

Balancing an Inverted Pendulum on a Cart

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ME 4012 Modelling and Control of Motion Systems

Hardware

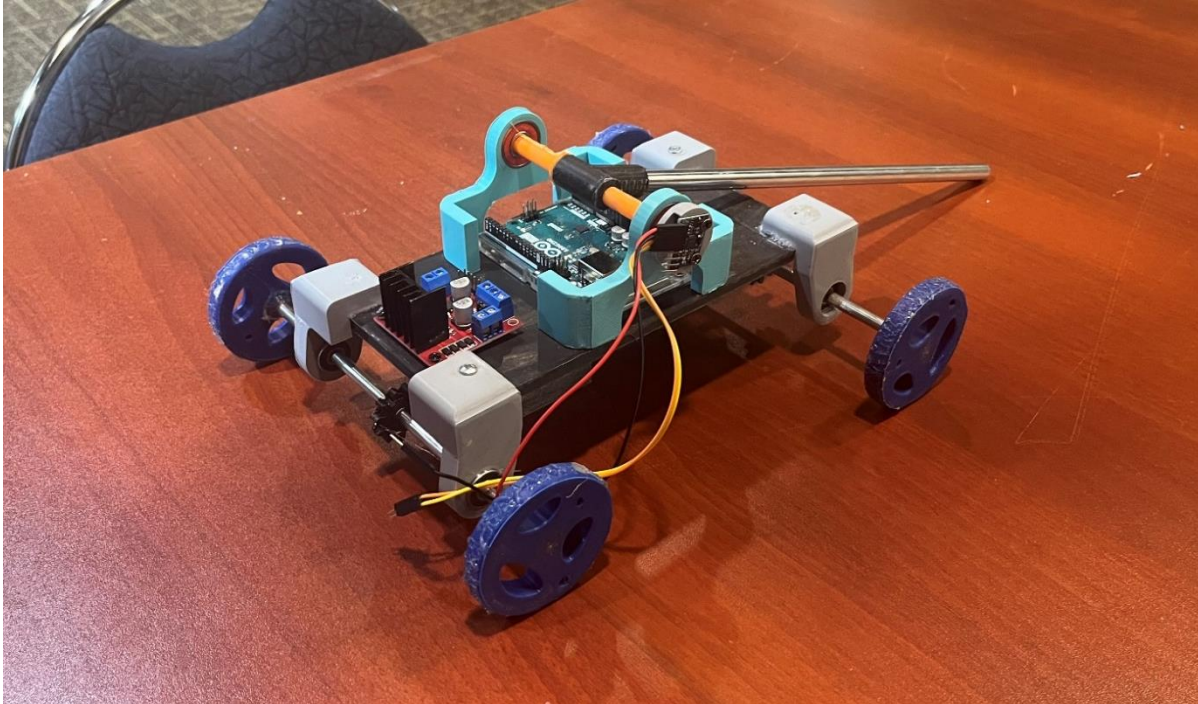


Figure 1. Overall View of The Vehicle

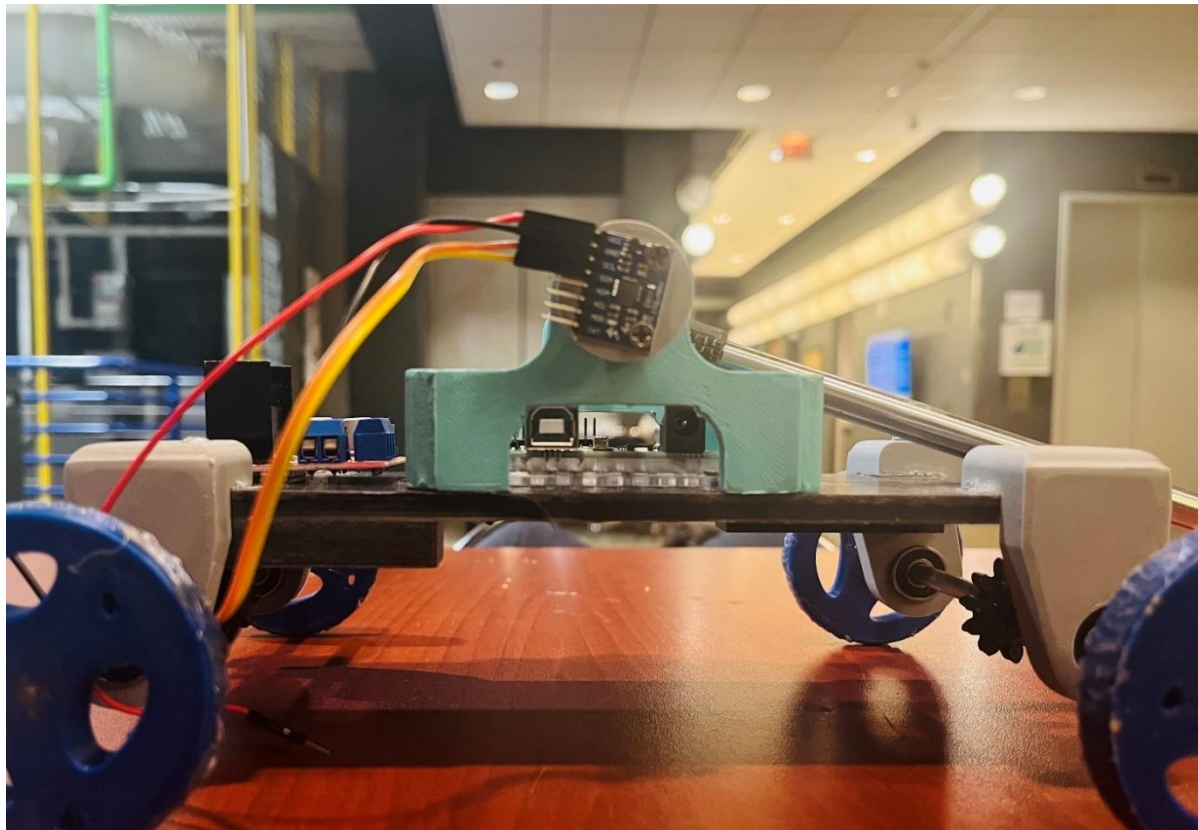


Figure 2. Sideview of the Vehicle

Things Working Well

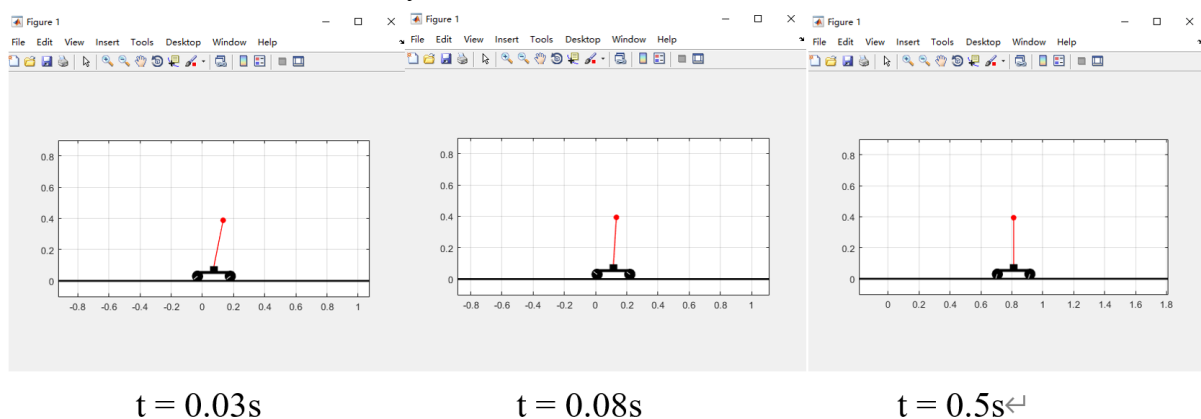
The entire cart structure is very strong and can withstand well the weight of the 30-cm steel pendulum. The bearings are smooth and does not create a significant amount of friction / damping even when operating at high speeds. The IMU sensor as well as the motor controller board has been tested to work fine and we have the code ready at https://github.com/RongmingGuo/ME4012_FinalProject/tree/master/ArduinoCode.

Things Working Poorly

We are having problem with our drivetrain. One major issue is slipping at the gear. We've purchased flange for the motor and redesigned our gear to be able to pair with the flange. We don't have all the parts ready yet. Another issue is finding a suitable battery pack for the Medium geared motors. We tried to drive it using 5V voltage supply from Arduino as well as the motor driver board but it barely moves. Seems we need a 24V battery pack? Those are really hard to find :(

Next Steps

A simple PD controller has been tested in the simulation, and we have several pairs of PD gains that might be able to work. However, we don't know how drastic a difference there is between the ideal and the real system.



←
($K_p = 2$, $K_d = 0.1$)

When the flange arrives and we have the battery, we will finalize our drivetrain and start moving the testing onto the real system rather than in the simulation.