Vehicle Parking Problem

Fig.1 The UK driver taking eight minutes to reverse his vehicle into a sizable parking space. [1]

Fig.2 Some driver do not bother to park the car in a way that it takes minimum space [2]

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Jetbot by Nvidia

Jetbot is the actual smart robot powered by Jetson Nano.

- **4 cores of CPU**

- **128 cores of GPU**

- **4 GB of RAM**

Advantage :

> **Robot Operating System Framework is supported**

Disadvantage :

> **1 Front Camera**

Fig.3 Jetbot from Waveshare [3]

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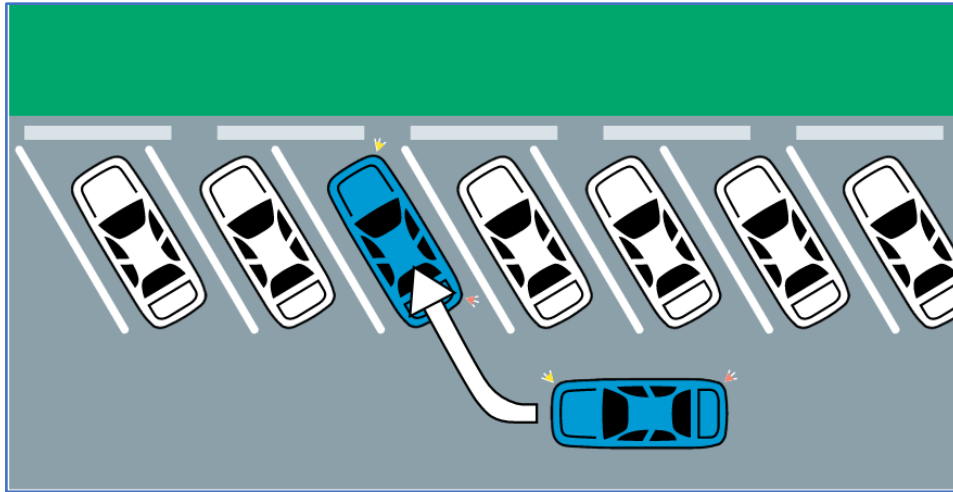
Parking Pattern
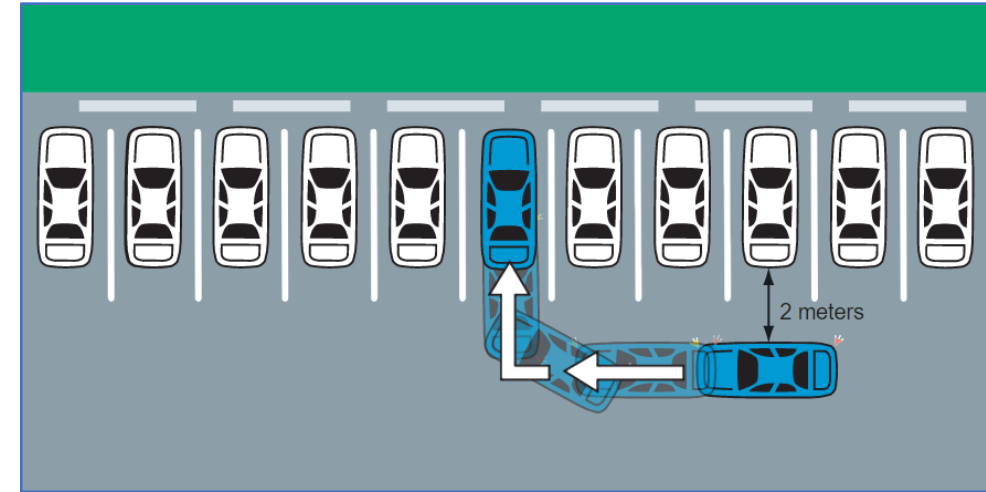

Fig.4 Angle Parking [4]

Fig.5 Perpendicular Parking [4]

Transfer Learning

" the technique which reduces the training time of deep learning models by reusing some of the already trained models."

Pre-trained Model → E.g., GoogLeNet, VGG, ResNet-50 etc.

In this research Resnet-18 model and AlexNet are used :

ResNet-18   **AlexNet**

Design Method

Start → Design Operation of the system → Data Collection → Transfer Learning → Testing Model and Evaluating Accuracy → End

Data Collection
- Angle Parking
- Perpendicular Parking

Transfer Learning
- ResNet-18 Model Training
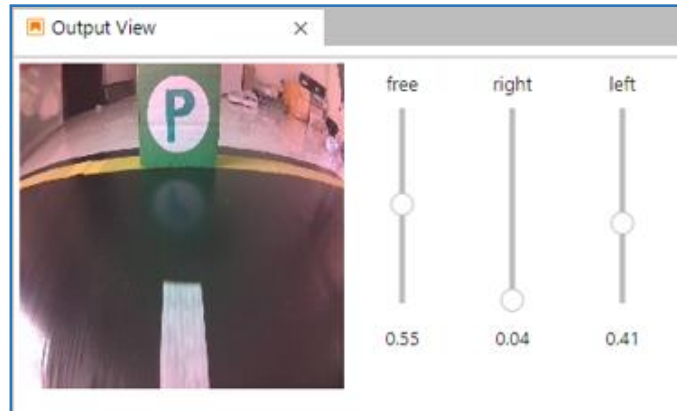- AlexNet Model Training

Testing Model

Fig.6 Output View from Jetbot
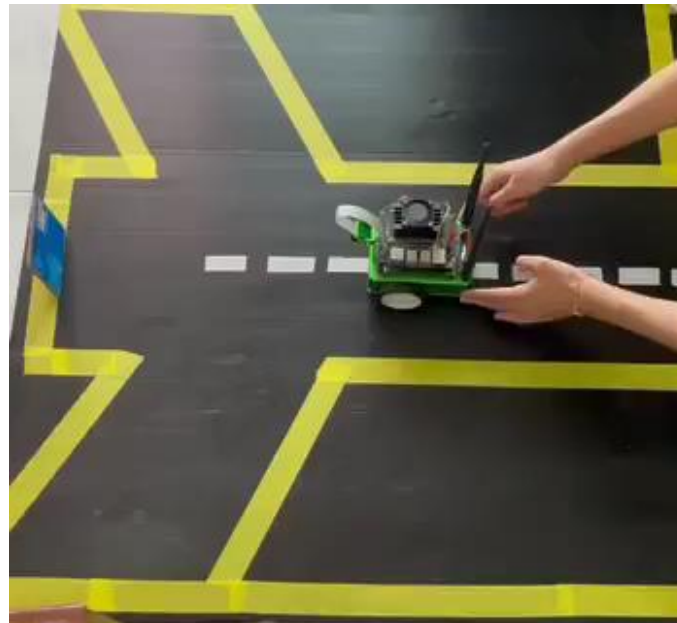
Fig.7 Angle Parking

Fig.8 Perpendicular Parking

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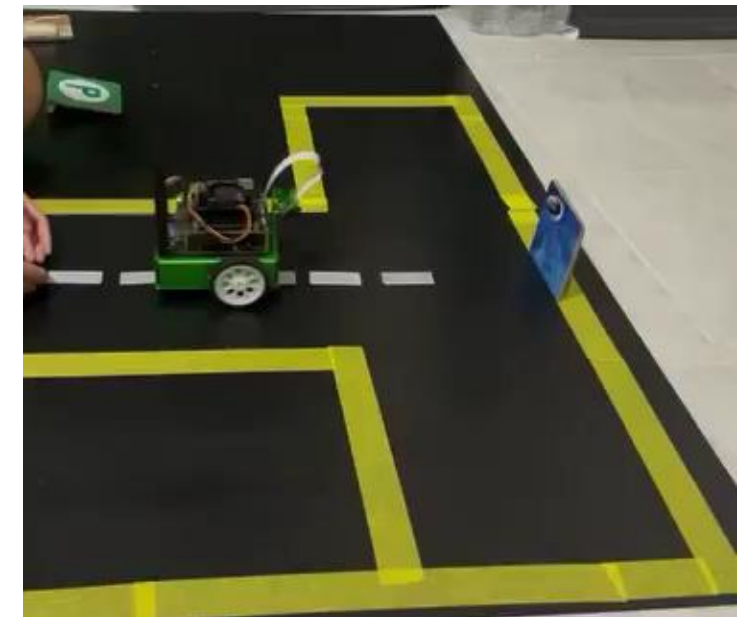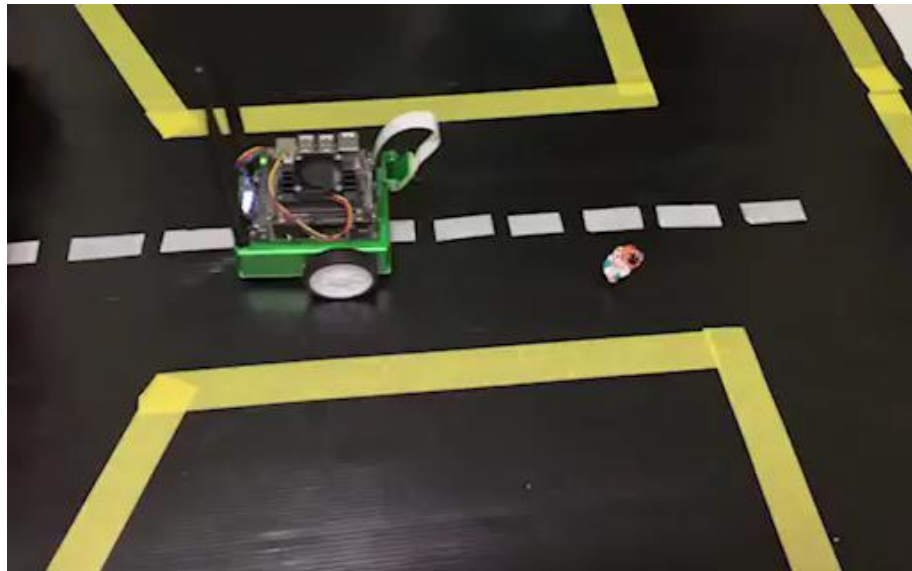
Safety Test

Fig.9 Jetbot that had perfectly stop when encounter the obstacle
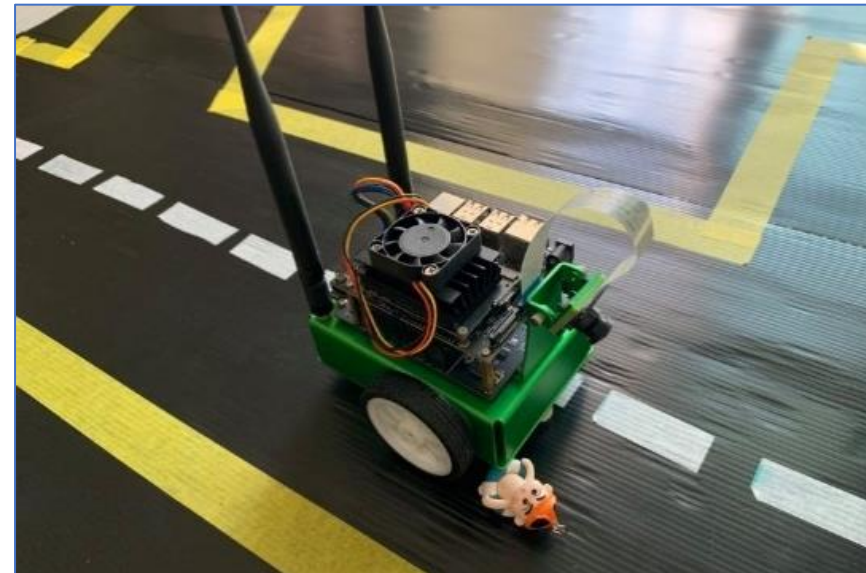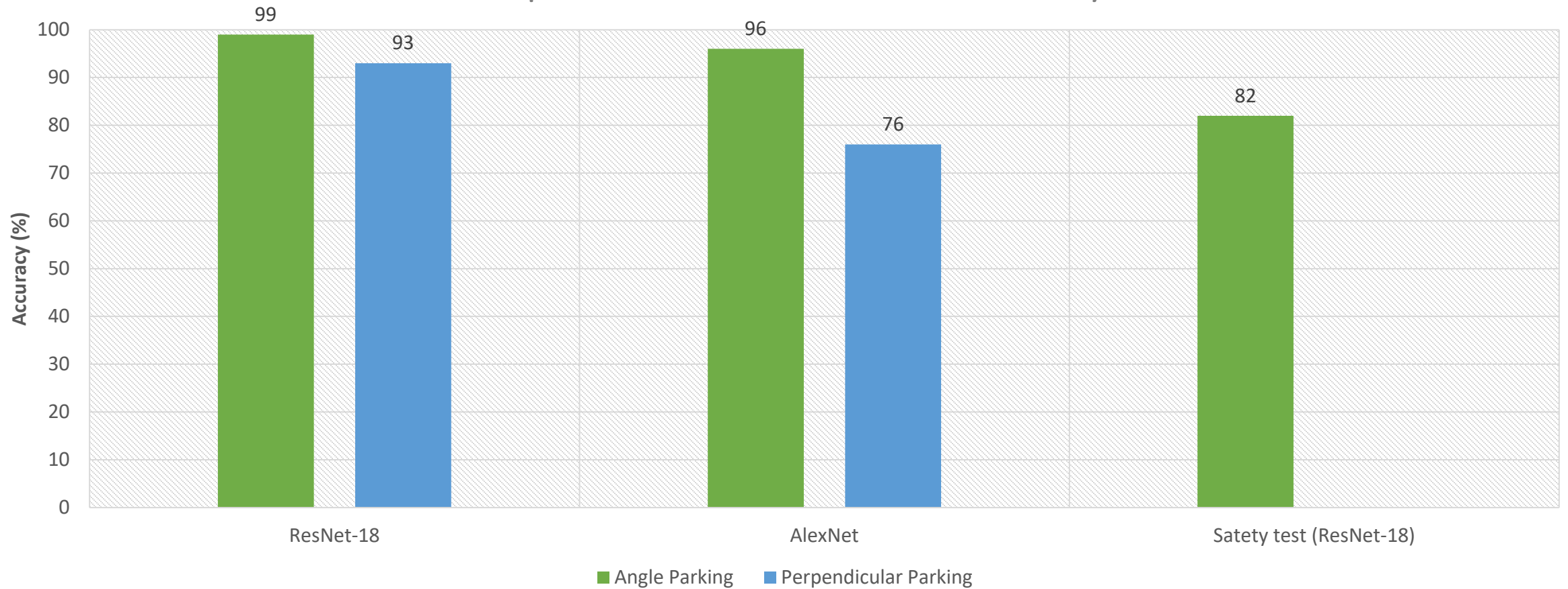

Fig.10 Jetbot that had not perfectly stop when encounter the obstacle

Result

Comparison of Pre-trained Model Accuracy

Conclusion

- **The Resnet-18 model is more accurate than the Alexnet model** in both Angle parking and Perpendicular parking

- **The Accuracy of Resnet-18 Pre-trained Model**
  - **For Angle Parking is 99 %**
  - **For Perpendicular Parking is 96%**
  - **For Safety Testing is 82%**

- **There are some limitations of using Jetbot for Parking Simulation**
  - **The Jetbot has only one front camera**
  - **The Battery of the robot**
  - **The Hardware limitation**

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