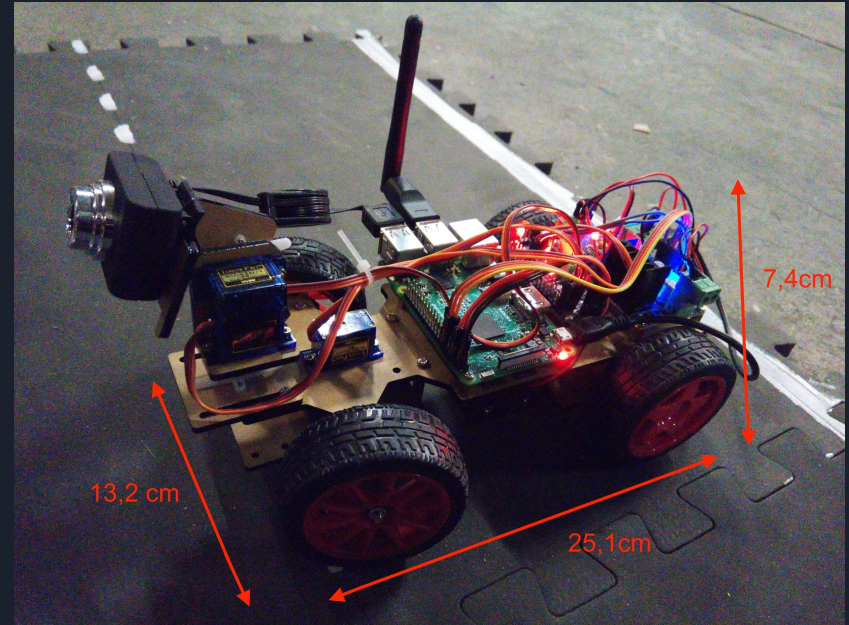


SmartCar

Axel Mendoza
Thibaut Barroyer

Raspberry Car's Hardware

- 13.2 x 25.1 x 7.4 (cm)
- 800 g
- Max speed 2 km/h
- 3 hour autonomy
- Wireless communication
- Remote access





Raspberry Car's Hardware

- Raspberry PI 3 equipped with 4 processor cores
- Wish-eye camera handling 15 fps
- Ultrasonic sensor with 1m range
- Wireless antenna of 300 MBPS

Costs

Matériel	Quantité	Prix	Livraison	Total
Pack de 16 dalles	4	30.00	0	120.00
Smart Video Car Kit for Raspberry Pi	1	90.59	0	90.59
Raspberry PI 3 Model B	1	40.26	0	40.26
Clé Intel Movidius	1	98.96	0	98.96
Clé Wifi nets XF2123	1	11.99	0	11.99
Märklin World 72201	2	9.89	6.99	26.77
6 * AA Battery	2	6.00	0	12.00 €
Total				407.57

Trajectory Planning Pipeline



Raspberry Car



Generate
Angle/Speed
labeled data

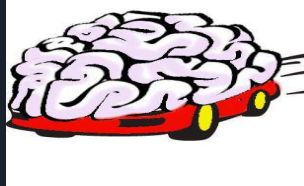


Pre-process
and
augment data

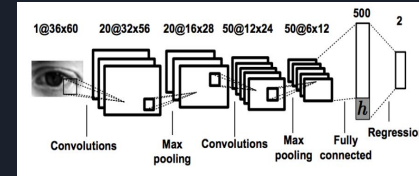
Real-time
Angle/Speed
prediction



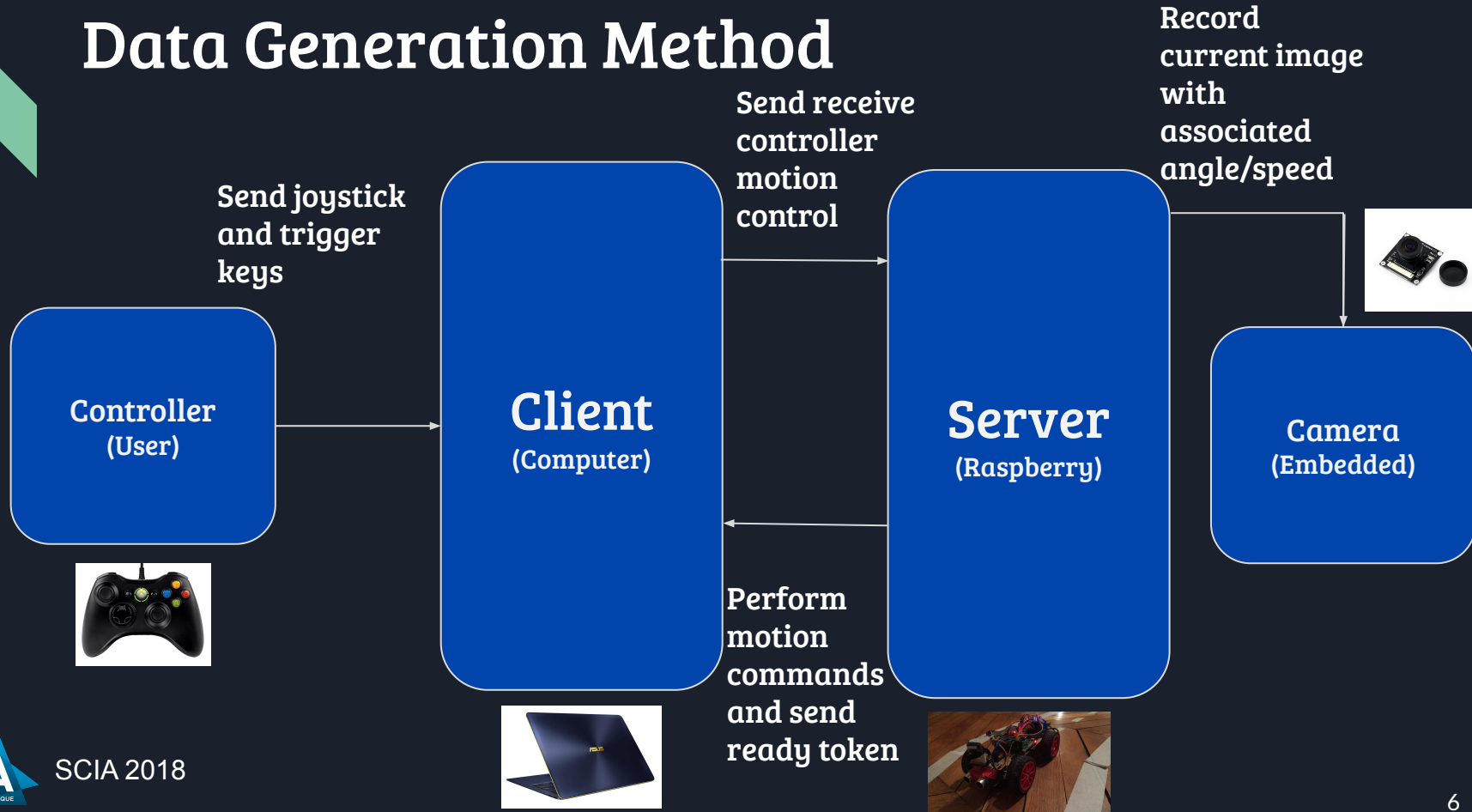
Dump model
on
Raspberry Car



Train
Deep Learning
model



Data Generation Method



Data Augmentation

1. Flip Image



Original
angle_label = -1



Flipped
angle_label = 1

2. Random brightness generation on original and flipped images



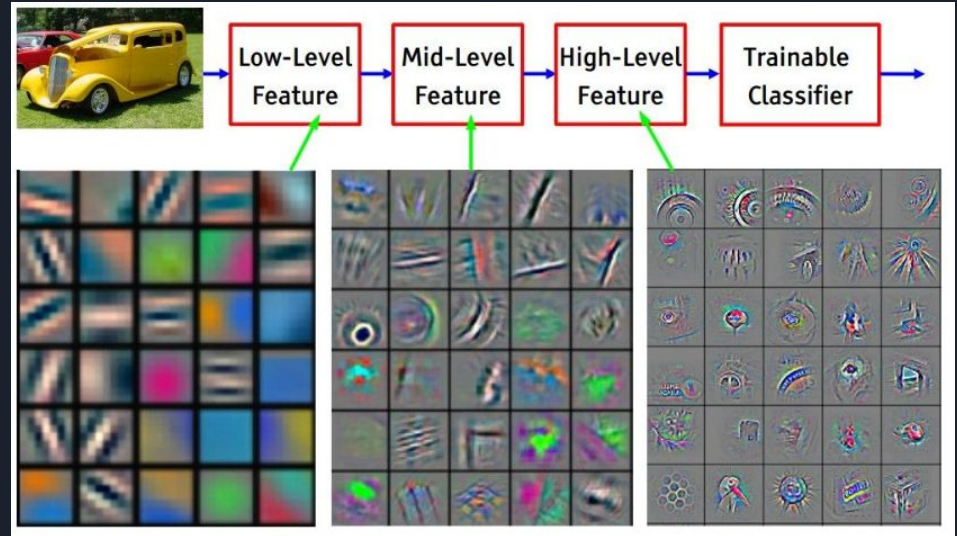
Why CNN ?

Pros :

- Invariant in translation
- Can analyze from **small** to **high** patterns
- State of the art in **computer vision**

Cons :

- Need a **lot** of data



Model Architecture

- Light enough for real-time prediction on raspberry
- Good performance



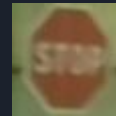
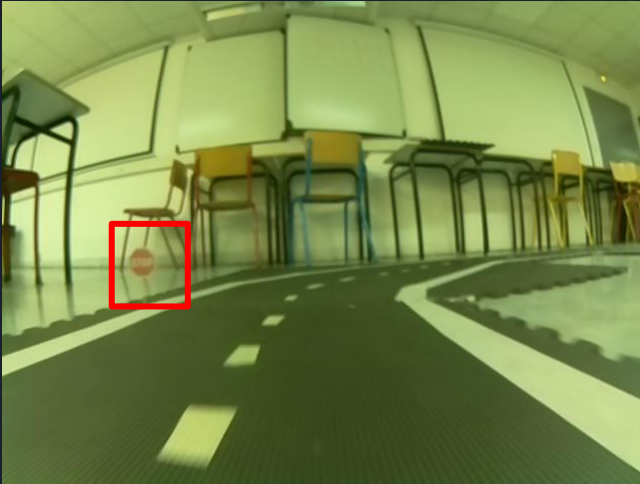
Obstacle Detection

- Ultrasonic sensor
- Range of 1 m
- Stop in front of obstacles



Sign Detection

- Need to detect boxes of the sign in the image
- Same model as angle/speed detection



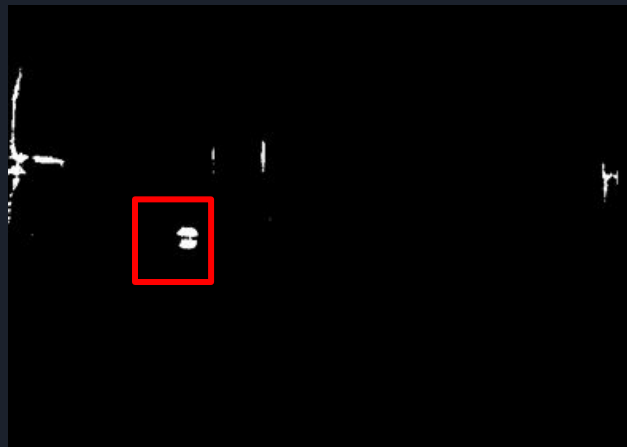
Box Detection Method

Hough transform:

- common method for circle detection
- not for real time

Hand-made method:

- edge detection
- try to fit circle
- predict with the sign classifier



Sign Dataset

- 1) Random flip
- 2) Random scale
- 3) Random shift
- 4) Random brightness



Driving Demo



Improvement tracks

- Intersections management
- Improve computing power - Donkey Car
- Movidius - Inception
- LSTM



Contact

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THANKS!

ANY QUESTIONS?