Guidelines for Using Photogrammetric Tools on Unmanned Aircraft Systems to Support the Rapid Monitoring of Avalanche-Prone Roadside Environments

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Background

A number of western states' Department of Transportation (DOTs) have important routes below mountain slopes where snow avalanches threaten the roadway. In the winter, keeping these roads open for safe and reliable travel requires that these DOTs operate programs to monitor snow conditions and assess avalanche risk. Current monitoring efforts frequently involve collecting snowpack data by physically visiting and examining an avalanche release area. This approach, while effective, is costly and time consuming, and can be dangerous if not conducted carefully.

Small unmanned aircraft systems (UAS) have seen significant advances in the past 10 years and have become increasingly affordable and easier to operate. Past research by the project team has determined that camera equipped UASs paired with low cost photogrammetric software (Structure from Motion or SfM) can obtain high-quality snow surface and snow depth data. Collecting this data using UASs has the potential to support the faster, safer, and more complete evaluation of avalanches risk by quantifying show pack conditions and by allowing avalanche staff the capability to survey larger areas and to collect data above locations that are unsafe or inaccessible to humans.

Research Project

The research team will work directly with avalanche professionals from the Alaska Department of Transportation and Public facilities and the Washington State Department of Transportation to determine a methodology for operational use of SfM on UAS for the purpose of monitoring avalanches in areas of high risk. This research will use avalanche-prone area test areas in both Washington and Alaska and will initially fly these areas before snow fall to familiarize the project team with the area, create a GPS based flight profile, and record the altitude of the snow-free ground. The second set of flights, guided by the flight profile recorded earlier, will occur when there is snow and will be used to explore avalanche risk based on capturing snow depth and snow surface conditions.

This project will use these flights to evaluate what products derived from SfM can be useful to the DOTs and the ability of DOT staff to use this technology on a routine basis to support avalanche monitoring. This research will evaluate the capabilities of SfM operating in less than perfect conditions including capturing images in times of poor visibility, the processing time required for useful output, computing requirement, and the repeatability of the results over time.

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FOR MORE INFORMATION
http://depts.washington.edu/pactrans/research/projects/guidelines-for-using-photogrammetric-tools-on-unmanned-aircraft-systems-to-support-the-rapid-monitoring-of-avalanche-prone-roadside-environments/