294-112 Project Proposal

Objective
High speed collision avoidance with quadcopters. Our goal will be to develop new RL inspired methods for stabilization and navigation through hallway environments at a fixed altitude. This entails learning the visual features of obstacles as well as the the low level dynamics (pitch, roll, and yaw) of the system to avoid the obstacles, utilizing simulation and real world environments.

Related Works
http://rll.berkeley.edu/icra2016mpcgps/ICRA16_MPCGPS
- Only in simulation

https://arxiv.org/pdf/1707.05110.pdf
- No collision avoidance

https://arxiv.org/pdf/1611.04201.pdf
- Trained only in sim → we want to do better than this

Generalization through Simulation:Integrating Simulated and Real Data into Deep Reinforcement Learning for Vision-Based Autonomous Flight
- Pretty good but needs to be better

Technical Outline
- Learn high level vision based obstacle avoidance in simulation
  - GibsonEnv
- Learn details of system dynamics in real world
  - Stabilization with pitch roll yaw
  - Predict future collisions or speed and orientation or both?
  - Do this with front camera and possibly flow deck info
- Novel contribution: how to do sim to real transfer/combine models trained in sim and in real world for improved performance in real world?