

### ***Assessing Image Accuracy using GNSS***

This exercise introduces a formal evaluation of data source accuracy. We collect much of our data from aerial images. The positional accuracy of our data is limited by the quality of the source materials. With UAVs/drones making it easy to collect high-resolution images, we often need to estimate the positional accuracy of those images before using them. Here we'll evaluate the horizontal positional accuracy of the 2017, leaf-off drone image collected over the St. Paul Campus. The image may be found in the class L drive, in the Campusimages folder.

Our broad workflow is:

- Identify about 30 points collected by Andy Jenks, using GPS/GNSS system, and converted to the UTM, zone15 N, NAD83 1996/2007/2011 system. There are over 100 to choose from. We've provided an overview image and detailed image chip data sheets, available on the course website. The chips show the exact GPS/GNSS data locations (e.g., sidewalk/curb corners, stable paint marks, small pipes), identified by a unique point ID number.
- Very carefully digitize those points on the image, making sure to digitize the precise location shown on the close-up image chips for each point,
- Use the ArcGIS Calculate Geometry tool to reveal/record the x and y coordinates for those "test" features.
- Subset the GPS/GNSS collected data, provided in a shapefile or feature data layer, and export "true" coordinates, as you did with the digitized points
- Calculate the image coordinate error using an NSSDA spreadsheet with the GNSS/GPS as truth, and image points as test
- Create an overview map of your point set, and a second map that shows a close\_up subset the image accuracy points
- Submit data and maps to Canvas

Things to keep in mind:

You may not be able to find all your points, it makes sense to identify about 25 to 30 suitable test points in your study area on the 2017 leaf-off image. You need to collect coordinates for the NSSDA exercise for at least 20, and preferably 25 of the points. If there are some that you cannot see clearly on the image, identifying and digitizing a few extra you may save time.

Select features that are well distributed across your study area, you should strive to have no two points closer than about 20 m, the width of a 3 lane road. Examples of points are shown in the image below.



These points are too close together, you would want them well-distributed throughout your area, but they are examples of the kind of points we'd like to identify.

Be careful of significant figures. The GNSS/GPS data are only accurate to the nearest few centimeters, at best, so reporting metric coordinates with more than two decimal points is non-sensical.

Inspect your point pairs after you've calculated errors. Are there a few outliers, e.g., greater than most others? If so inspect them, to make sure you didn't blunder. You might want to check your few largest errors, unless they're all under 30 cm (probably reported as 0.30, if you just take the exported coordinate difference).

If the data were collected with a drone at a 2.5 centimeter (0.025) meter resolution, why don't they have that accuracy? How many times larger is the average error than the resolution?

This work should underline the key fact that higher resolution doesn't necessarily guarantee higher accuracy, and that you should empirically test the accuracy of input images.

Turn in your spreadsheet, maps, and data, as described on the course website.