

# Assignment Report

## Goal 1:

Forked the repository and cloned it locally.

Created a new ROS package called `inverted_pendulum_controller` using `catkin_create_pkg`.

Ran a simulation using the given initial parameters by substituting in the node file.

## Goal 2:

Made a sinusoidal force controlled by amplitude and frequency using the equation:

```
force = amplitude * (amplitude - 0.5) * (1 - 2 * (abs(t * frequency - round(t * frequency))))
```

Recorded the result along with the graphs. Video attached under the name, `octobotics_goal_2.mp4`.

## Goal 3:

Wrote the algorithm and code for PID control of the inverted pendulum, in a vertical position.

Was not able to tune the parameters within the given time. If given enough time, a proper control algorithm using LQR can be created. **Coincidentally, I had created an MPC (Model Predictive Control) model for an Inverted Pendulum on Cart system [here](#) as part of my class project.**

To tune the model, first,  $K_p$  should be adjusted until an approximately oscillating state is achieved. Then,  $K_i$  will be tuned to bring it closer to the stasis state. Then  $K_d$  will be adjusted to reduce oscillations.