

# AutoPylot

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# 1 Introduction

## 1.1 Project nature

Autonomous cars will likely dominate our roads in a relatively close future, with this project, we aim to have a first approach to such a complex problem. We will be using a 1:10 scale radio controlled car transformed into a small autonomous car !

## 1.2 State of the art

In this section, we will try to see what was previously made in this sector of industry. It would not be realistic to compare our 1:10 project to real sized cars such as Tesla's, simply because in a racing environment, we don't need to deal with such an amount of safety: pedestrian detection, emergency braking, speed limit detection and other. So we will only see miniature autonomous racing framework that we would likely race against.

The most known is called "DonkeyCar", created by Will Roscoe and Adam Conway in early of 2017. Most of the models trained with DonkeyCar are behavior cloning models, meaning models that tries to replicate the behavior of a driver. This methods uses a big amount of images (input) associated to steering angles and throttle (output), it requires the user to drive the car (collect data) prior to training the model: no examples means no training. The lack of training data often leads to the car leaving the track.

One other framework worth looking at is one created by Nvidia called "JetRacer" released in 2019. It uses a different approach from DonkeyCar where the user annotates the images by hand by clicking on where the car should go. The model used is similar to what DonkeyCar uses meaning a Convolutional Neural Network with one input (the image) and two outputs, one for the steering angle and one for the throttle to apply.

# 2 Objectives

## 2.1 Final objectives

Our main objective is to make our car race against other cars and win the race ! This will require multiple intermediate milestones:

- Being able to send scripted controls to the motor and servo
- Being able to drive the car manually using a controller
- Develop a way to gather images and annotations and store them in a structured way, for example sorted by date
- Process those data before feeding them to the neural network
- Being able to train a convolutional neural network using those data
- Tweak the architecture and the parameters of the chosen model to acheive the best results
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## **2.2 Optional objectives**

Those are the opt objectives

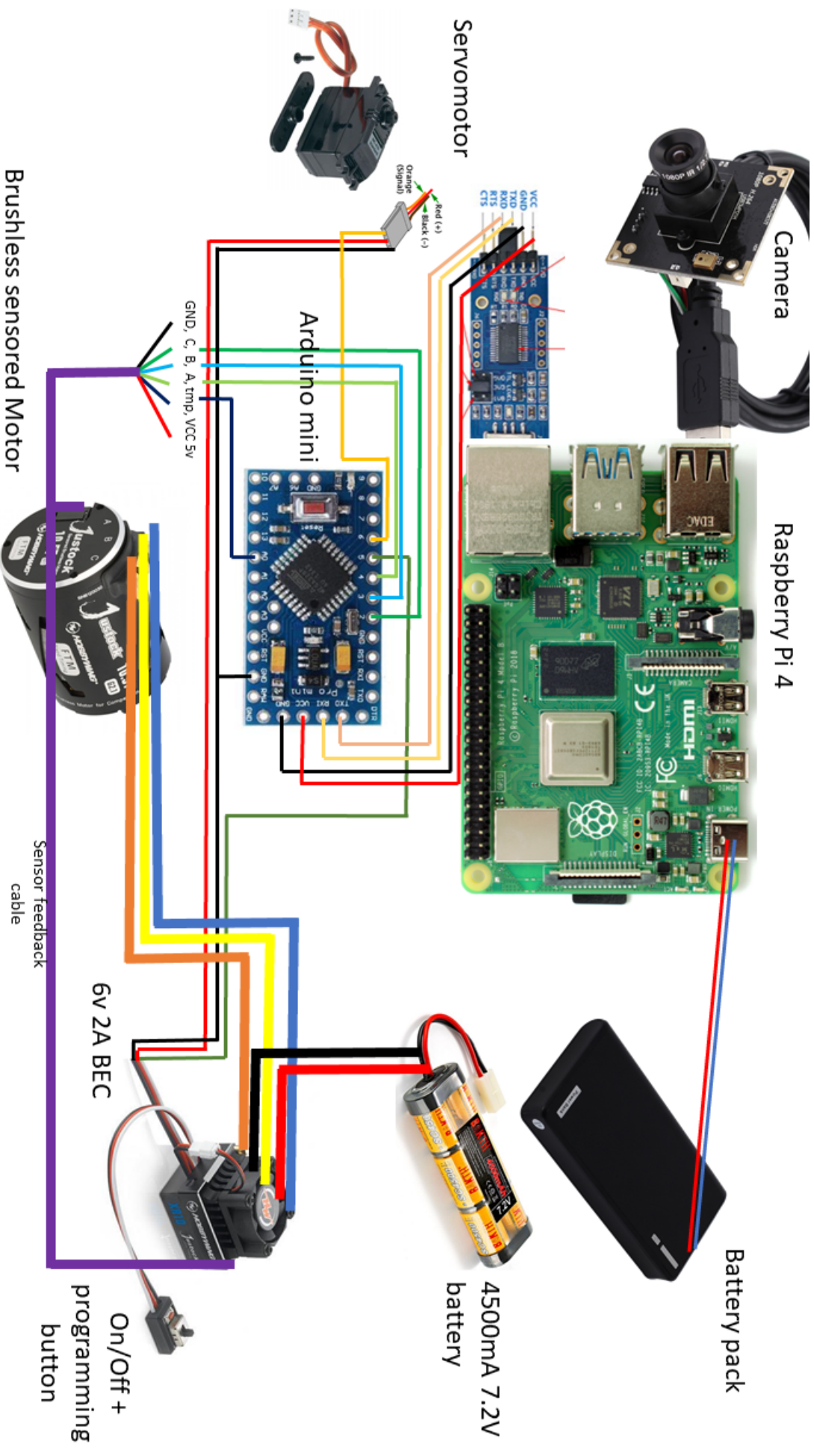
## **2.3 Motivations**

Those are the final requirements

# **3 Technical specifications**

## **3.1 Hardware**

Those are the technical specifications - what we need - what will we use ?



## **3.2 Software**

- data generation / gathering - what software parts we will need

## **3.3 Constraints**

- weight - language: python - autonomous navigation - data ? - framerate, efficiency of the algorithm - safety

## **4 Planning**

## **5 Task allocation**

## **6 Conclusion**