Using Open Source Software to Process LandSat Imagery

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Abstract

Remote Sensing and GIS has been regarded as an art or science of making measurements of the earth using sensors on airplanes or satellites. But with technology advances made today, this information is not only made available to cartographers, computer scientists, or other skilled scientists. Satellite imagery and open source software is made readily available to the public, making it possible for the "average user" to easily explore this field. The purpose of this research is to investigate these online software tools that offer an alternative to commercial products that are expensive. We accomplished this by downloading LandSat etm satellite imagery, ILWIS 3.6, MapWindow, Google Earth, kml2shapefile. Then using this geographic data and software, we attempted to manipulate the data and assessed the functions of the software.

Fig. 2 Error within directory

1. Introduction

For years, Geospatial Data has been used by scientists and research communities to identify and depict geographic locations for a number of reasons. For example, land survey data and land cover type data which are critical to many agencies such as the U.S Fish and and Wildlife Service (USFWS). Government agencies such as the USFWS can afford to spend a large sum of money for software such as ARCGIS. However, there are a number of individuals who take interest in imagery processing and manipulation and buying a license for this professi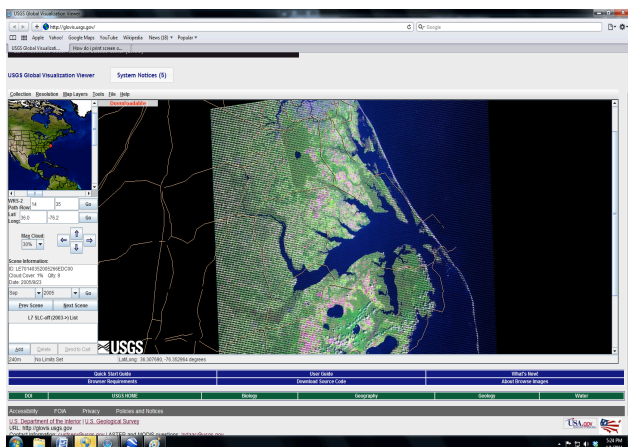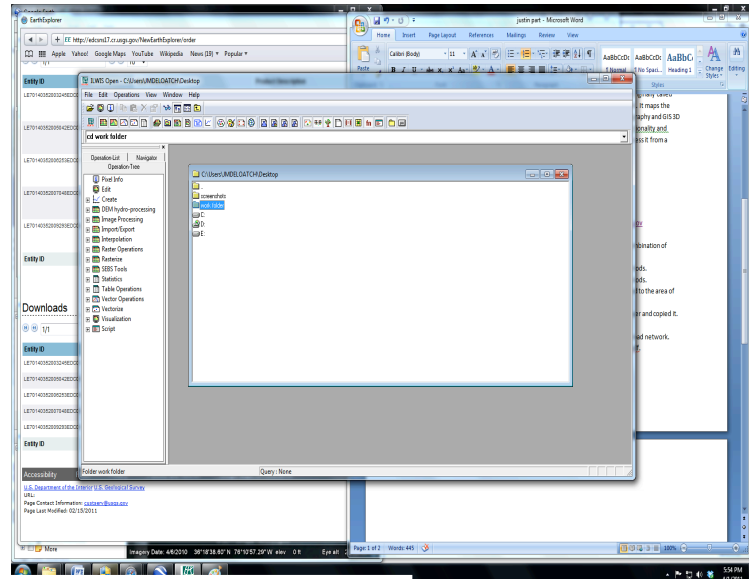onal software does not seem feasible. The purpose of this research is to attempt to look at other software packages that are available on the internet that closely resembles the features of this commercial software. In addition to the low cost, it is very simple to gain access to this data and imagery. As a result, users of remote sensing and GIS have changed from professionals to novice beginners.

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2. Software

ILWIS 3.6 is a user friendly open source Geographic Information Systems (GIS). ILWIS is acronym for Integrated Land and Water Information Systems. It was developed and distributed by ITC Enschede (international Institute for Geo-Information Science and Earth Observations) in the Netherlands for use by its researchers. Since, it's release it has been subject to distribution and became a free software. This enables users to visualize, manage, edit, and analyze data. As a result, users are able to compose printable maps and an integrated raster and vector approach.

KML2Shapefile is a plugin to MapWindow GIS that converts Google Earth KML and KMZ files into shapefiles for use in a GIS.KML2Shapefile will split each KML geometry type into a separate shapefile. It supports
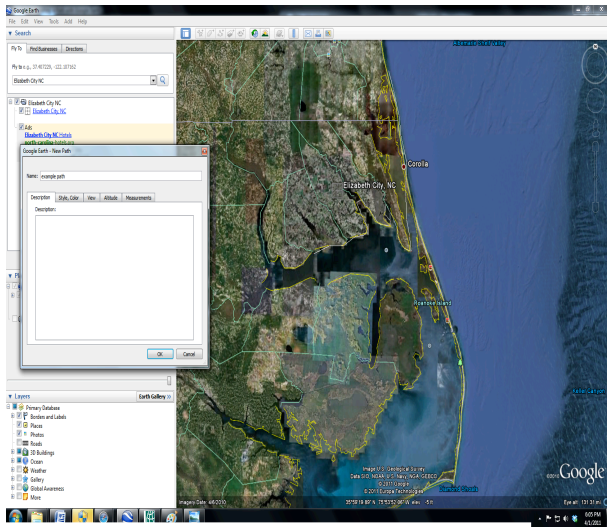

Fig. 1 illustrates image of northeastern North Carolina downloaded from the USGS website

Fig. 3 Example of road network using add path tool

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visualization features as well as input database attribute table editing, shape file editing, and grid importing and conversion.

Google Earth is a virtual globe, map and geographical information program that was originally called EarthViewer 3D. It was created by Keyhole, Inc, a company acquired by Google in 2004. It maps the Earth by the superimposition of images obtained from satellite imagery, aerial photography and GIS 3D globe. It is under two different licenses. One is Google Earth, a free version with limited functionality. The other is Google Earth Pro ($399 per year), which is intended for commercial use. Users can access it from a computer, phone, or a tablet, and most users use it for navigating purposes.

3. Method

First, we downloaded all the applications that were needed to complete this project. The applications were Google Earth, MapWindow, KML2Shapefile and ILWIS. Next we wanted to create our own spatial data set. We chose our point of interest to be Elizabeth City, North Carolina and downloaded the Landsat ETM+ satellite imagery from the US Geological Survey website which is open to the public. Once we opened the file, we had difficulty with zooming into the road layer. As pictured in "Fig. 1", traces of roads were patterns were visible.

Unfortunately, we were unable to distinguish characteristics of the road. We decided to repeat this process for the same location but within a different time period. Images from 2006 were successfully downloaded; however we encountered an error when we attempted to download another year. Next, we launched ILWIS 3.6 and tried importing the image to ILWIS format with natural color, but we also received an error for this. To import images the image had to be placed in a folder and open this directory up within ILWIS 3.6. Unfortunately, we encountered another error that opened a directory that was created previously instead of the desired image as noted in "Fig.2." The next step was to update the road network for all of the images. We only had one image but it was viable to see if this process was doable. Since we could not zoom in far enough to repeat the process with the road network, we decided to do the same process but with an outline of a small section of eastern North Carolina. This was done using the add-path tool in Google Earth. We created the pathline starting under Perquimans and moved east to Elizabeth City then under Camden, next under Jarvisburg, finally upward pass Corolla. Afterwards, we made an example of a road network with the add-path tool and copied and imported into the kml2shapefile as pictured in "Fig. 3." We were unable to properly install the kml2shapefile application but we used the kml2shapefile website which provided the same functionality.

4. Results

After the conversion from KML to a shapefile, we were given the results. Once we had this file we could now combine both satellite imagery and shapefiles. We successfully imported the satellite imagery but could not import the shapefiles as pictured in "Fig. 3." The February 2006 image is showing but the polygon image is not visible. "Fig. 4" shows the final product which was all the images and shapefiles ouput in PDF format.
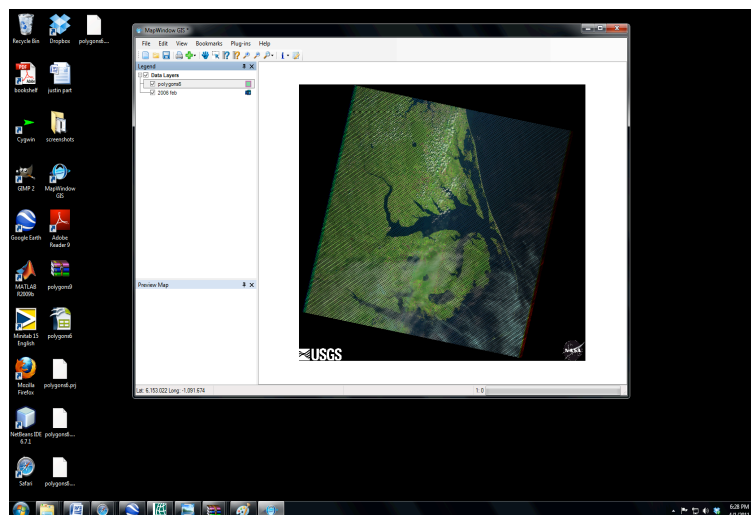

Fig. 4 Final product

6. Future Works

Future works for this project will be to add even more open source applications to this process. For example we could use Quantum GIS, which is an Open Source GIS that runs on Linux, Unix, Mac OS X, and Windows. SAGA GIS is a system for automated geoscientific analysis, which is a hybrid GIS software. SAGA also has a unique application programming interface and a fast growing set of geoscientific methods, bundled in exchangeable Module Libraries. GRASS GIS is originally developed by the U.S. Army Corps of Engineers. There are multiple applications that the team can implement in this project to better the results.

6. Conclusion

ILWIS 3.6 is comparable open source software with ARC GIS but with limited capabilities such as zooming features. However, the software was user-friendly, requiring little to no assistance from outside resources. Also websites alternatives were readily available if the application did not work, such as the KML2Shapefile.

References

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