

Learning to drive based on multiple sensor cues in The Open Racing Car Simulator (TORCS)

Project Progress Presentation

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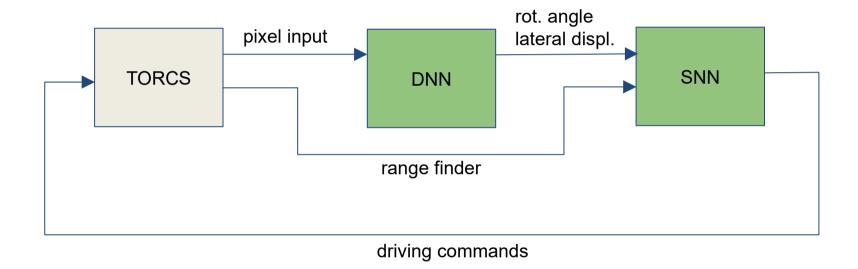
Presentation Structure



- 1.Overview
- 2.CNN
- 3.Controller
- 4.Timetable

Overview





DNN: Deep Neural Network

SNN: Spiking Neural Network

Controller



The nengo controller is built with the following **modules**:

- Steering
- Accelerating / breaking
- Gear changing
- Clutching

We aim to use **supervised learning** for the following modules:

- Steering
- Accelerating / breaking

The other ensemble connections are handcrafted.

Supervised Learning - Steering



Input Signals:

- Speed
- Lateral displacement
- Rotation angle
- Range sensor (19 dimensions)

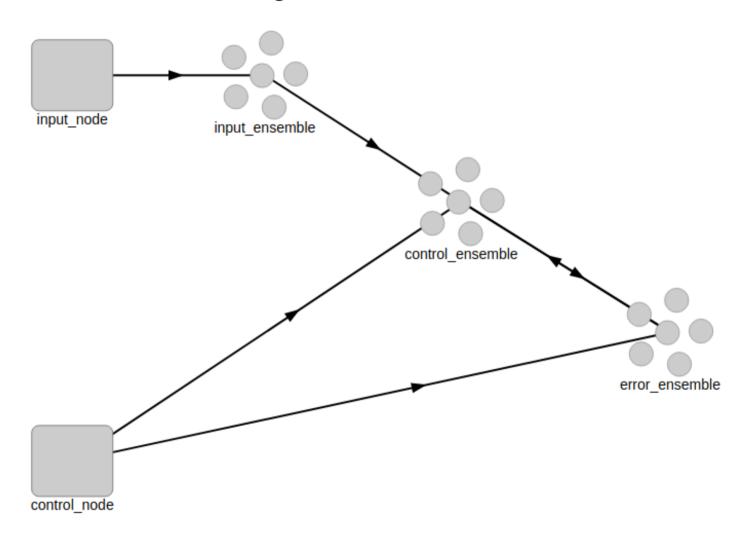
Output Signals:

- Steering angle

Supervised Learning – Steering



- offline online learning



Controller



- learning alternatives
- Nengo deep learning library
- Train connection function with tensorflow / keras
- Hard code connection function



- learning sensor data from images





Distance



- training the network

One training track

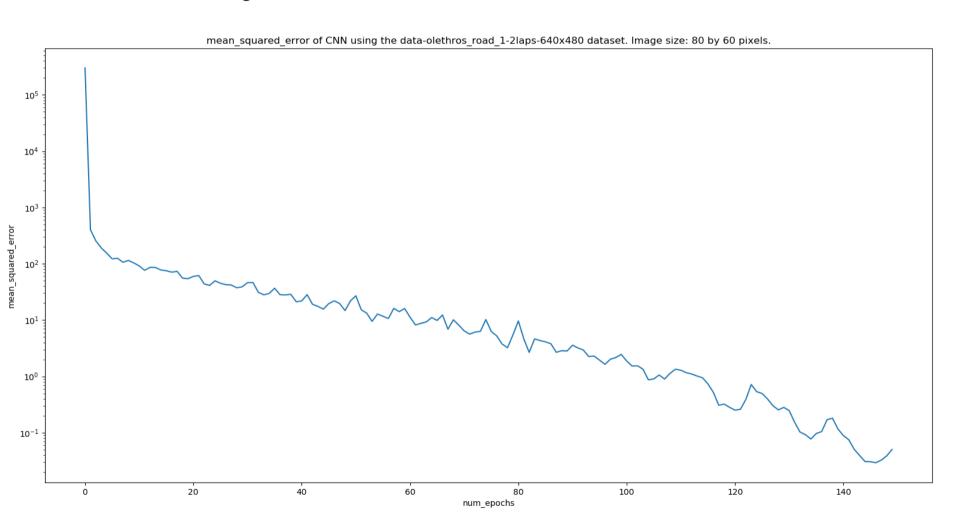
4930 samples

150 training epochs

Input image scales: 0.125, 0.25, 0.5

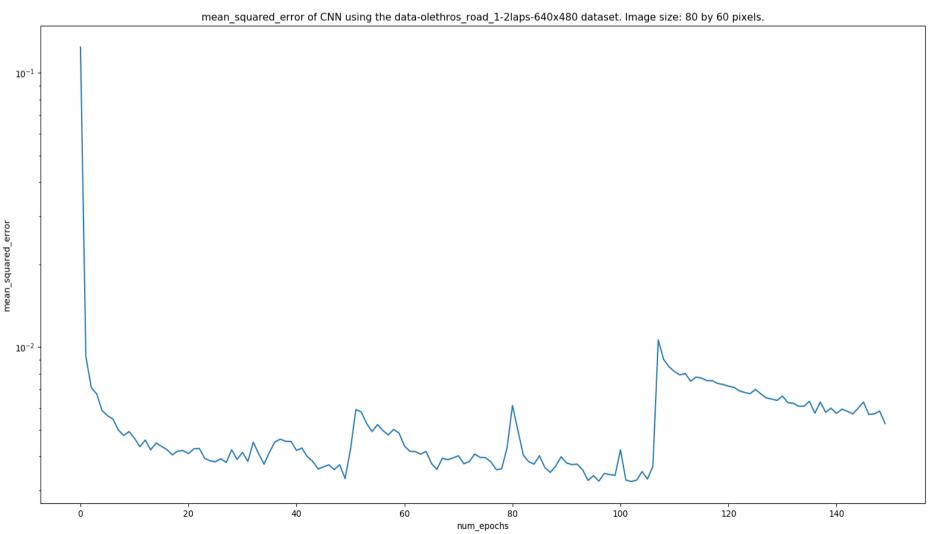


Img \rightarrow Conv2D \rightarrow FCL \rightarrow FCL \rightarrow values





"AlexNet": Img \to Conv2D \to Conv2D \to Conv2D \to FCL \to FCL \to FCL \to values





- possible improvments

- Generate own training data
- Generate more training data
- Try different network architectures
 - difficult to evaluate without testing

Timetable



We are a bit behind on our original planing

Now:

- Write report draft 7/12/17 14/12/17
- Write final report 15/12/17 11/1/18

Until report draft:

- Finish training the CNN
- Experience on training the SNN

Final report:

- Connect CNN and Controller
- Discuss the supervised learning results for the SNN

Questions



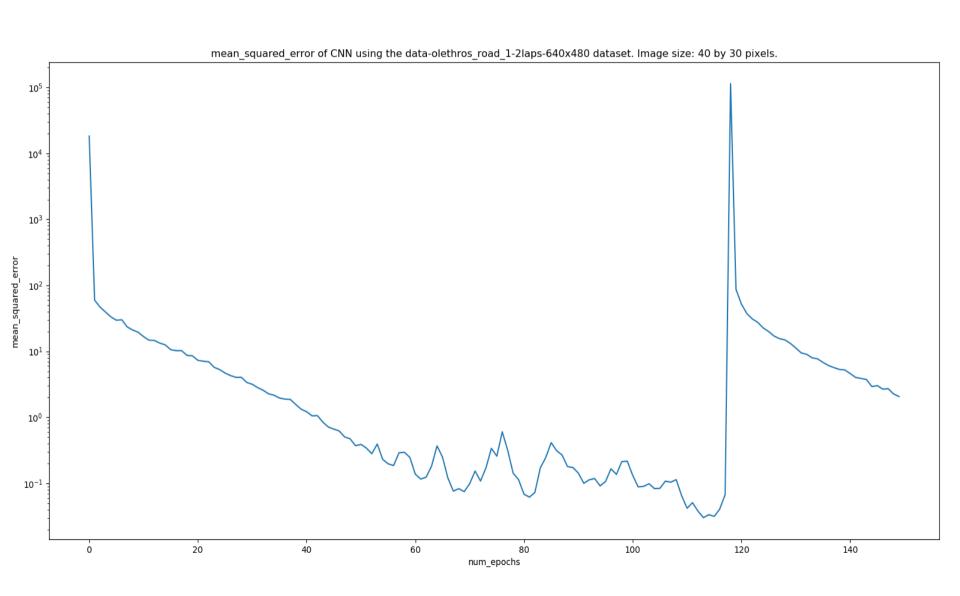
- Does our car need to be able to drive on tracks we didn't train on?
 - "generalised model"



Thank you for listening!



 $Img \rightarrow Conv2D \rightarrow Conv2D \rightarrow FCL \rightarrow FCL \rightarrow values$





 $Img \rightarrow Conv2D \rightarrow Conv2D \rightarrow FCL \rightarrow FCL \rightarrow values$

