Traveling Robot Van

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Sponsor: Dr. Michael Shafer

Design Requirements

- Goal 1: Build two robots for classroom demonstrations
- Goal 2: After the prototypes are finished, create a handful of the two robots
- Sub goals:
  - Make the robots safe
  - Provide educational value
  - Robots are easy to operate for both teachers and students

Introduction to Robots

- Robot 1: Self-Balancing Robot

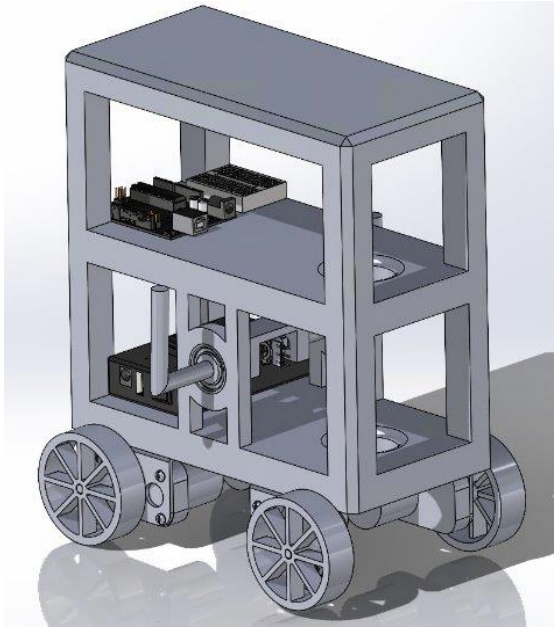

Figure 1: CAD Model of the self-balancing robot

- Robot 2: Ball & Beam Balance

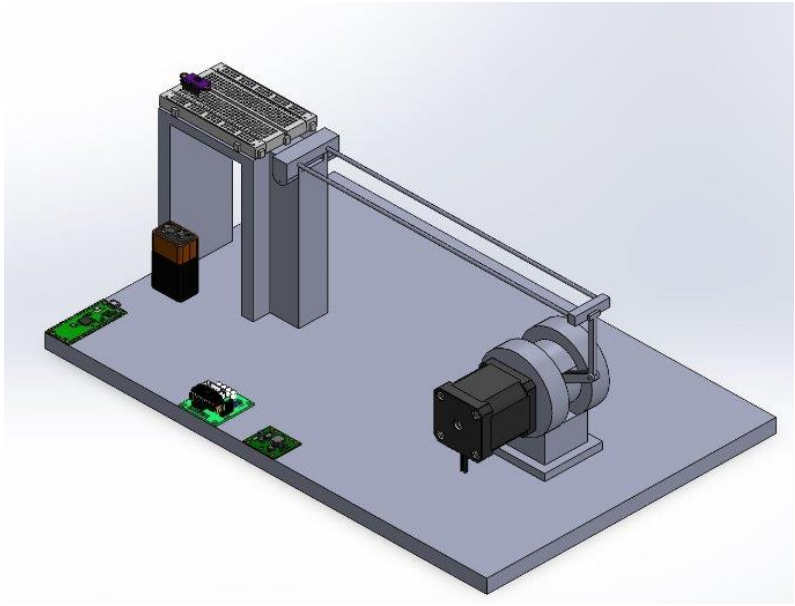

Figure 2: CAD model of the ball and beam balancing robot

Robot 1 - Introduction

- Goal is to build an inverted pendulum robot
- So far:
  - The EE half initially tuned the PID Controller to output generally correct motor speeds
  - The ME half of the team designed a CAD model
  - The team made an initial hardware prototype

Robot 1 – Parts List

Figure 3: WH148 Potentiometer

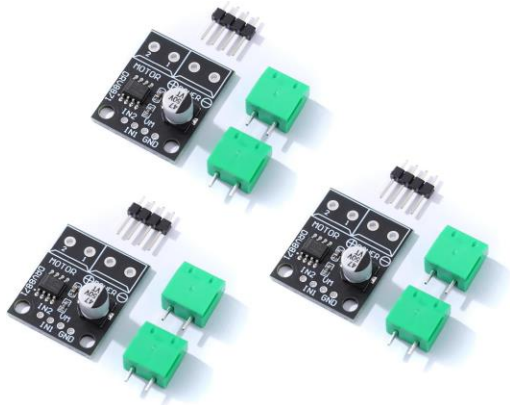

Figure 4: DRV8871 Motor Driver

Figure 5: GM3865-520 DC Motor with Encoder

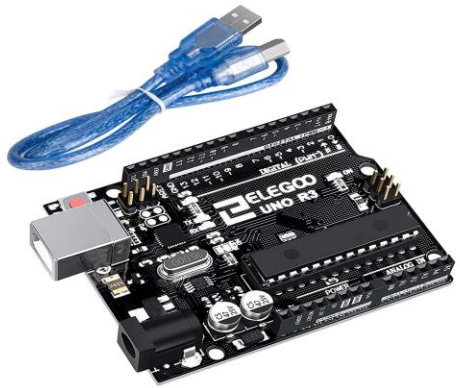

Figure 6: Elgoo Uno R3

Robot 1 - Diagrams

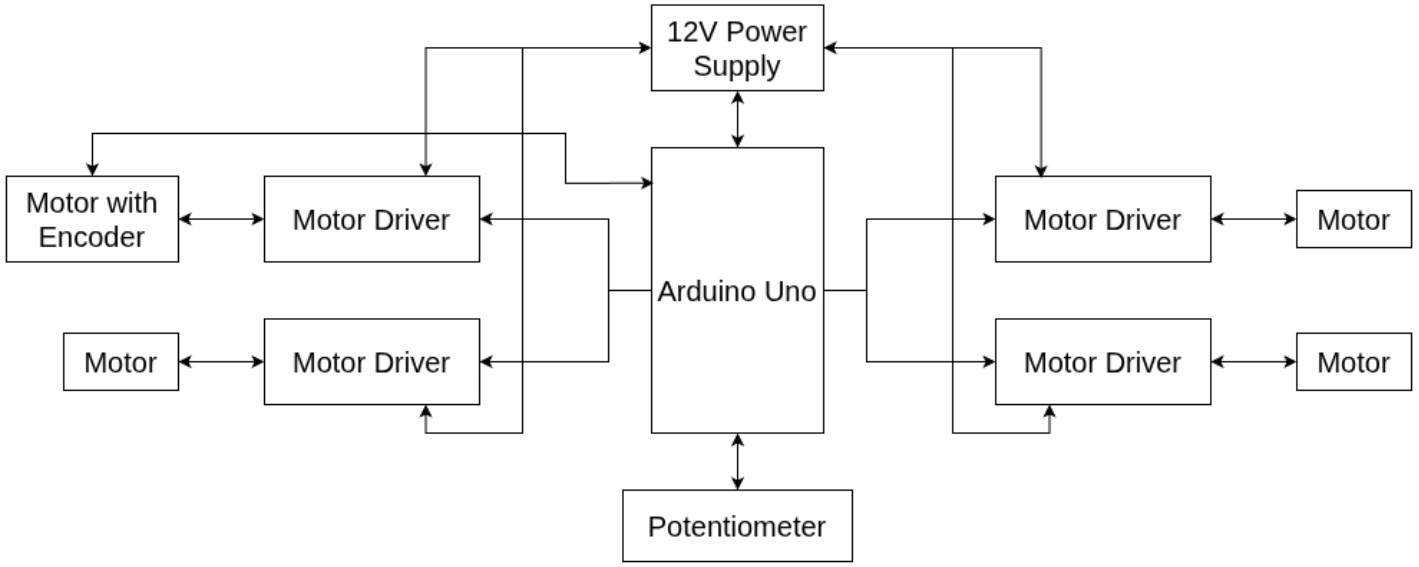

Figure 7: Simple Circuit Diagram for the Inverted Pendulum Robot

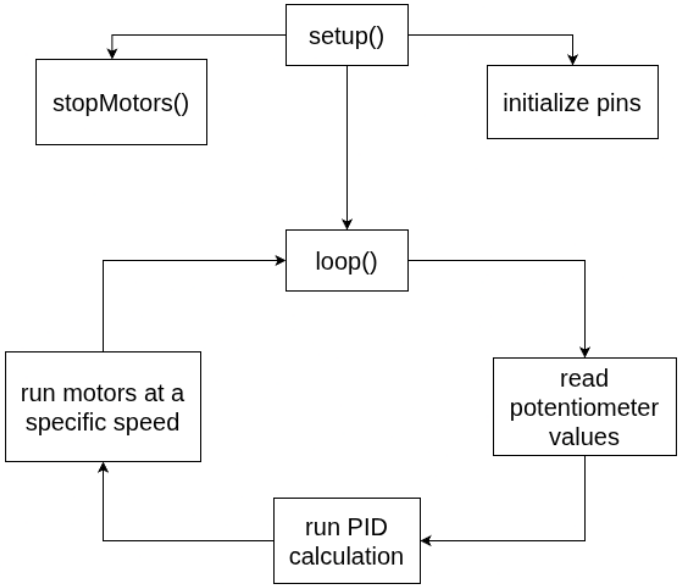

Figure 8: Code Flowchart for the Inverted Pendulum Robot

Robot 1 - Prototyping

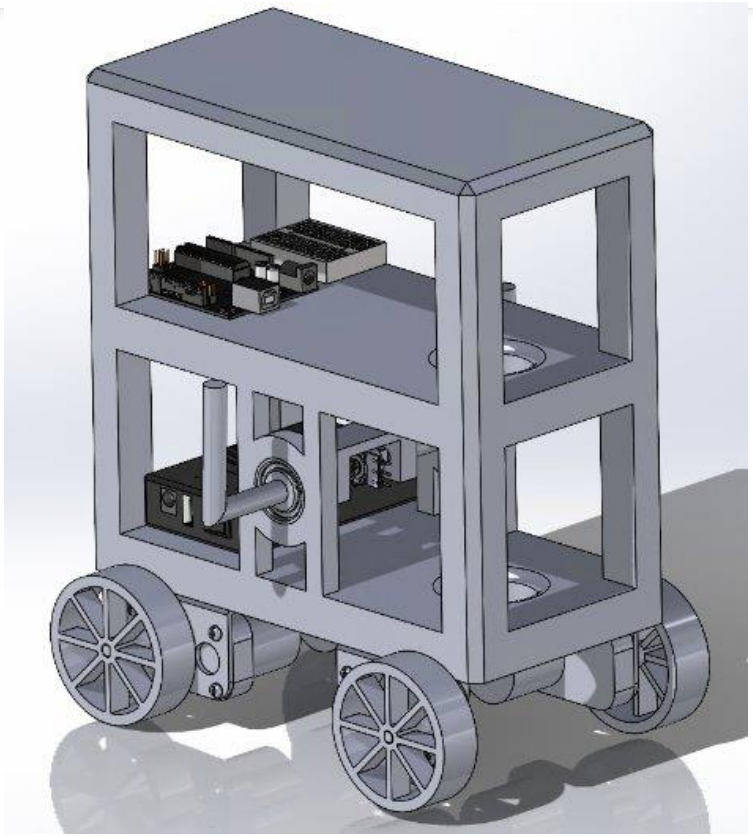

Figure 9: CAD Model for the self-balancing robot

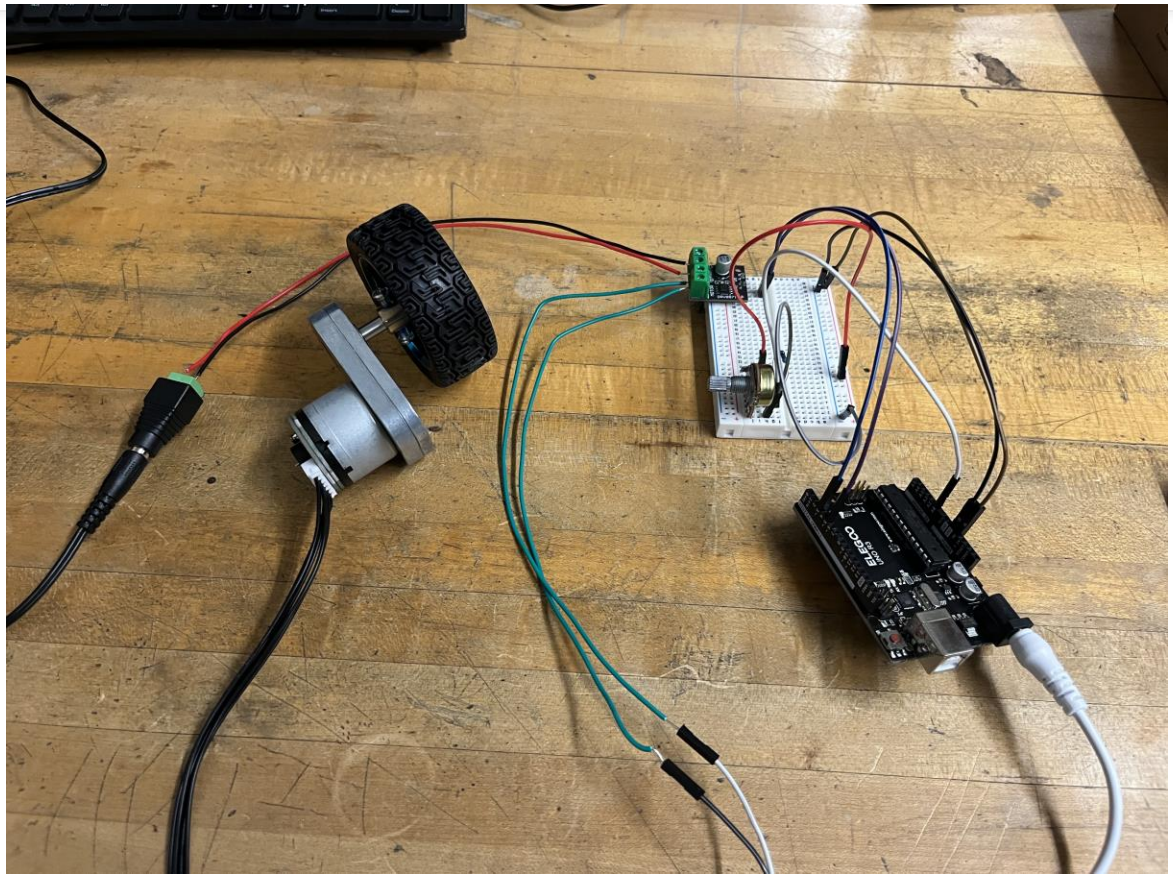

Figure 10: Electrical prototype of the CAD models circuits

Robot 2 - Introduction

- Goal is to design a ball and plate balance robot
  - Scaled back design to focus on the motor design and code
- Right now, the prototype is building a one-dimensional system that can be used to scale up into the ball and plate balancing robot

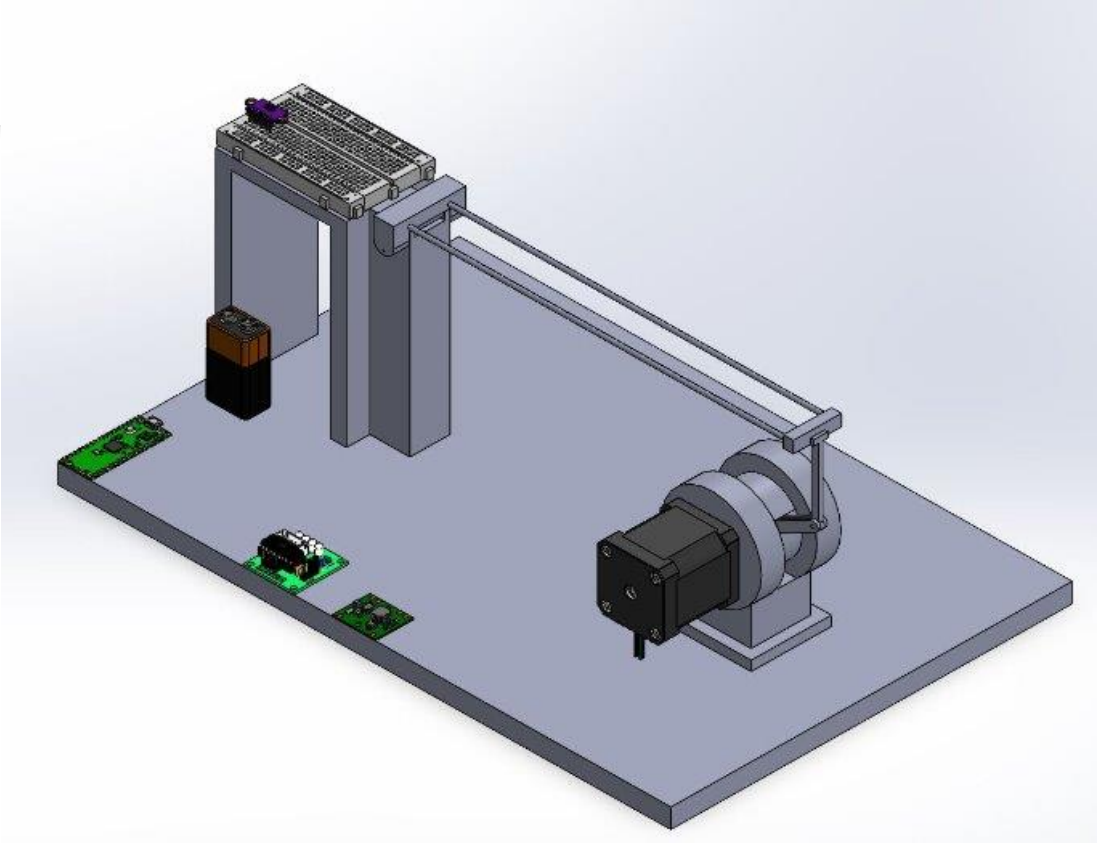

Figure 11: CAD Model of Ball and Beam system Drawn up by the Mechanical Engineering Team

Robot 2 - Parts List

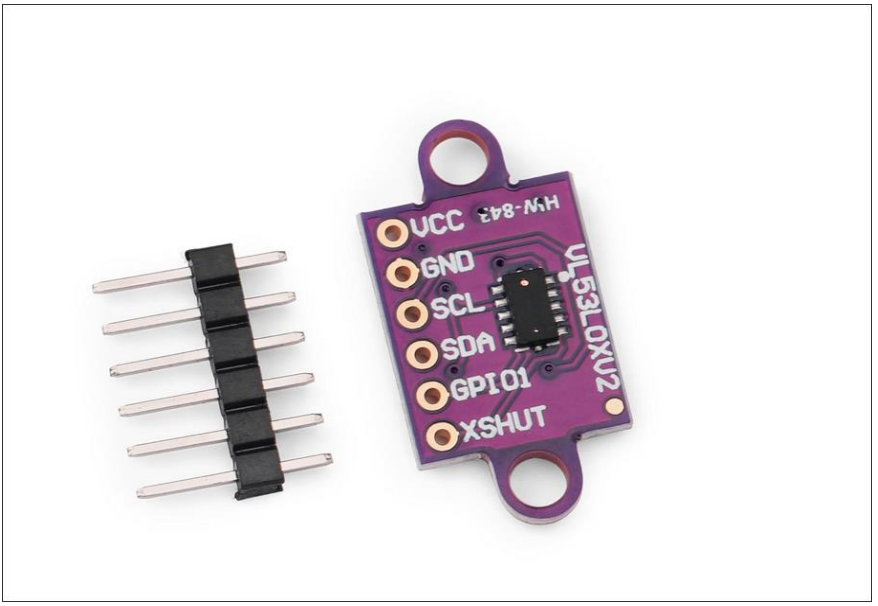

Figure 12: Time of Flight Sensor

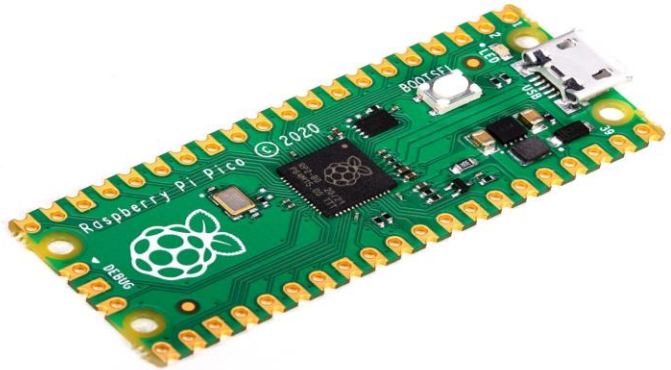

Figure 13: Raspberry Pi Pico

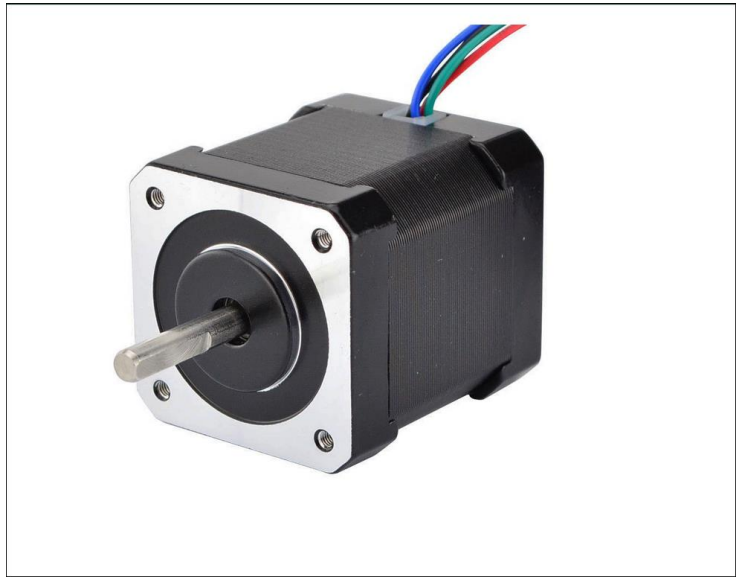

Figure 14: 12V stepper motor

Robot 2 – Prototyping

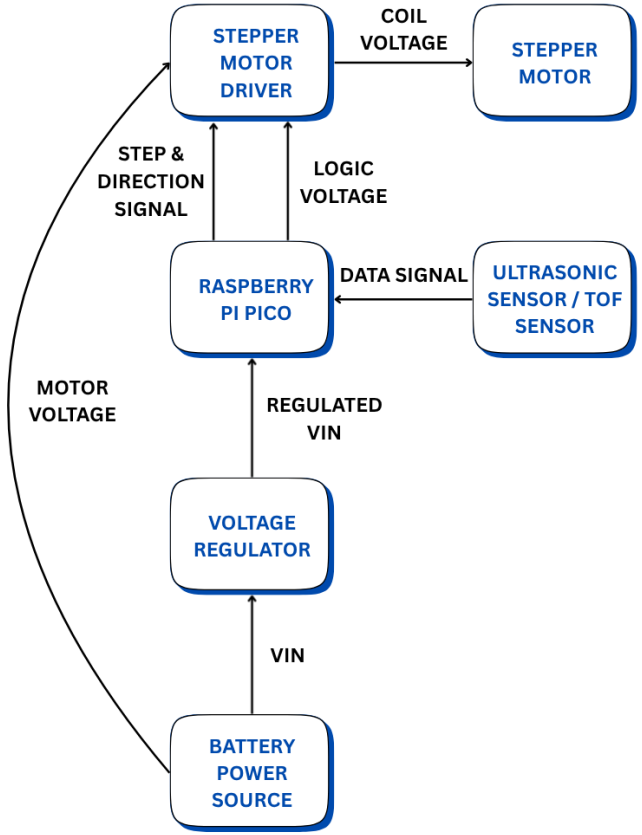

Figure 15: Circuit Diagram for Ball and Beam Robot

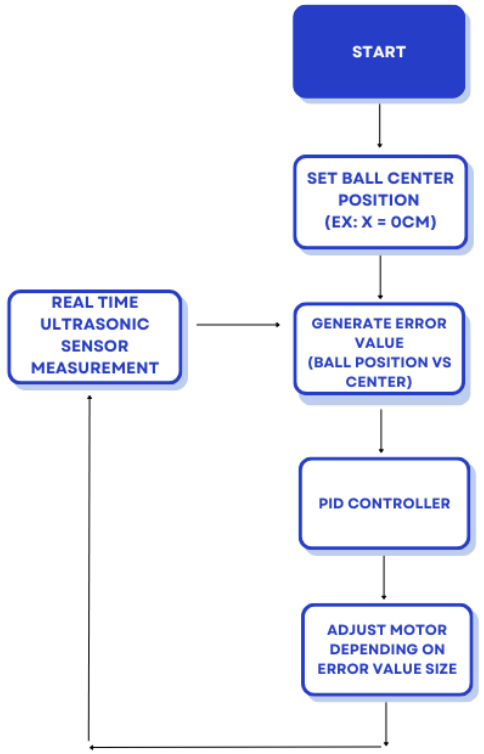

Figure 16: Code Flowchart for Ball and Beam Robot

Robot 2 – Prototyping

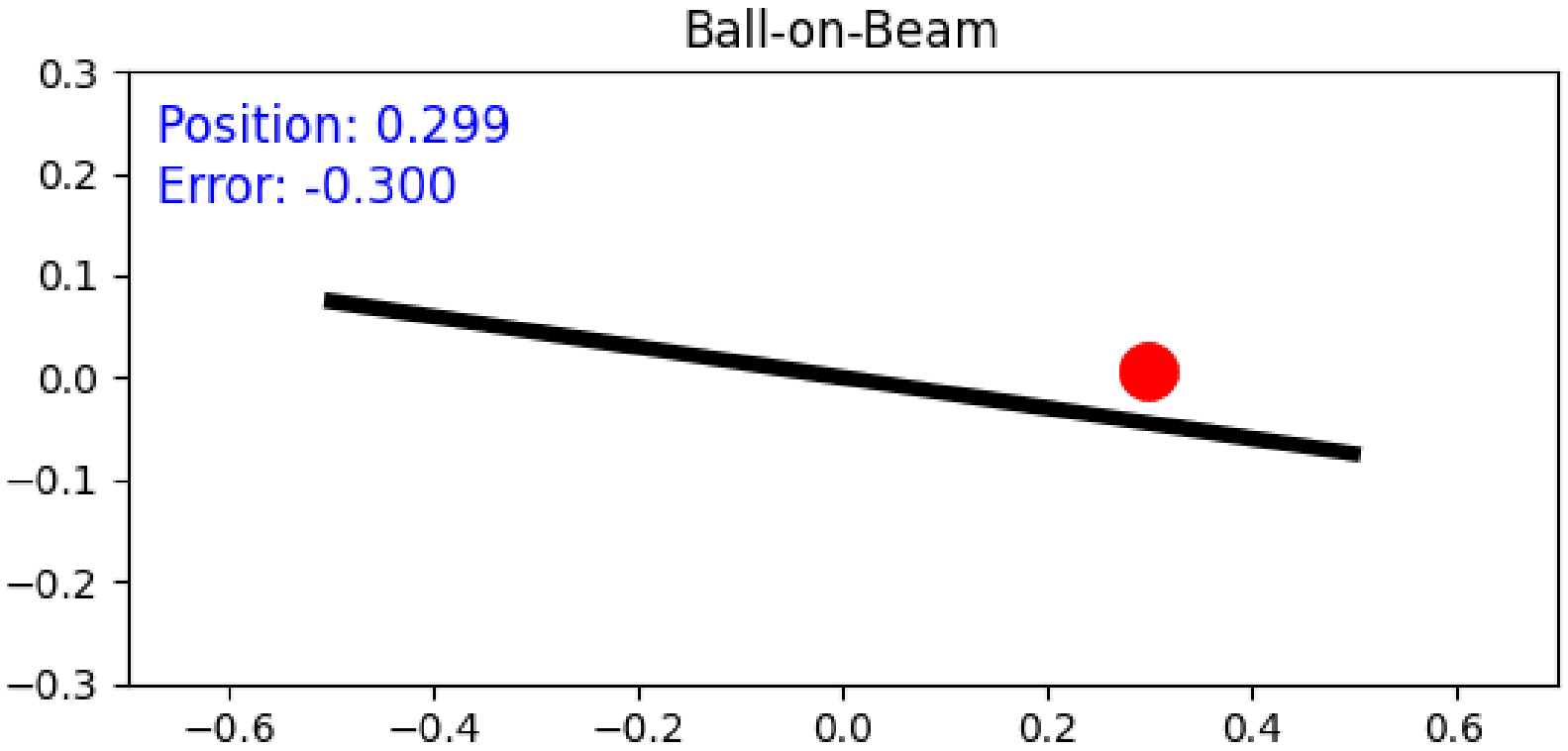

Figure 17: Live simulation of the beam and ball balancing system

- Motor moves beam depending on error size

Questions