Project Proposal

Snowpack Viewer/Projected Runoff Analysis

CEEn 514

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Proposal Leader

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Project Title

Snowpack Viewer/Expected Runoff Analysis Application

Team Name

The Snowmen

Team Members

Jason Biesinger, Jorge Sanchez, Travis McStraw

Goal of the Project

To be able to view snowpack data on a global scale in order to help make engineering decisions in different regions throughout the world. Also, to be able to make a general estimate of expected spring runoff for a user defined watershed that includes snowpack data.

Engineering Problem Being Addressed

There are many locations around the world where snowpack data is available but not always viewable. Engineers could use this tool to more easily find and view the data available to help them as they make engineering decisions and calculations. The information found in this app could be used to calculate the expected spring runoff of a user defined watershed. This would allow users to predict runoff based on snowpack data.

What kind of vector and raster data analysis will be required?

Most of the viewing capabilities will not necessarily involve any geoprocessing tools. However, the idea is to allow the user to upload a custom polygon shapefile(vector data) of a designated watershed and then be able to calculate the total volume of water due to snowmelt in that watershed. Research will have to be conducted to investigate what formats global snowpack data is available in, but it will likely be in some sort of grid/raster format. The idea is to

calculate the volume in each of the grid cells that intersect the uploaded watershed shapefile in order to calculate the total volume of expected runoff in the watershed.

What data will be distributed to the app via map services?

The time series data will need to be distributed using a map service. Our initial idea is to create geotiffs of the snowpack data(or some other form of gridded contours) and store them on geoserver and use WMS to display the geotiffs in the tethys application on a global map. The local analysis based on the user defined watershed, will also require geotiffs of the specified region to be stored on geoserver and mapped to the map window using WMS. A global imagery basemap will also be displayed underneath the geotiffs.

What geoprocessing workflow will happen on the server - in general terms?

In general terms, the geoprocessing workflow will use the snowpack data(probably in the form of a raster) as input. The attributes stored in each of the grid cells will be the volume of snowpack within the cell. We will have to look into the following idea further, but its possible that temperature/climate data can then be used to determine the expected snowmelt. This will require some research to determine what data/other rasters/equations need to be included in the raster calculator. The other and probably simpler option would be if the app displayed change in snowpack, in which case the raster calculator can be used to display how much snow melts in between each time step. This would mean the new value in each of the cells would represent the amount of snow that melted since the last time step. The attributes of all of the cells can then be summed to calculate the total amount of expected runoff for the watershed due to snowmelt for any given month.

In terms of regional analysis, the intersect tool or something similar will need to be used to get the grid cells that only include the region specified by the user.

What are the basic functions that will exist on the front-end user interface?

There are a number of basic functions that we intend to include in the front-end user interface. One of the main functions that was mentioned earlier would be to add the ability to upload a

shapefile to the interface that represents a particular region or watershed. If there seems to be problems with this idea(such as a lack of resolution, problems with the shapefile being too detailed, etc) we can also consider simply adding a drop-down menu that facilitates regional analysis of the world's major mountain ranges.

An alternative to the above feature would be to allow the user to click out his/her own polygon in the interface and just get the data that resides within the boundaries of that polygon.

Another function would be to add a text box where the user can input a loss coefficient. This will allow the user to account for the losses that may occur as the water travels to the outlet point of the watershed(evaporation, soil infiltration, etc).

We'd also like to have the snowpack data display as both a map and an animation. This would allow each time step for the data could be played consecutively as an animation to show the change in snowpack over each time step. We intend to make this a feature for both the global and local regional maps.

A final option would be to add a time series chart in the interface to allow the user to see the change in snowpack in graphical form. Ideally the user would be able to download the chart as an image or possibly even the data as a .csv file.

How will you store the code (GitHub under what account?)

The code will be stored on GitHub under the account tmcstraw.

What license will you license the source code under?

We will use an open source license for the code used in the application.

Who on the team will be responsible for what part of the project?

The task assignments of this project are subject to change, however we have outlined who will take charge of which parts of the development of the application. Although we will all contribute to each part of the development process, Jason is going to take the lead with collecting

the data sources and the different formats in which we can find the snowpack information. Travis is going to lead the webapp developing process and Jorge is going to take the lead in the calculation process to estimate the runoff from the snowmelt. We will all contribute to the development of the front-end user interface with Jason as the organizer of that, however Travis will lead the development of the map layers and the work that has to be done with Geoserver. As mentioned above, Jorge will mainly work with the geoprocessing portion of the project and the parts of the calculations that will need to be run on the ArcGIS server.

Conclusion

We hope to create a tool that can be useful in viewing the change in snowpack in all of the major mountain ranges throughout the world. We also hope to be able to provide users with the ability to analyze specific regions that interest them and to provide them with a tool that can help predict the total estimated runoff due to snowpack for particular time steps.