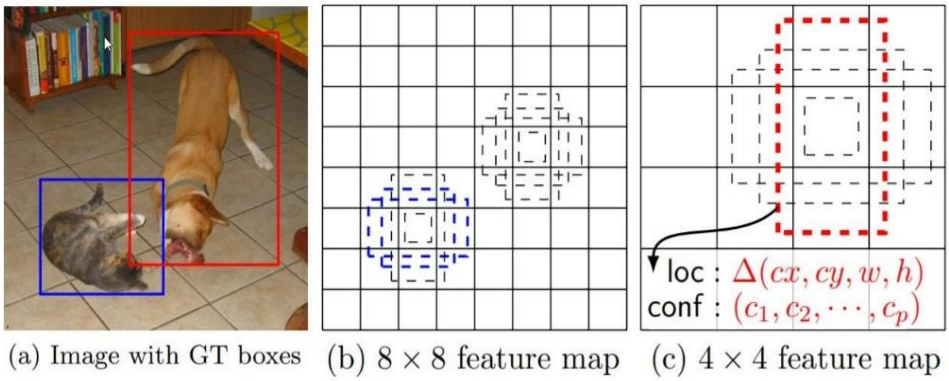

Figure 1: How to divide feature maps to identify images with different sizes

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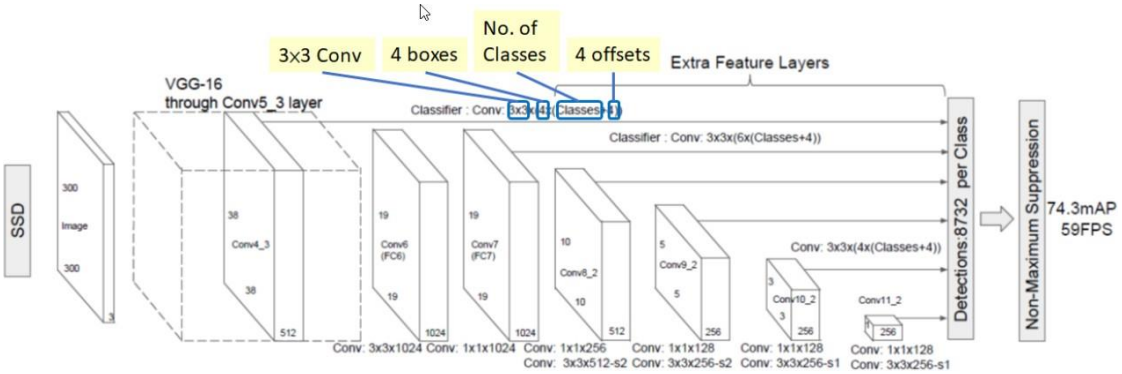

Figure 2: Architectural diagram of SSD network

III. EXPERIMENT

3.1. Setting environment

Experiments are set up in the Windows environment and in the Google Colab cloud. (Colaboratory notebook).

CPU: NVIDIA TESLA K80 24GB GDDR5 PCIE 3.0 RAM: 12GB

DISK: 60GB

3.2. The necessary tools

Programming language: Python, Java.

Tools: IDLE Python, Android Studio, Google Colab, Github.

3.3. Implementation process

By using google or taking photos to collect some fruit images for modeling, there are 5 types of fruits: banana, strawberry, durian, apple, and dragon fruit are collected. Each type chooses 15 pictures with different sizes, colors, and shapes.

Figure 3: 05 types of fruits are collected

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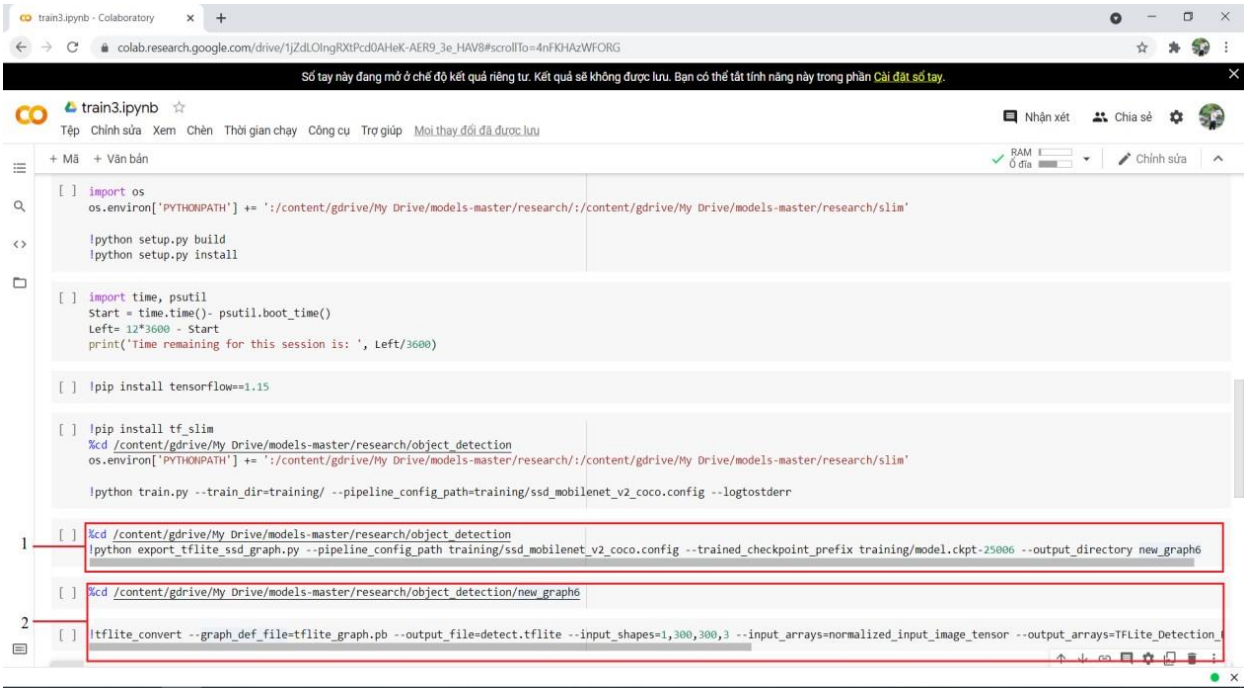

Figure 4: The command to convert to the official model

3.4. Model check

Conducting a model test after training how it works, and how accurate it is with the image.py program.

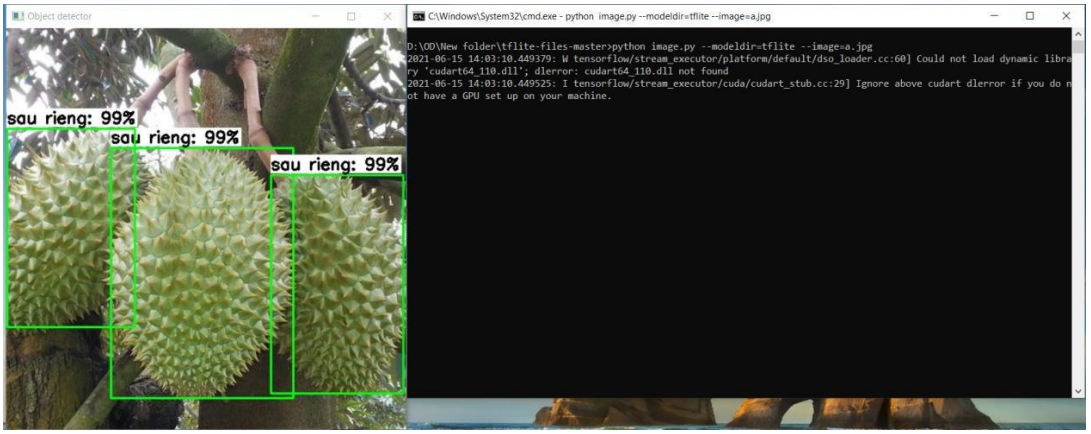

Figure 5: Testing with durian

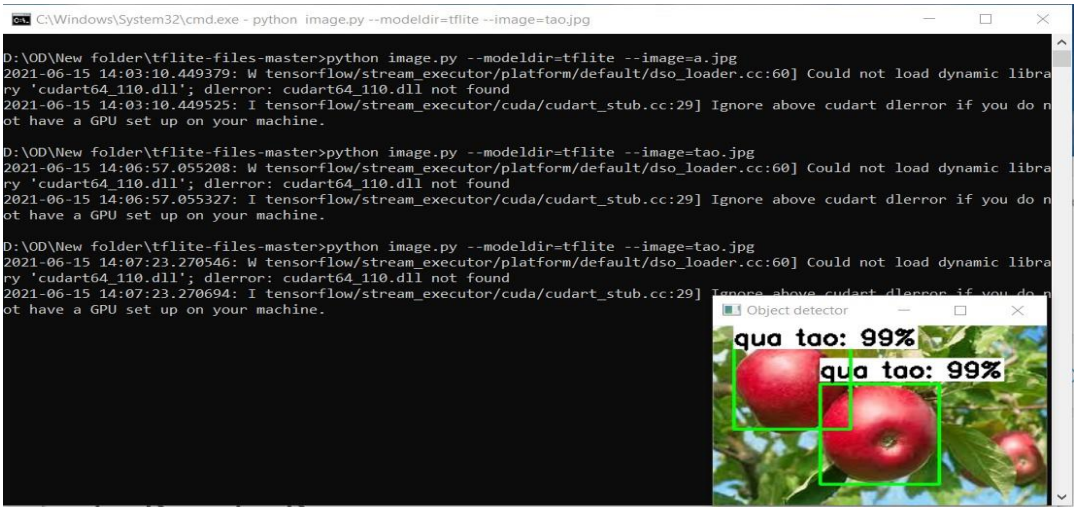

Figure 6: Testing with apple

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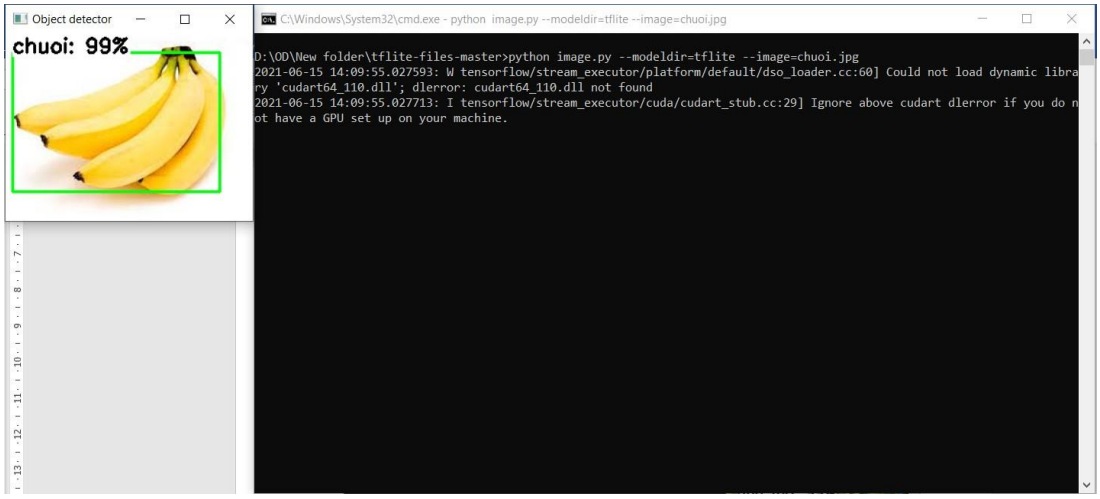

Figure 7: Testing with banana

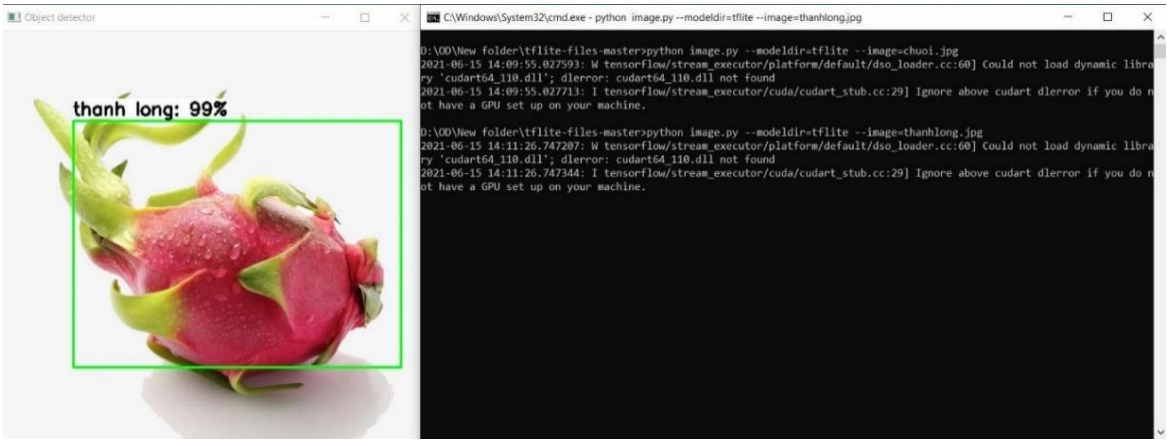

Figure 8: Testing with dragon fruit

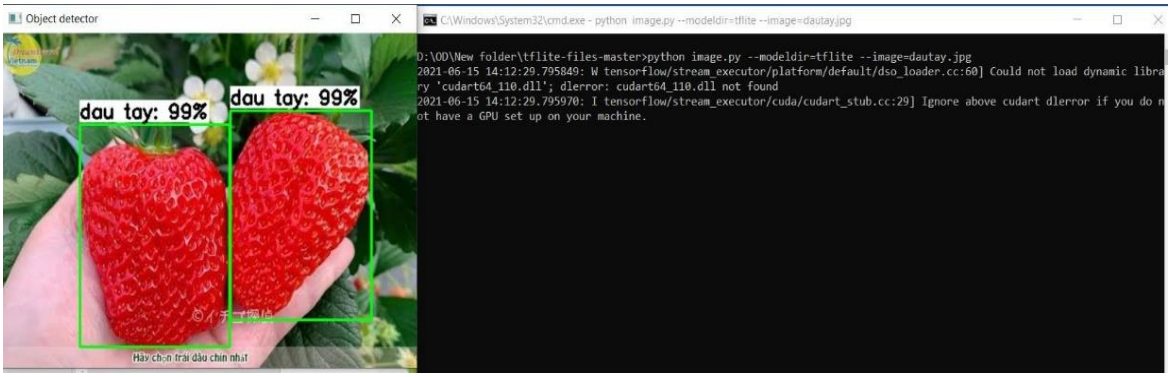

Figure 9: Testing with strawberry

Experiments were carried out with positive outcomes. The model produces results with a high level of identifying accuracy over many tests and relatively fast speed.

3.5. Test and evaluate on Android device

Table 1. Accuracy assessment table

No.	Objects	Frame No.	Lowest accuracy	Highest accuracy	Average accuracy
1	Apple	10	80,80%	100%	> 90%
2	Strawberry	10	83,60%	99.98%	> 90%
3	Banana	10	91,44%	99,93%	> 95%
4	Dragon fruit	10	90.04%	99.88%	> 90%
5	Durian	10	57.65%	100%	> 90%

IV. CONCLUSION

The project has achieved the set objectives including understanding basic algorithms, learning to build models, and getting an Android application that can identify 05 basic types of fruit. Having an understanding of AI as well as some related technologies.

4.1. Development orientations

Based on the knowledge gained and after many times building models, the author plans to develop applications that identify faces, expressions, license plates, etc. These are applications that bring practicality and practical implementation.

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