### Minicar Training

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#### Members

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#### Motivation and goals

In this project, we will train deep learning models to drive DonkeyCars autonomously on different tracks. On each track, the car will have some additional task. Potential ideas for tracks and tasks include

* having the car avoid randomly placed obstacles on the track,
* having two cars drive on a figure-8 track and learn to give way to one another (obey the Priority-to-the-right rule for example),
* traverse an agriculture field in between the beds.

We will choose at least 2 ideas to train but multiple projects have already explored avoiding obstacles on a closed track so we might not do that.

#### Data collection

The model will learn through imitation learning: a human first drives the track multiple times and the model learns to steer and accelerate from the video feed. The car has a forward-facing camera that records the lap.

After the first round of video feed is collected by the human and a model is trained, we can have the model drive around and record its trip. Then we can use the model’s video to train a new generation of the model. Later generations tend to learn better because a model’s driving is smoother than a human’s.

#### Methods

The data is collected by humans driving the car with a video game controller and thereafter the model is trained to imitate the driving style. DonkeyCar software has existing artificial neural networks that can be used for model training but most likely we will design custom networks for our tasks.

We expect processing the video data to be an important part of the project because the cars have a lot of variance to them. The steering angle, driving speed, and camera focus differ between cars and the camera image depends on the environment’s lighting (sunny day vs night).

We will train different generations of the models as described in the previous chapter.

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#### Notes from the meeting (don’t include this in the checkpoint!)

* Quick start guide: <https://docs.google.com/document/d/1u85Od-jY9HA28jDJ3Vus7W6ejri7PhZWXl5SkZC1vos/edit>
* read battery instructions to not blow it up
* if the camera seems foggy, change cam’s focal length by adjusting the wheel on the cam
* don’t keep controller batteries in the controller if not using the controller
  + to test if controller batteries are depleted, press “vibrate” on the controller
* come up with multiple tasks so we have a use for all 5 people. Potential ideas:
  + avoiding obstacles on a track (same as shown in the demo)
  + have two cars drive on a figure-8 track and learn to give way to one another (via the right-hand rule for example). - proposed by Peep
* One significant part of the project could be data preparation: figuring out how to filter/augment/transform the image so that the performance is consistent in different environments (sunny day vs night). Doing this thoroughly is enough work for an entire person.
* To spice up a model, Ardi said we can try training different generations. 1st gen model learns from the video feed of the human driving. Once this model has learned, the 2nd gen model learns from a video feed generated by the 1st model driving. And so on for possibly multiple generations. Ardi said that later generations tend to drive better because humans don’t drive as smoothly as a learned model.