Memorandum

EEE455/457 (Elec/Comp Eng)

10 Apr 18

PMO EEE455/457

Decision Making using
Computer Vision on Drone Platform

1. Aim. The aim of this project is to create a high-level decision-making system for an aerial platform that can make decisions based on computer vision input and track a pattern or figure on the ground without a needing to create, modify, or illuminate the target.

2. Background. Many applications for aerial vehicles involve observation or inspection of assets on the ground. Often these assets are arranged in a pattern and spread out over large distances. Creating a system that allows for an aerial platform to track features on the ground for long distances would enable inspection of assets such as row crops, transmission lines, tree fruit, or coastlines. Creating a system that allows for an aerial platform to track a single feature on the ground could enable inspections of buildings, vehicles or other assets. Making the system autonomous allows for longer range and eliminates reliance on operator skill and radio communication problems.

3. Main Activities.

a. Initial research and scoping – this is perhaps the most difficult part of the project, as hardware projects are difficult to scope well. We would most likely require supervisor feedback for this section. We have already conducted some initial research, and found solutions based on tracking infrared targets. Researching filter methods to create efficient computer vision methods to track patterns will be necessary.

b. Acquisition of components and familiarization with platform – the robotics lab at RMC has platforms for us to use, both ground-based robots and flying drones. Some of these drones already have a cameras and 3D LIDAR sensors. If required, a personal drone can be adapted to allow use of Raspberry Pi and Emlid Navio2 hardware. We would also have to familiarize ourselves with computer vision in general. Depending on which platform we use, we will endeavour to familiarize ourselves with both computer vision methods and the hardware chosen during the summer.

c. Platform testing – after acquiring all the components, we would need to test them separately first, then combine them. Testing separately is a necessary step, and although not directly related to our project, we cannot proceed without having working sensors and a working aerial platform.

d. Project realization – developing a computer vision decision system that could first be used to steer a ground-based platform. In parallel developing a high-level decision system for an autonomous vehicle. Combining the computer vision decision system with the flying platform once both are predictable will result in the final vehicle.

e. Testing – once our project is built testing it first in the robotics lab will be necessary, and perhaps later testing outside. If testing outside is desired additional paperwork to comply with either Transport Canada or DND rules will need to be completed well in advance.

f. Performance evaluation – once the testing has been complete, we could compare our results to our initial project requirements.

g. Expansion – if we can get everything working before the deadline, we could consider expanding our robot to perform more tasks than initially planned. Instead of just tracking a pattern, it could also be trained to identify anomalies and save higher resolution photographs of anomalies for inspections.

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