



# Research and Implement Control Program for Autonomous Car with Deep Learning

## INSTRUCTOR

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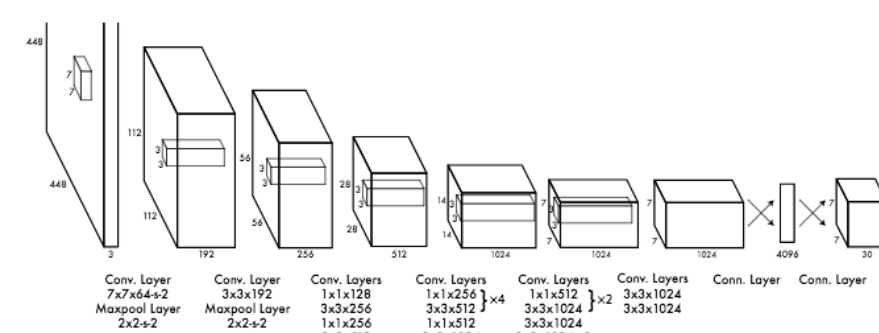
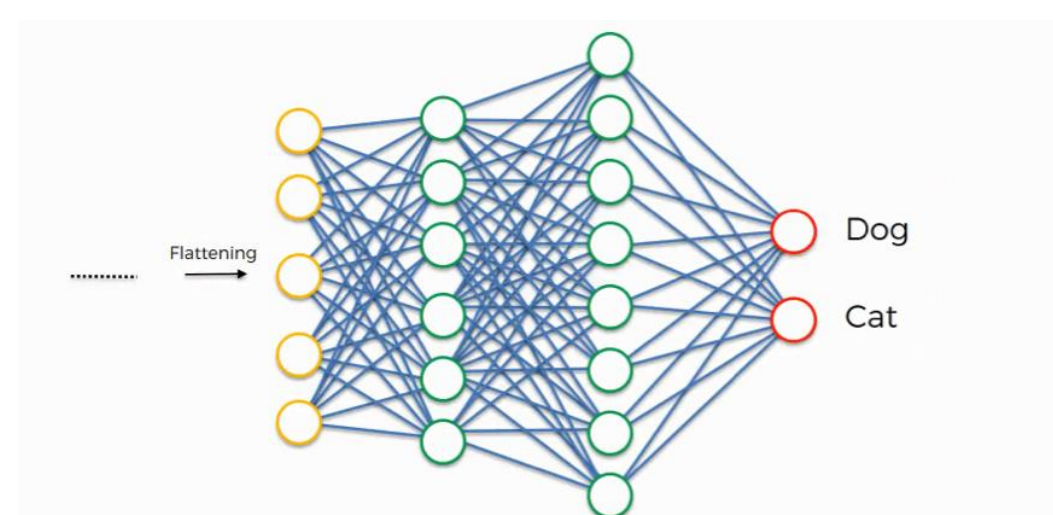
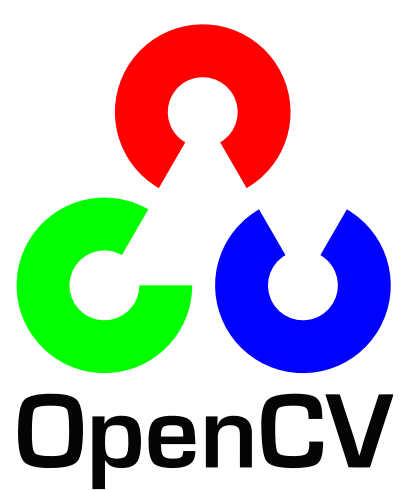
## ABSTRACT

In era of industrialization, automation is one of the most important factor in 4.0 technology. And Automatic vehicle has a significant role. In this project, our target is to build a simulated Radio Controlled car with 3D camera implemented on it. Besides, we use Deep Learning to create a neural network for detecting and recognizing road line, traffic sign. In addition to accelerate processing progress, we add multi-threading programming as a separated module. We finished the simulation of car with Unity 3D application, which is researched and built based on C# programming language, and deployed this system to Nvidia Jetson TX2 board. As the result, we successfully operate the system with high durability on Radio Controlled Car. Further more, Unity application can be reused in many projects in the future.

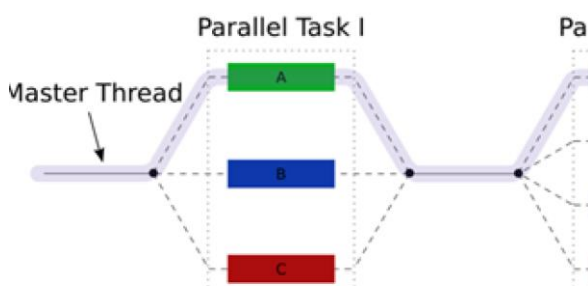
## INTRODUCTION

There are many ways to solve the problem “how to detect road line and traffic sign”. We research 3 ways:

OpenCV Convolutional Neural Network (CNN) YOLO v3



In order to accelerate real time processing progress: We use  
- Multithreading Programming



## RESULT

### Accuracy

#### OpenCV + CNN

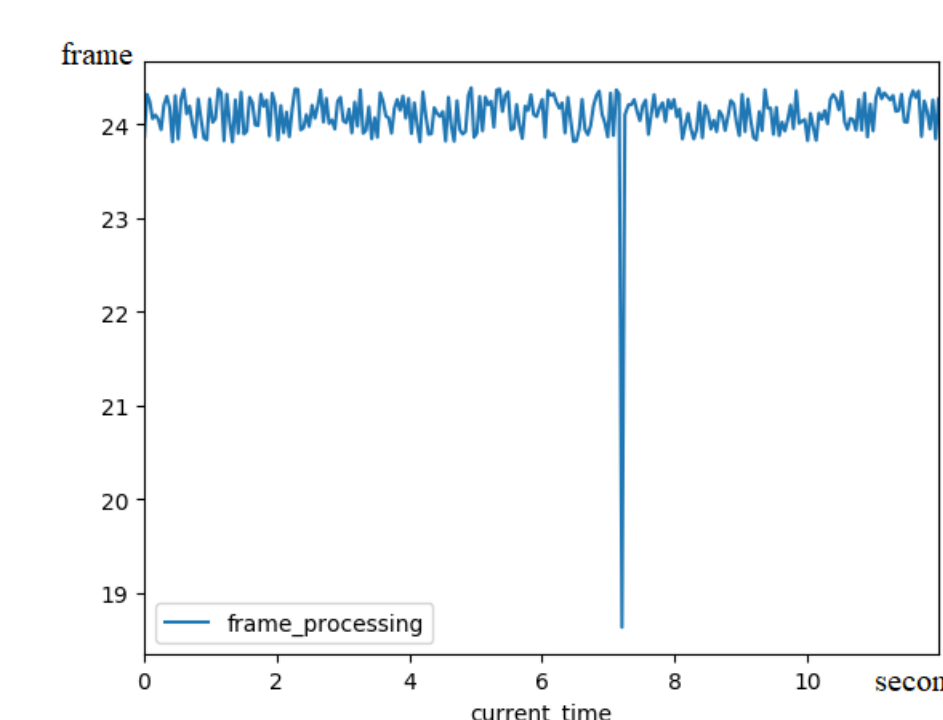
- Accuracy: 97%
- Train samples: 1000
- Test samples: 300

#### YOLO v3

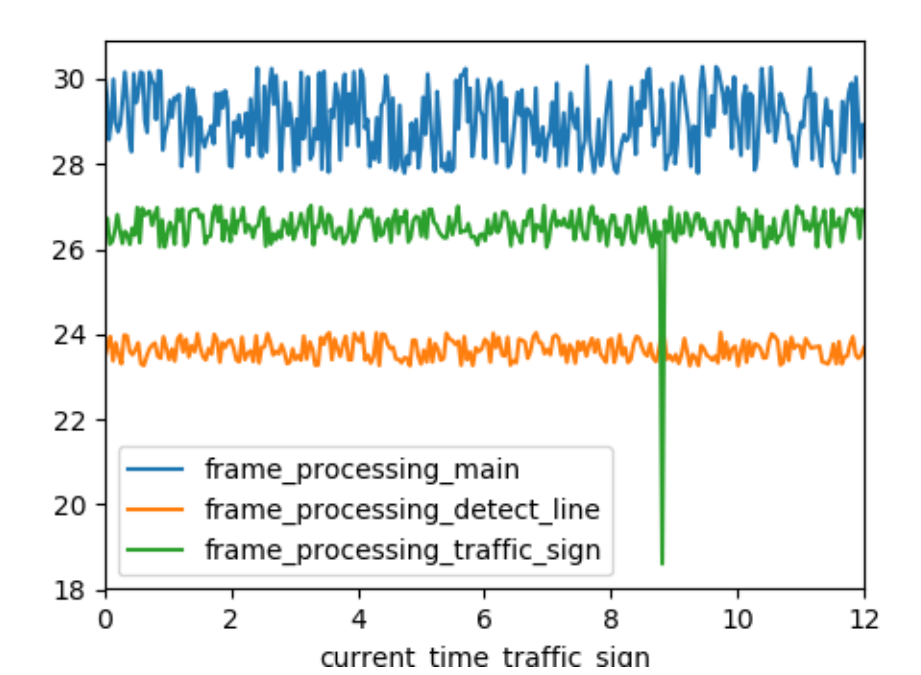
- Accuracy: 97%
- Train samples: 250
- Test samples: 80

### Speed

#### Non-Multithreading



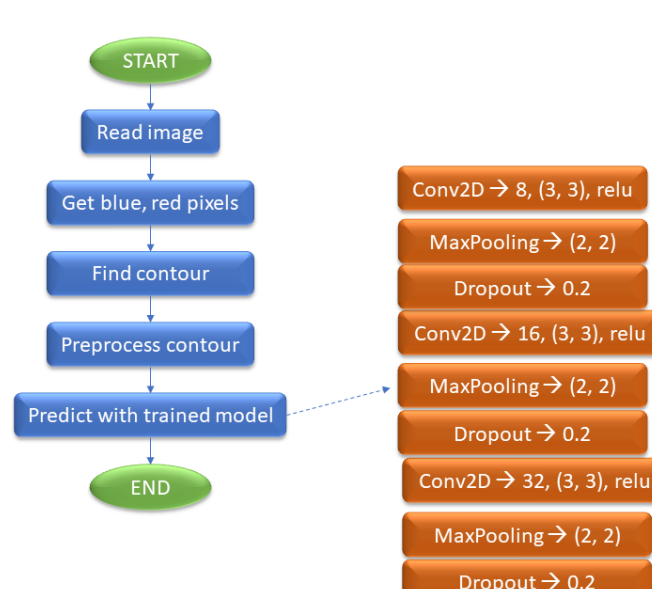
#### Multithreading



The lowest FPS is when processing traffic sign

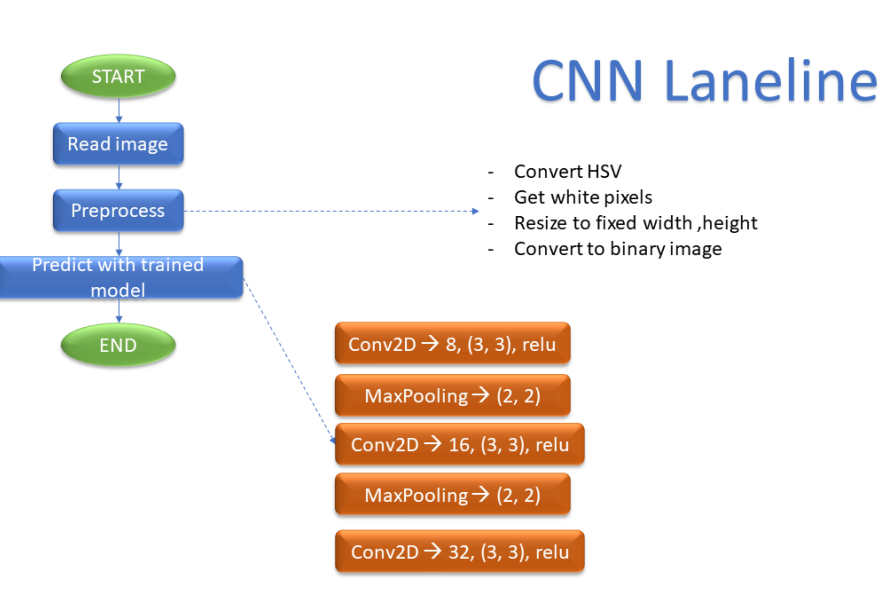
## PROPOSED METHOD

### OpenCV + CNN Algorithm



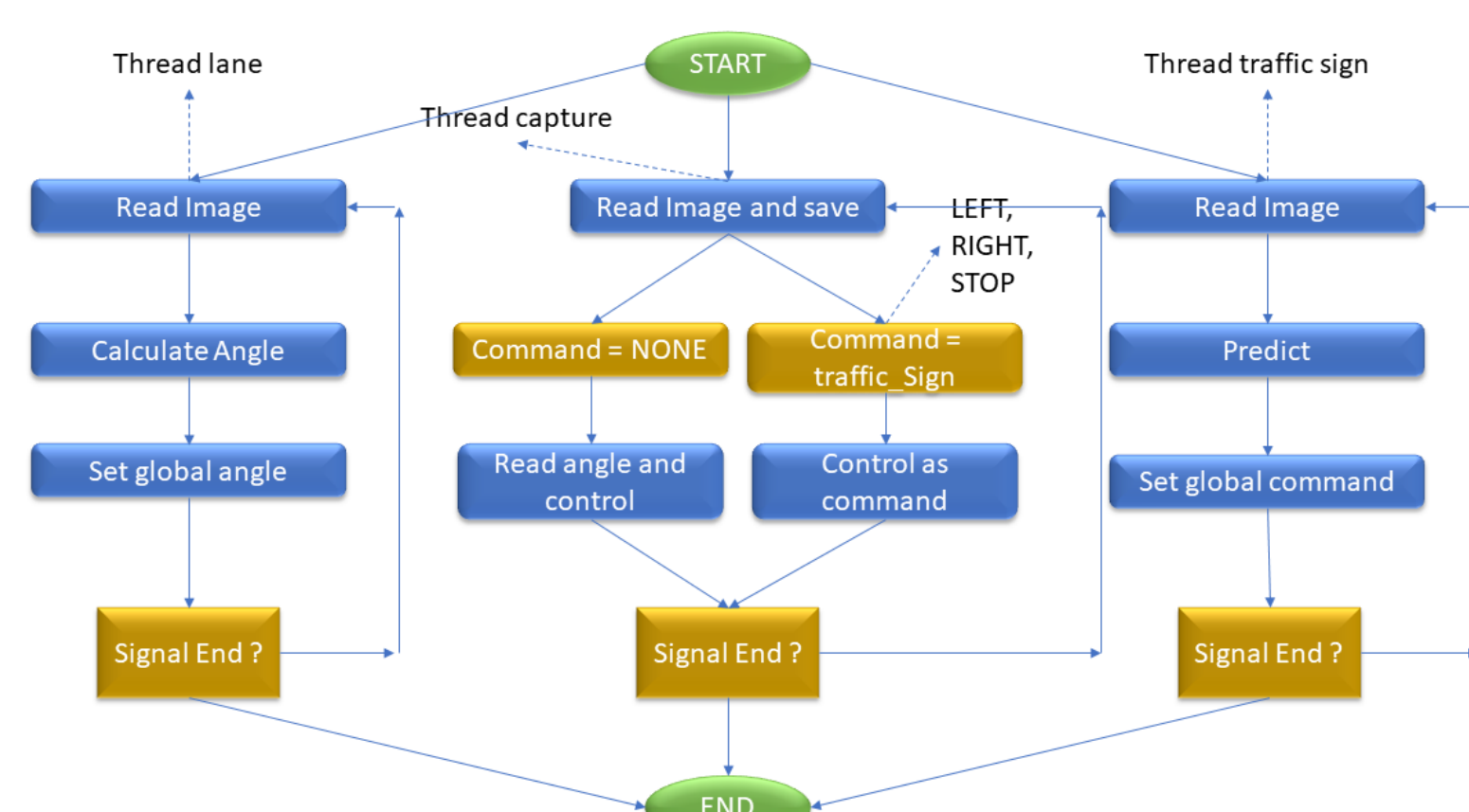
OpenCV+ CNN

### CNN (detect road) Algorithm



YOLO v3: use full YOLO model

### Multithreading Programming Algorithm



## CONCLUSION

### Strong point

- Durability of Radio Controlled Car's Control Program
- Realtime processing: program could reach 30fps
- High Accuracy of detecting and recognizing road lane and traffic sign
- Low price (~30 million VNĐ)

### Weak point

- Yolo v3 processing speed is slow
- Uncertainly worked with outdoor environment
- The dataset has small amount of samples
- Algorithm is still restricted in some functions compared to other algorithm in the world





# HARDWARE IMPLEMENTATION OF AES WITH S-BOX USING COMPOSITE FIELD

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## ABSTRACT

**Summarize:** **Why** you choose this project? What is your **target**? What have you **done**? What is your **result**?

*Use 1 to 3 sentences to answer each question. The purpose of this section is to give reader a quick look about your thesis and make first impression that make people want to read more.*

NOTE: Size of this poster is 36 inch x 48 inch. If you want to print this, go to File → Export → Create PDF/XPS Document. Then print the pdf file.

You can move texts and blocks based on your length of each section.

You can change the font size (all section must have the same font size) to fit your content.

## INTRODUCTION

Show your purpose when you choose this project: what problem do you solve, what are limitations of current methods, what is your proposed method.

Show your detail target: project limitations with measurable indicators.

*Try to use graphics (Icons, SmartArt, Flowchart, Images) to make your poster easy to understand and more attractive.*

## RESULT

Show and explain the result that you have achieved: prototype images, measurement results, comparison tables, etc.

Compare to the targets that you have written in Introduction section.

*Try to use graphics (Icons, SmartArt, Flowchart, Images, Tables) to make your poster easy to understand and more attractive.*

## PROPOSED METHOD

Show your proposed method: system flowchart, algorithm, core formula, etc.

Explain what you have done.

*Try to use graphics (Icons, SmartArt, Flowchart, Images) to make your poster easy to understand and more attractive.*

## CONCLUSION

Do your proposed method work? Is it efficient when compare to other methods? What are the advantages and disadvantages of your method?

Future work?