UAV-Based Approach to Predict & Monitor Landslide Events in WA State

Interdisciplinary Team
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Abstract

The use of Unmanned Aerial Vehicles (UAV) has been showing promising applications in mapping the surface structure of the land using remote sensing and high-resolution images. In this research, an interdisciplinary team is investigating the use of an integrated commercial UAV with high-resolution cameras to monitor and analyze the surface of certain areas especially after heavy rain to develop a prediction of a landslide activity in WA State and the Salish Sea area.

Landslides Facts

- Occur on gentle to steep slopes
- Occur when the strength of material on a slope becomes less than the force of gravity
- Can cause tons of damage and injuries
- Landslides in the U.S. kills between 25 to 50 people on average each year!
- Landslides in the U.S. causes ~$3.5 billion in damage each year
- A typical landslide travels at 10 to 35 miles/hour
- The largest landslide in the history of U.S. happened in WA state, Mount St. Helen in 1980.
- Common landslide triggers are rainfall, earthquakes, and change in water levels

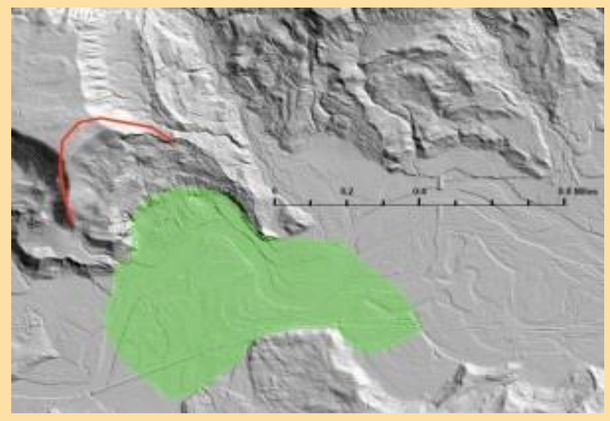
http://file.dnr.wa.gov/publications/ger_fs_landslide_hazards.pdf

WA State & the Salish Sea

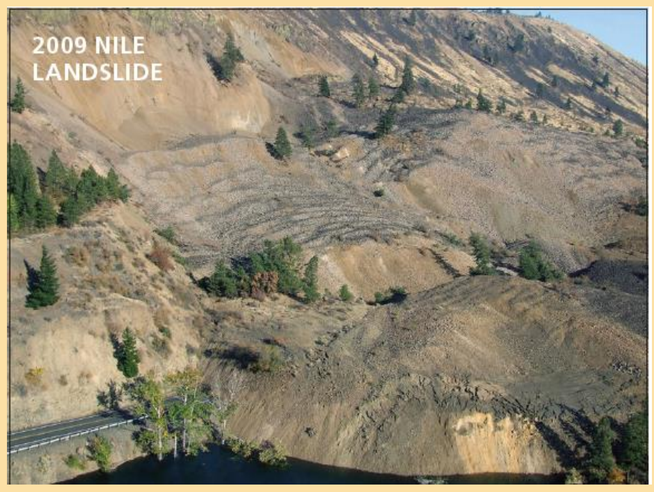
Recent Landslide Events in WA

2014 Oso mudslide:

- Northwest Washington, area of known landslide activities
- March
- Multiple casualties
- 30 houses were covered
- 150%-200% precipitation that winter
- 10 million cubic yards (volume)
- 0.7 miles/ hour (speed)
- No associated earthquake



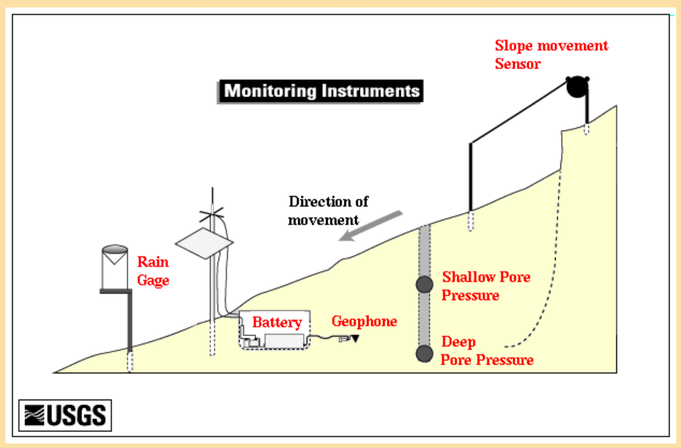
https://www2.usgs.gov/blogs/features/usgs_top_story/landslide-in-washington-state/



Current Approach

- Continues real-time monitoring:
  Radars, LIDAR
- Portal instruments package "spiders"
- Aftermath analysis

http://landslides.usgs.gov/monitoring/



Proposed Approach

- Great mobility
- Real-time data
- Flexible weather conditions
- Record and analyze the overall environmental change
- Digital photogrammetry
  Digital Camera, digital Video, GPS system
- Build a procedure of disaster information collection.

Niethammer et al, 2011

Multidisciplinary Team

- Manufacturing Engineering student/faculty working on the specifications of the UAV, update it with a GPA system, attach selected camera(s), modify the device to be able to fly in rainy/windy weather conditions and any other hardware related modifications/issues.
- Electrical Engineering student/faculty working with the image processing software and the digital signal processing (DSP) of the images received from the UAV, and any other software related modifications/issues.
- Environmental studies student/faculty looking into the databases of hazardous areas in WA and provide support in the hazards risk reduction field.
- Geology student/faculty working on images analysis and interpretation.

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