Obstacle Avoidance Project: Project Update

We have struggled with finding image libraries representing forests or more specifically, images or videos reflecting movement toward an obstacle. One alternative was to detect approaching cars on the road. However, while an extensive list of libraries of road traffic exists, few are in the first person mode, and rarely any trailing another vehicle, let alone approaching one. Luckily, we stumbled upon a hobbyist drone video site where amateurs upload videos recorded by cameras attached to their drones as they are flown (remote controlled) through various terrains, including forests. The number of videos are limited, but likely enough for us to illustrate our concept. Taking more images/videos ourselves remain a possibility.

We have implemented SURF in Python using the OpenCV 3.1.0 library for feature detection. As baseline, we use the nearest neighbor method to match features from a “previous” frame to those in the “current” frame. We have confined relevant features in the “previous” image to be those residing in the middle 3rd of the frame, as that is the assumed path of flight. We use the feature “size” method of SURF to detect whether the physical sizes of relevant features (ex. tree) have increased beyond a threshold. With our limited sample set, we have been able to consistently detect whether we have gotten nearer to an object, although the “object” sometimes may not be the tree we are concerned about but rather the rock on the ground. As can be seen in the images, features of non-relevant objects (noise) need to be better filtered.

Figure 1. “Previous” frame (far)



Figure 2: “Current” frame (near)



Figure 3: Feature match using nearest neighbor and preliminary feature filtering



We need to:

1. Improve filtering out of noisy features
2. If we can’t filter out features pointing to irrelevant items (ex. rock on the ground), we may need to do some classification to focus on trees.
3. Investigate heuristics in place of NN to speed up processing even more. We are currently looking into FLANN among others.
4. Increase dataset – since the drone flies throughout the forest, many different scenes are captured in a single flight, potentially allowing us to attain a representative dataset through only a few videos.