INDE599 - Project Proposal
Collision avoidance

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April 30, 2018

For my IND E 599 project, I would like to base myself on the linked paper[1] about an unmanned aircrafts collision avoidance system. However, I would like to tweak the context to a low altitude drone collision avoidance system to prevent crashes against trees, etc.. I will first need to code the model in which my drone evolves. I plan on reusing a similar model as in [1], i.e only considering a trajectory in a discretized plane perpendicular to the ground. I would like to consider deterministic transition probabilities for the sake of simplicity. I'll consider two different models of sensors: perfect sensors and noisy sensors with additive Gaussian noise making the problem a POMPD. The sensors would have limited range r. The first computational task would be to find an approximate optimal policy by running q-learning simulations on the state space until convergence as my state space will be too big to consider direct solving. This will maybe require to implement an exploration policy to avoid falling into unrealistic local minimas. I will model the obstacles to appear randomly and to have variable heights. The complexity of the inference will likely also require to be approximated via a particle filtering technique. I would then evaluate the success rate of my optimal policy with simulations against a simple baseline policy. I for now consider the simple policy of going up if anything within a distance threshold is sensed and down to the horizontal trajectory line otherwise. I would also like to evaluate the performance of the policy as the parameters change - the range and the reliability of the sensors - as well as the coefficients of the linear cost function features.