Utilizing a Social Networking Site as a Web Portal to Process CReSIS Radar Data

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1. INTRODUCTION

The last one hundred years of increasing global temperatures, often referred to as Climate change or Global Warming, has brought forth the question as to the advance or decline of ice sheets in Greenland and Antarctica. Evidence of glacier retreat, ice shelf collapse, and change in ice stream velocities were observed in these areas creating the research focus of determining the rate at which these changes were occurring. The pace at which these changes occur affects the contribution of the ice sheets to sea level rise, which has a global effect on coastal regions and their inhabitants. Scientists and engineers are in need of instruments and models to measure and predict the response of ice sheets to recent climate change. These needs can only be fulfilled by an extensive number of collaborations between government agencies, universities, and industry partners working together in a concerted effort.

Elizabeth City State University (ECSU) has joined in partnership with Indiana University (IU) in establishing a technological means of resourcefully linking computers, people, and data focused on research, education, and outreach to support the processing of ice sheet data from the Center for Remote Sensing of Ice Sheets (CReSIS) Greenland and Antarctic expeditions. This Cyberinfrastructure partnership, under the National Science Foundation grant CI-Team Award # OCI-0636361, is slated to give ECSU a 600-node, 5-teraflop high computing system as part of a distributed Cyberinfrastructure to gather and process data.

This system will give users access to applications, data, models, and education on polar ice sheets. Access for distributed computing systems takes place at a web portal which offers a consistent interface to access resources on the system. ECSU, in partnership with IU, will now be required to develop and maintain a web portal for this system.

IU has taken the lead in researching the possibility of using third-party services and Web 2.0 technologies to construct this portal. Web 2.0 technologies would not only shorten the development time, but this method could also extend the life of an application which would normally be cut short due to change in personnel or funding at a local level. The hypothesis for this paper is that a portal to CReSIS radar data can be created by integrating an application into a social networking site with the use of JavaScript, PHP, and HTML.

2. METHODOLOGY

The project target was to create an interactive presentation of ice sheet data collected by CReSIS at the University of Kansas for use by researchers and educators. This would be followed by an implementation of the resulting presentation into a Social Networking frame to provide a "Gateway" to the data.

The Jakobshavn Isbrae, Helheim, and Kangerdlugssuaq Glaciers are three of the fastest moving glaciers in Greenland. The data for this project were obtained during a single flight over the Helheim Glacier in Greenland by the CReSIS project team. The data used in this project was gathered by several systems installed on a DHC-6 Twin Otter aircraft.

Three types of MATLAB® digital processing filters were developed at Indiana University by Jun Wang within MATLAB® for this project: Median, Wiener, and Finite Impulse Response 1 (FIR1). The MATLAB® binary command line applications filter code was then wrapped as a Web service using the Open Grid Computing Environments Generic Factory tool.

Dataset selection, filter selection, and parameters were passed to the filter functions at IU via SOAP with the return value from the filter operation being a URL to an image residing on the IU server.

The parameters for the Median and Wiener filters were horizontal and vertical values (h, v) of pixels to be operated on at each step in the filter operation. The FIR1 parameter was a cut-off frequency (f) allowing for low frequency, high frequency, and cutoff filter operations.

The Helheim Glacier position dataset was displayed in the Google Maps web mapping service and took place completely within the local server. The data for this portion of the project was received from CReSIS via Indiana University in a comma-separated values file (CSV). The values in this file included the latitude, longitude for 17,023 recorded locations of the flight.

The output file for this project is located on a development server at ECSU. This file is initially loaded from a form with the variables for the data set name, filter name, and the parameters for that filter. This file contains the HTML, PHP, JavaScript, and CSS code for the following operations:

- Retrieval of filtered image from IU
- Collection and clustering of data points for Google Maps
- Display of Google Maps results with interactivity
- Display of IU image with location overlay
- Data form for new image

An image comparison tool was developed using JavaScript to modify CSS opacity attributes. This tool takes in two previously created images selected by the user and overlays them on top of each other fading one each time the cursor is passed over them. This allows for the comparison of the filters on the same set of data.

The goal of this project was to place the application into a social networking environment to allow log-in capabilities utilizing a third party service. While the log-in capability was taken to a higher level by IU during the summer and fall of 2009, this project did succeed in integrating the application with Facebook.

The method used involved creating an application which "wraps" the pages being served by the ECSU server with a Facebook iFrame. This routine allows developers to utilize more familiar tools such as JavaScript, HTML, and CSS to build their applications, reducing the need for Facebook Markup Language (FBML). Facebook takes the locally developed pages and converts them to FBML to be served up in the IFrame to the Facebook user. The advantage here is that the pages are being served from a Facebook frame allowing for the use of social network identities and attributes while the application is still hosted on a local server.

3. POSTER CONTENT

The poster being submitted will illustrate the components of the final product along with steps taken to achieve those applications. Graphics will consist of screenshots, graphs of timed runs, and photographs of data collection.

Poster Outline
1. METHODOLOGY
   a. Definition of Goal: Original Tasking
   b. Project Data Source
   c. Communication

Sample Graphics

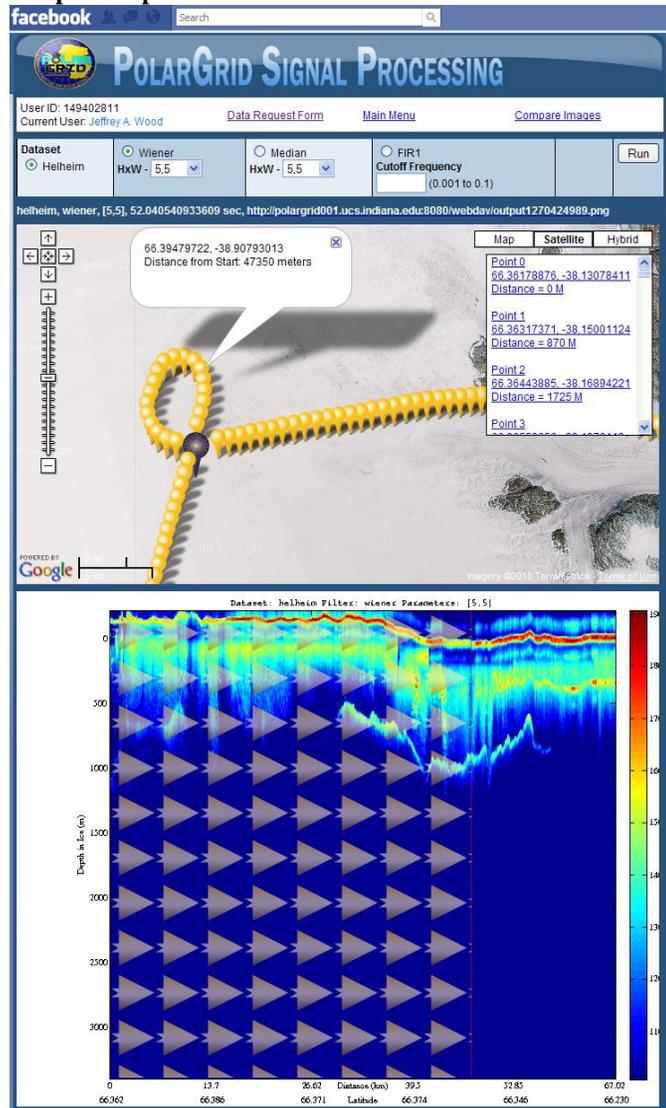Figure 1 Facebook Implementation
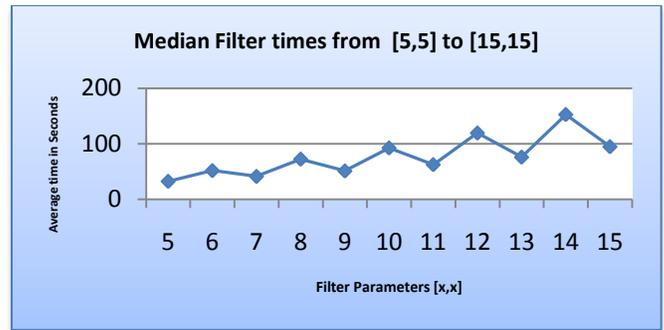
Figure 2 Median Filter Times
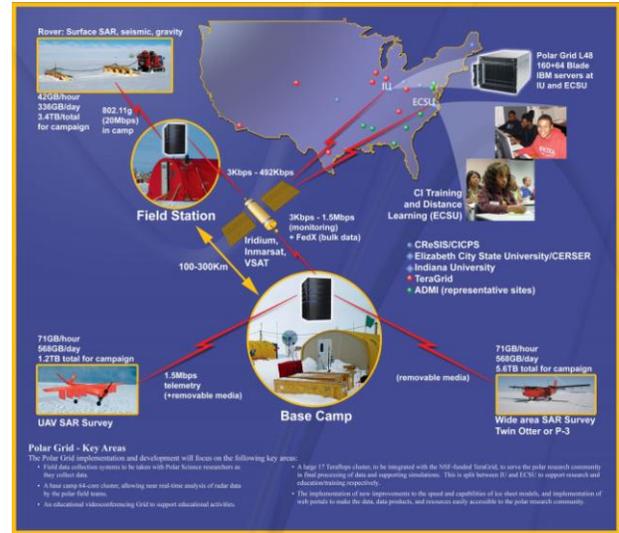
Figure 3 PolarGrid Elements
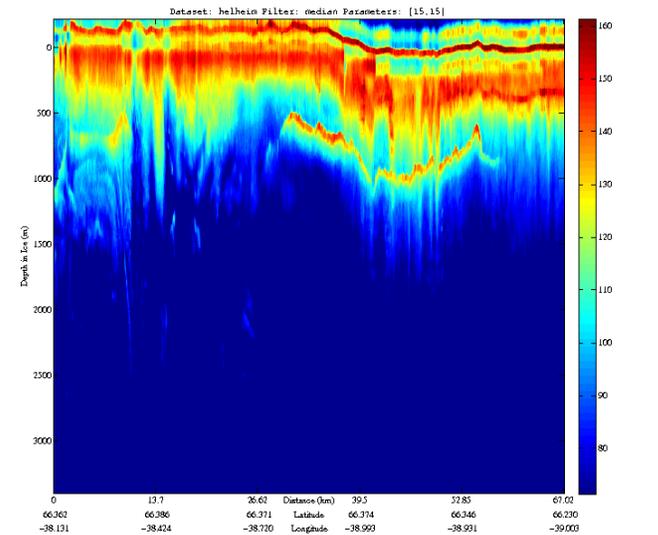

Figure 4 Folded dipole antennas under wing of Twin Otter

Figure 5 Output Image: Helheim - Median - [15,15]