Unmanned Aerial Vehicles (UAVs) are gaining momentum when it comes to solving complex research problems in fields ranging from biology to agriculture to civil engineering. It is important to be aware of the many regulations associated with flying UAVs and the designation of your aircraft (civil, governmental, or hobbyist). This project is focused on configuring a drone with a multispectral camera attached and taking aerial photos of wetlands/vegetated areas. The photos will then be processed and the health of the vegetation can be assessed using the NDVI value.

What exactly is NDVI?

Normalized Difference Vegetation Index is an equation that provides insight into vegetation health of a given area. Healthy vegetation does an excellent job at reflecting light in the Near-infrared part of the spectrum. High NDVI values (near 1) correspond to rainforests while low values (near 0) correspond to barren areas.\(^1\)

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\text{NDVI} = \frac{(\text{NIR} - \text{RED})}{(\text{NIR} + \text{RED})}
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The goal of this project is to assess the feasibility of using UAV’s in multispectral image capture used for environmental decision making with special emphasis on transportation applications. The hope is that this project will help DOTs decide if this is a technology worth pursuing.

Methods

Before flying the drone with the camera attached, it was critical to understand the different components and their role in enhancing the flight. After figuring this out, locating a wetland or green space was the next step, we chose an area near Innisbrook because of an existing COA in place. Once the image has been taken a compact flash card reader is necessary to get the images from the camera onto the computer. Safety should always be the top priority when flying a UAV.

Results

The above photos represent a couple of test images taken before the camera was attached to the UAV. Figure 5 appears red/pink because there is a large amount of vegetation that reflects Near-infrared light. The camera processes NIR in the red plane. Figure 6 has an NDVI value of close to 0.6 indicating healthy vegetation. Indoor test images that were taken did not appear red because of no vegetation present. After flying at Innisbrook, we obtained about ten aerial photos. Most of the images taken had NDVI values in the 0.75-0.85 range indicating a healthy mixed southeastern forest (temperate). The flight went well and the camera remained tightly fastened to the drone using Velcro.

Conclusions/Future Work

All things considered, UAVs serve as a legitimate option when it comes to identifying wetlands. Figuring out how to process the multi-spectral photographs and identifying a professor with a COA served as a couple of the obstacles that we faced throughout this project. Based upon the team’s experience with the UAV, this technology is certainly worth pursuing. Future recommendations and items to consider include:

• Give about 4-6 months as buffer time to obtain a COA and proper regulatory paperwork. During this time, become familiar with the drone and its functions. When applying for the COA try and select a location with naturally occurring wetlands.

• Outline specific goals for the flight. Once the objectives have been laid out ahead of time, deciding on certain equipment as well as a proper location (wetlands) will become much easier.

• Continue to maintain a strong relationship and collaborate with researchers in other departments and learn about the advancements they are making in this field.

Additionally purchasing a drone with a longer battery life and increased wind resistance will allow for an enhanced scope of the mission along with the use of a pre-programmed flight path from Mission Planner.

References
