Automatic number plate recognition from videostream

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What is automatic number-plate recognition?

- Automatic number-plate recognition is a technology that uses optical character recognition on images to read vehicle registration plates to create vehicle location data. It can use existing closed-circuit television, road-rule enforcement cameras, or cameras specifically designed for the task.

Use cases

- ANPR is used by police forces around the world for law enforcement purposes, including to check if a vehicle is registered or licensed.

- It is also used for electronic toll collection on pay-per-use roads

- As a method of cataloguing the movements of traffic, for example by highways agencies.

Approaches of ANPR

- End-to-end model. One neural network receives an image as an input, outputs are texts and coordinates of image.

- Pipeline of multiple models. This approach means to divide the task into subtasks and use a separate neural network for each subtask.
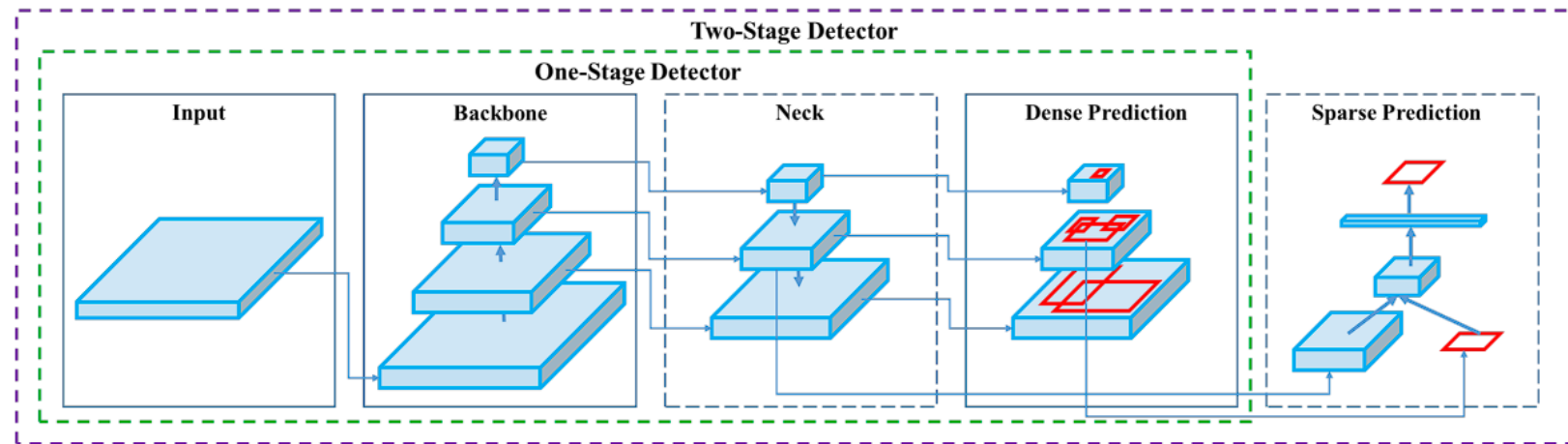
Goals

- Find an automatic number plate recognition solution that is powerful enough to efficiently recognize numberplates and texts from a videostream using CPU.

- The solution should recognize the Latin and Cyrillic alphabets.
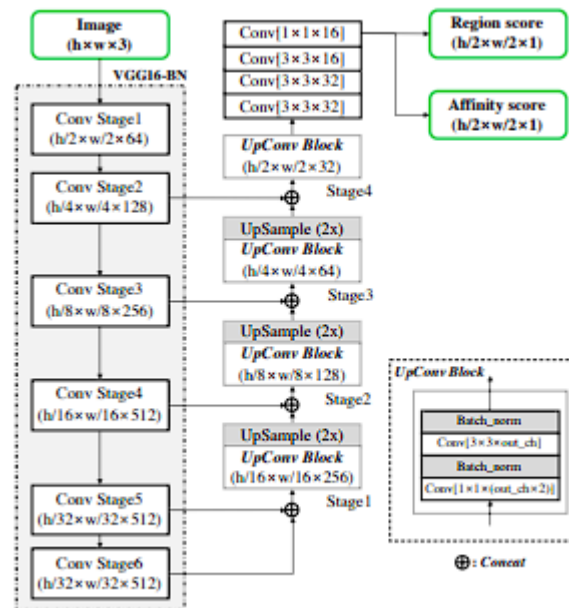
Pipeline

image → Number plate segmentation → Character segmentation → Character recognition → text, coordinates
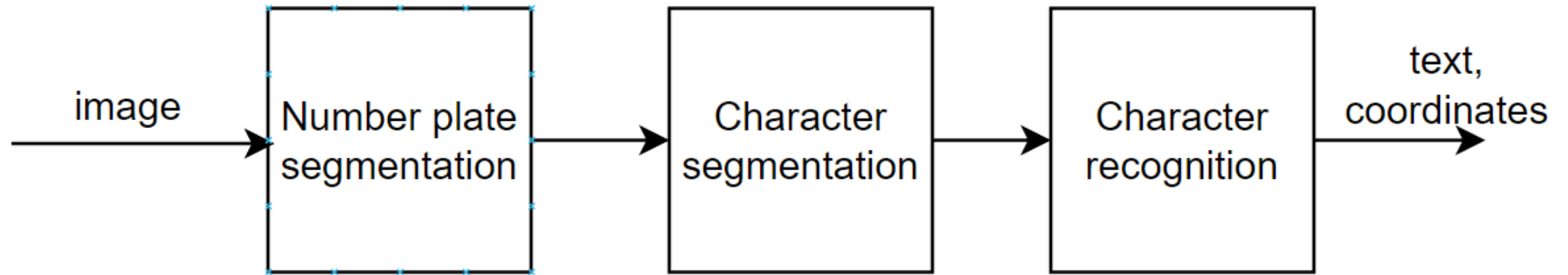
Number plate segmentation

- For number plate segmentation is used YOLOv5 model which is a Pytorch implementation of YOLOv4.

YOLOv4 architecture

Alexey Bochkovskiy et. al.,YOLOv4: Optimal Speed and Accuracy of Object Detection, 2016

Character segmentation

- For character segmentation is used CRAFT which is a neural network based on VGG16.

CRAFT architecture

Youngmin Baek et. al., Character Region Awareness for Text Detection, 2019

Character recognition

- For character recognition was used a neural network based on RESNET18 with bidirectional LSTM on top of it.
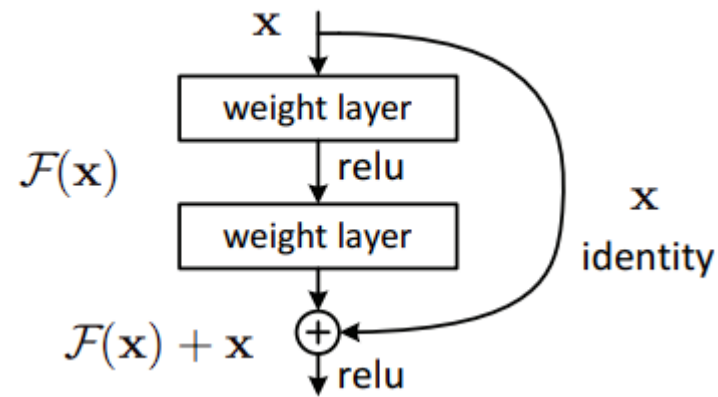
Residual block architecture

Kaiming He et. al., Deep Residual Learning for Image Recognition, 2015

Recognition examples

Results

- Performance of this pipeline was tested on 2 different CPUs and with and without multithreading. The obtained results are calculated without intermediate operations of writing to the database and drawing on images. When using these operations, performance is reduced by 15%.

Time for one frame reconition,s

Ryzen 5 1600 16 RAM DDR4	Ryzen 5 1600 16 RAM DDR4 2 threads	Xeon e5 2666 12 RAM DDR4	Xeon e5 2666 12 RAM DDR4 2 threads
0.33	0.31	0.5	0.38

Conclusions

- On tested devices, we got 2-3 fps, which is enough to recognize license plates of cars in the city if the camera has a top view over the road

Thanks for your attention