Robotics Autonomous vehicle camp list of topics

**Day 1**

* Icebreaker – blind navigation
  + ~~Something related to having students move around an area blindfolded with another student as a guide acting as the ‘computer’~~
    - Students think about what type of ‘data’ the computer will have to relay in order to efficiently navigate a space
  + Maybe use the Tello drones for this
* Intro to autonomous vehicles
  + 5 levels of
  + Waymo
  + Sensor technology

3Pi 2040 robots

* Why are we using them
  + Overview of their sensors
  + Demo programs
* Micropython essentials for the 3pi robots
  + LEDS
  + Sound
  + Motion
  + Buttons
* Project 1 – Robot Dance routine (Before lunch day 1)
* **Overview of PID control**
* PID Tuning Lab
* Drive a route using PID controller code (warehouse navigation challenge)
* Assemble the MentorPi (likely will be day two)
  + **Ensure batteries are charging**
* ~~Project 2 – Movement to distance/driving straight data collection~~
  + ~~Goal 1 – figure out how to define 1 meter (or another unit) based on motion commands~~
  + ~~Evaluate how well the motion command allows the robot to maintain a straight path~~
    - ~~Simple move based on time~~
    - ~~Move based on encoder values~~
    - ~~Move based on a PID controller (custom code)~~

**Day 2**

* IR ground sensing (Code 7-9)
  + How does it work?
  + **Experiment**: Boundary Contain
  + **Experiment:** Lane-assist lab
    - Design and test custom lane
* Wind Sprint Challenge

Switch Robots to the MentorPi

* **Drive Challenge** - Race with controller or some kind of drive challenge
* Intro to ROS2
  + Nodes and communication
  + Ackerman steering overview
* Connecting to the Mentorpi robot and linux CLI basics
* Basic ROS commands

**Day 3**

Human vs. AI Quick Draw challenge

AI and neural networks brief overview

* Play around with some AI tools
  + Quick Draw
  + AI Duet

MentorPi Vision experiments

* Pose detection and metapipes
* Map Driving / YOLO object recognition

Kit Soldering

Wrap up and conclusion