Volume calculations and survey methods are needed to detect changes in the flow of glaciers over time, and to calculate the capacity of gullies. The current solutions are either labor-intensive, expensive, or both. This produces a barrier to entry, making the process slower. This poster provides a solution called 3D-Quantify, a framework for volumetric calculations using Structure from Motion (SfM). SfM is a cost-effective method for reconstructing a 3D model of an area by stitching 2D images. These models can then be scaled to extract features, including the volumetric measure and capacity of the area. This project explores existing solutions for the individual components, focusing on the volume calculation algorithm for refinement.

Motivation

- Calculating volumes of open areas, including glaciers and soil, is an unsolved problem.
- The existing solutions are labor or cost intensive.
- Reduced cost solutions like 3D-Quantify allow for greater accessibility of researches like Icelanding Field Studies.



Figure 1: Image of Sólheimajökull glacier

Components

- 3D-Quantify consists of the following phases:
- Data Collection and SfM,
- 2. Point Cloud Scaling,
- 3. Volume Calculation.



Figure 2: Point cloud of mound at Skalanes. The bright objects are reflective markers placed for calibration.









3D-Quantify: A workflow for generating Volume Ahsan Ali Khoja '19, aakhoja15@earlham.edu Computer Science Department, Earlham College, 801 National Road West, Richmond, IN, 47374.



Additional Algorithms in VolCalc



Figure 5: Image showing the shoelace algorithm for calculating Area



Figure 6: Image showing planar projection

Figure 7: Flow Chart for Scalar algorithm

Future Work

- Implement Scalar module,
- Implement the software that connects all the modules together,
- Measure and analyze the difference with more reflective surfaces, including glaciers.

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