RTK GPS Validation Lab 3

COGS
Centre of Geographic Sciences
nscc

Overview of goals

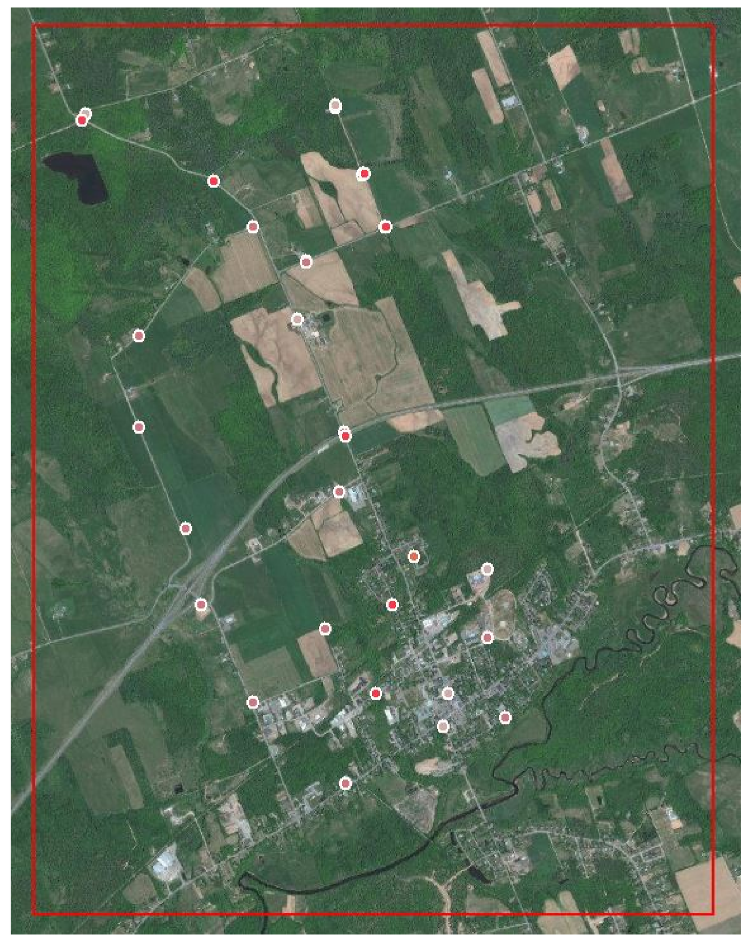
This lab is focusing on the collection of "point data" using carrier-phase Global Positioning Systems (GPS). One of the significant downfalls of a static GPS (does not matter if it is PPP, Precise Point Positioning, or post-processing) is that one receiver must observed at the "rover" location for several minutes in order to gain a reasonable accuracy.

"While very effective for establishing long-term control monuments, such observation times becomes inconvenient when collecting multiple points. Fortunately, such data can be collected much more quickly using Real Time Kinematic (RTK) GPS.

For this lab we will be explore RTK by collecting points for LiDAR validation in and around Middleton, Nova Scotia as covered by the LiDAR dataset given to us in class." (The last two paragraphs were taken from the Lab 3 RTK GPS for LiDAR Validation PDF that was handed out in class; they can be found on the front page at the top under the overview section.)

The RTK technology that was used during this lab was the Leica RTK system, the software that was used for this lab were Leica Geo Office, ArcMap, and Global Mapper.

The field activities were more or less trying to find areas that would fit within the code list that can be found below.



Precision and Accuracy Analysis

When looking at the accuracy for the points that were collected for this lab, more specifically the points that are south of Highway 101, the points are fairly accurate when zooming in, in ArcMap (the reason I know this is due to that I was on the crew who collected those points just South of Highway 101). As far as the rest of the points I will assume that they are in the correct location, I come to this conclusion based on zooming into the point and taking a look at where the point is located, then if I have a question about the location I would talk to the other team to see if this point is in the right spot or not.

As far as the precision of this lab, I believe that the points that were collected were collected with high precision, due to that, at least the ones to the South, are located in the correct location compared to where they were collected. That even goes for the point that was collected in front of one of our classmates car.

Configuration Parameters

The following list is a list of configuration setting that were used for the rover for this lab. Under Management click Jobs, then click the general tab and create a new job for this lab, then go to the Codelist page set that to <None>, Set the Coordinate System to NAD83 UTM20, the next thing is to go to Averaging and the default values should be 50mm Horizontal and 75mm Vertical. Then select store at the bottom, this will store/save your job.

The next step is to select Data and put in the base station (207520) and enter the coordinates in the Local Latitude , Local Longitude, and ellipsoid height. Click the COORD button to get the desired coordinate system, which is Longitude is West.

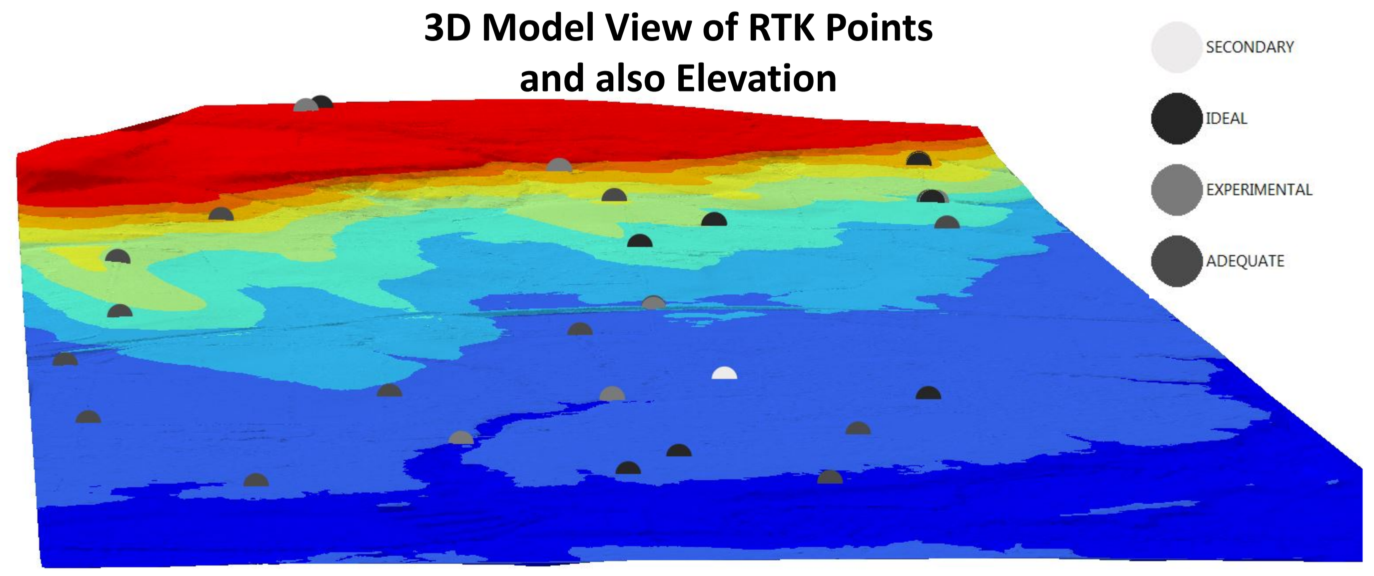
The base station should be set as a reference well you are collecting. The port that that should be used is PORT 1.

Before you go out and collect your points you need to create a new codelist and that you import should be the one that was agreed upon in class.

Methodology

The steps that were followed before, during and after this lab with be discussed in this section of the report. Before entering the field the first thing that was done was determine the location of the High Precision Network (HPN) monument that we would be using as a reference. The second thing that was decide which group was going to do what area, in the end it was decided that one group would do everything South of highway 101 and the other would do everything North of highway 101. The third thing that was decided was the Code List that was to be used well collecting. The next thing that was done before going out into the field was deciding what locations we wanted to collect a point, keeping in mind to have an even coverage of the study area. The second last step that was taken before going out into the field, was to gathering all the equipment that was needed in order to complete the lab. Finally, the final step that was taken before going out was to configure the RTK unit with configuration settings that have been provided.

3D Model View of RTK Points and also Elevation



The above screen shot is that of the elevation for the Middleton study area for this lab along with the RTK points that were collected for this lab. The points are symbolized based on the code list that was agreed upon in class.

Point_ID	Point_Code	Ortho_Heig	Z	Dz
126	IDEAL	52.80578	52.675259	0.130521
N001	EXPERIMENTAL	92.43471	91.739359	0.695351
N002	EXPERIMENTAL	92.18174	91.53755	0.64419
N003	EXPERIMENTAL	160.29317	159.770009	0.523161
N004	ADEQUATE	68.68355	68.245954	0.437596
N005	ADEQUATE	82.02875	81.434554	0.594196
N006	ADEQUATE	64.26506	63.668167	0.596893
N007	ADEQUATE	64.26434	63.667673	0.596667
N008	ADEQUATE	49.85259	49.627862	0.224728
N009	ADEQUATE	24.15413	23.698387	0.455743
N010	ADEQUATE	31.51479	32.576102	-1.061312
N011	EXPERIMENTAL	31.41048	32.3179	-0.90742
N012	IDEAL	56.20523	55.562913	0.642317
N013	IDEAL	55.22796	55.364407	-0.136447
N014	ADEQUATE	55.20289	55.3652	-0.16231
N015	ADEQUATE	42.46737	42.119323	0.348047
N016	EXPERIMENTAL	41.95316	42.080122	-0.126962
N017	EXPERIMENTAL	41.55469	42.025337	-0.470647
N018	EXPERIMENTAL	52.4887	52.348491	0.140209
N019	IDEAL	52.90711	52.670895	0.236215
N020	ADEQUATE	53.27315	52.914597	0.358553
N021	IDEAL	82.22642	82.005586	0.220834
N022	IDEAL	82.93129	82.947813	-0.016523
N023	IDEAL	83.2213	83.07965	0.14165
N024	IDEAL	163.73516	163.19522	0.53994
S10	IDEAL	21.11357	20.734783	0.378787
S11	ADEQUATE	20.29801	18.633303	1.664707
S12	EXPERIMENTAL	23.16912	20.353759	2.815361
S13	IDEAL	22.96847	22.505904	0.462566
S14	ADEQUATE	22.16107	21.915115	0.245955
S15	ADEQUATE	28.25793	27.965192	0.292738
S4	ADEQUATE	27.35198	27.063933	0.288047
S5	SECONDARY	22.70598	23.078127	-0.372147
S6	IDEAL	21.08793	21.075016	0.012914
S7	ADEQUATE	22.28132	21.925885	0.355435
S8	EXPERIMENTAL	19.4361	17.765286	1.670814
S9	ADEQUATE	21.25267	20.910953	0.341717

Code List

		A ("ideal")	B ("adequate")	C ("secondary")	D ("experimental")
Topography		Flat	Flat	Slight Slope	Steep slope
Land cover		Gravel	Grass	Any land cover	Any land cover
		Paved	Dirt		

The above list is the code this that has been agreed upon and what will be used to identify each point that is going to be collected throughout the duration of this lab.

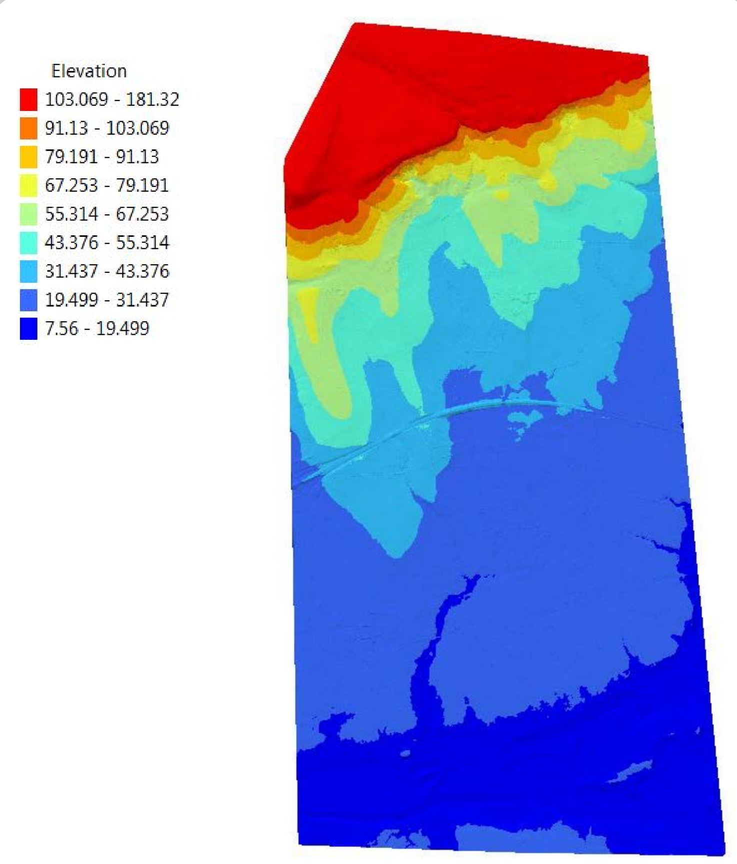


Image Descriptions

The image to left is showing the elevation throughout the entire study area of Middleton, Nova Scotia. The blue areas are the low laying areas, the dark blue areas in and around the river and the lighter blue area is where the town can be found and farm lands. As the elevation increases, that means there is a change in colour. So, the red areas at the top of the image means that is the highest elevation, which also means that is the North Mountain.

The screen shot to the right shows the Point_ID, the CodeList (Point_Code), the Orthometric Height (Ortho_Hgt), Z values (which are values based on the elevations taken from the DEM/LiDAR), and finally the last field the Dz values are values that were calculated by using the field calculator and by using the following equation Z (LiDAR) minus Ortho-Hgt (RTK). "By using this formula we can tell if the GPS point is above or below the LiDAR surface. Values that are negative show that the LiDAR elevation is lower than the GPS point." (This quote can be found on page 5 of the Lab 3 – Guide: RTK GPS PDF that was given to the class by our instructor).

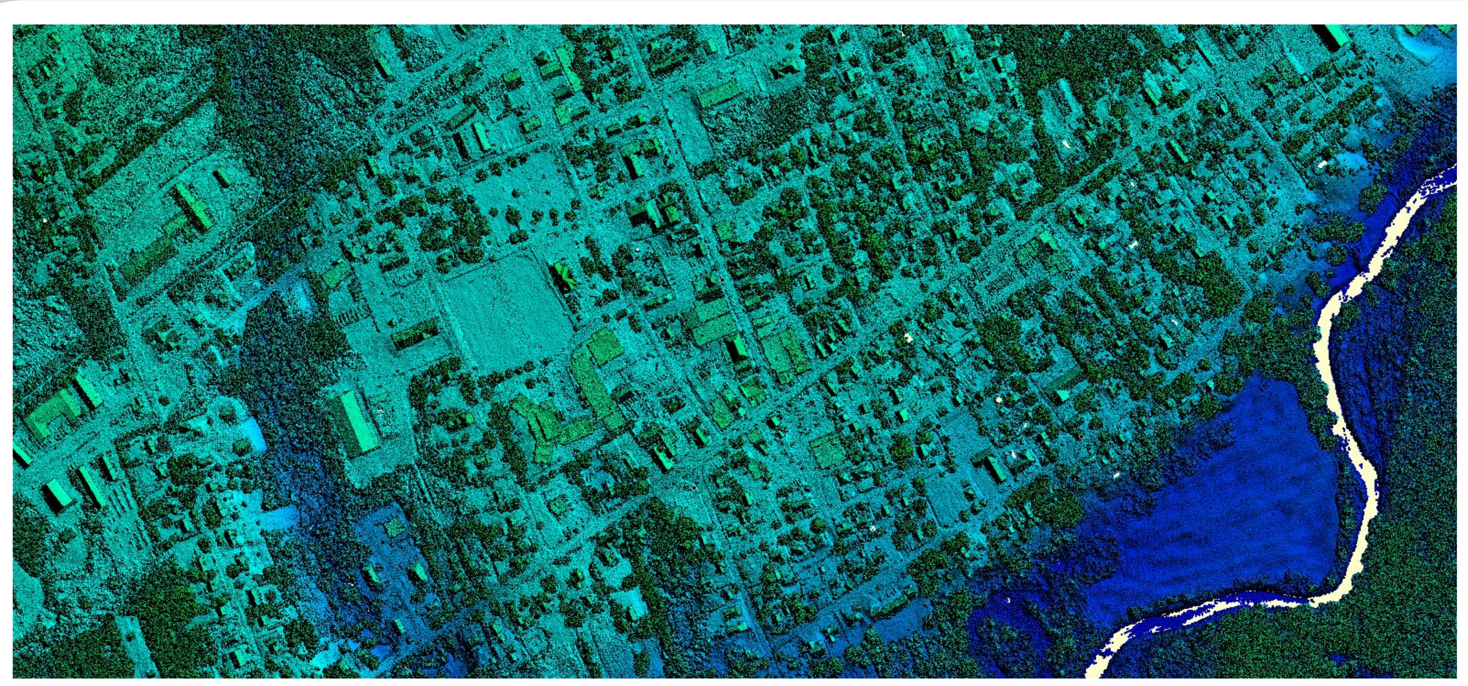
What have you learned about RTK?

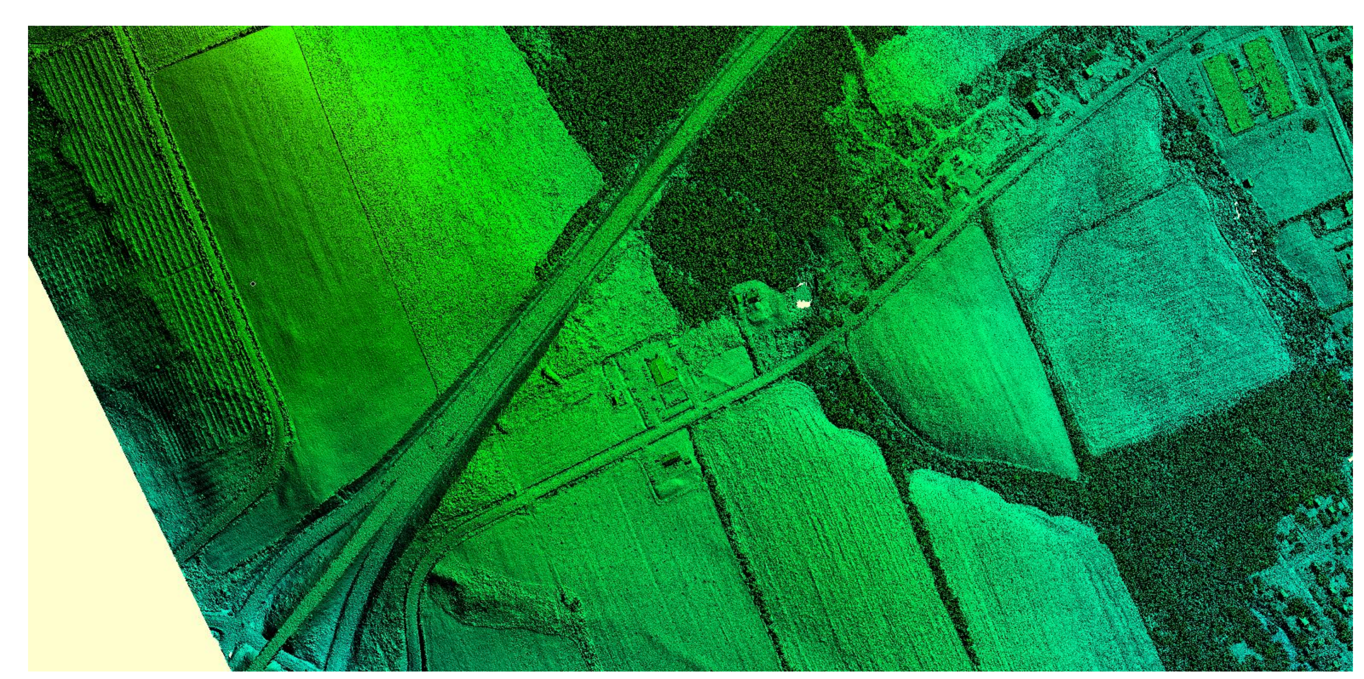
There is one thing that I have learned about RTK and that is if you are doing a project and you need to collect points fast due to a tight deadline, but with the RTK system you can collect those points in a timely manner and with a fair amount of accuracy.

Image Descriptions

There are two images to the right, the first image shows "downtown" Middleton. Then the second image is showing Highway 101 running through the image and then up in the top right hand corner you will find the Nova Scotia Community College (NSCC) located in Middleton. Both of these images where generated in Global Mapper v17.2 software using the Shader tool with Atlas Shader selected as well as the Hill Shading, 2D/3D view linkage are Enabled.

The image that can be found at the left top/center of this report is a screen shot of our study area along with the points that were collected by the class. The background image is a basemap image that can be found within ArcMap.





Author: Katie Chute
Date: November 9th, 2016
Instructor: Rob Hodder
Due Date: November 10th, 2016
Location: Middleton, Annapolis County, Nova Scotia, Canada
Reference: The LiDAR data came from our instructor Rob, and the points where collected by the students.
Projection: UTM Z20
Geoid Model: HT2
Data Reference: NAD83 CSRS UTM zone 20