UNIVERSITY OF NEW BRUNSWICK FREDERICTON

U.N.B. Campus Control Network
Designing a Deformation Monitoring Campaign

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Research Question

- How do we maximize practical learning experience for future students?

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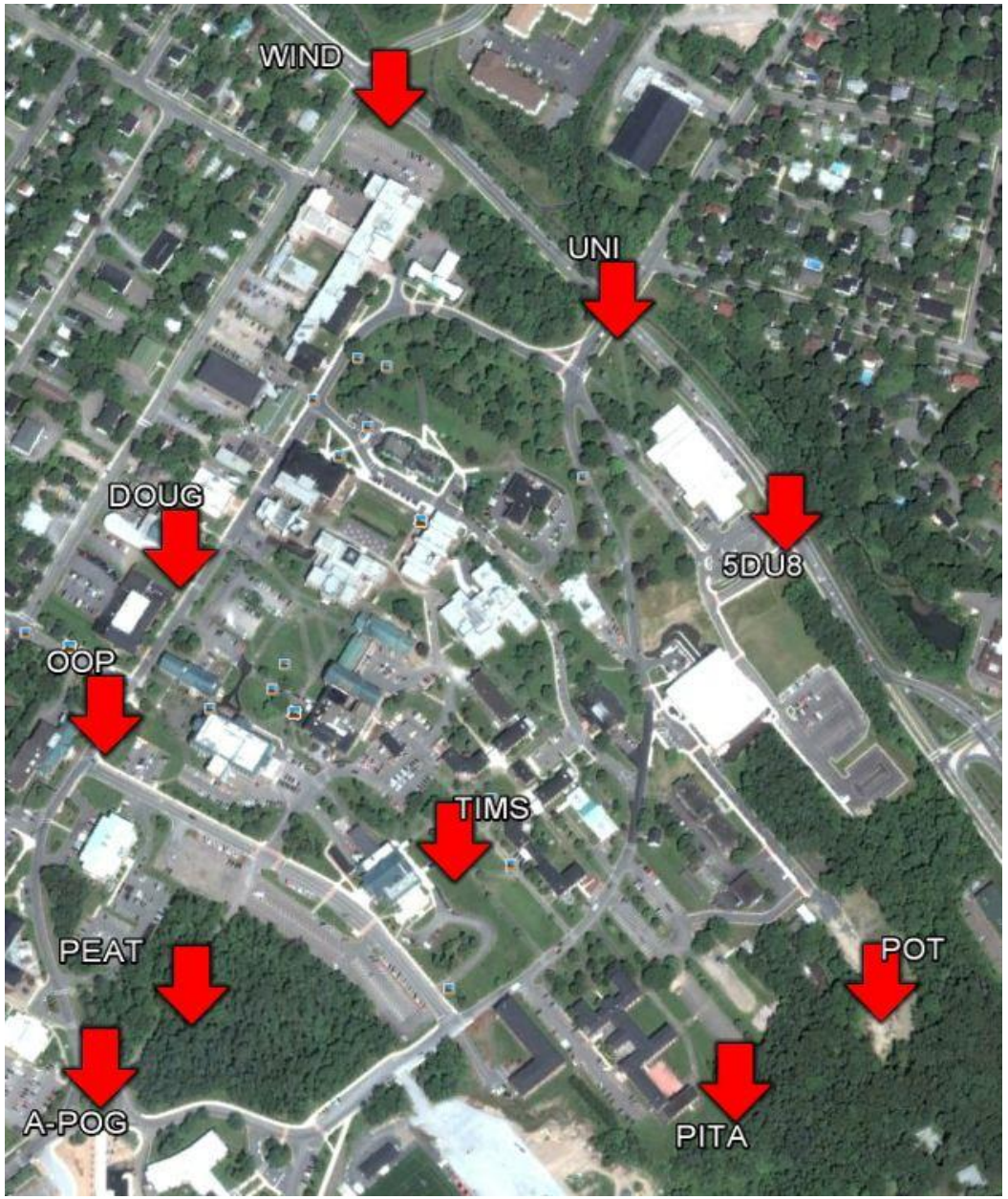

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Designing the Survey

- Need to determine the survey precision requirements:

$$\sigma \leq D_{ij}^{\max} \frac{\Delta t}{\Delta T} \frac{1}{3} \frac{1}{k}$$

Where:

- D^{max} is the value for the change in position you wish to detect
- ΔT is the period of movement (1 year)
- Δt is the frequency of observations (1 year)
- k is a statistical factor

- GNSS with some traverse observations where necessary.

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Designing the GGE 3023 Practical Assignment

- The students will be given the precision requirements, and they will decide how to preform the survey.

- Emphasis will be on meeting the precision requirements in as little time as possible.

Designing the GGE 4022 Practical Assignment

- Students will use data collected from the GGE 3023 practical assignment and analyze it using IWST.

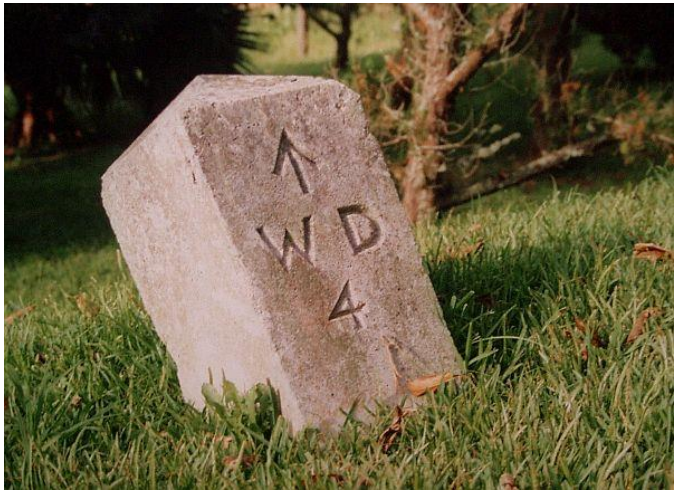
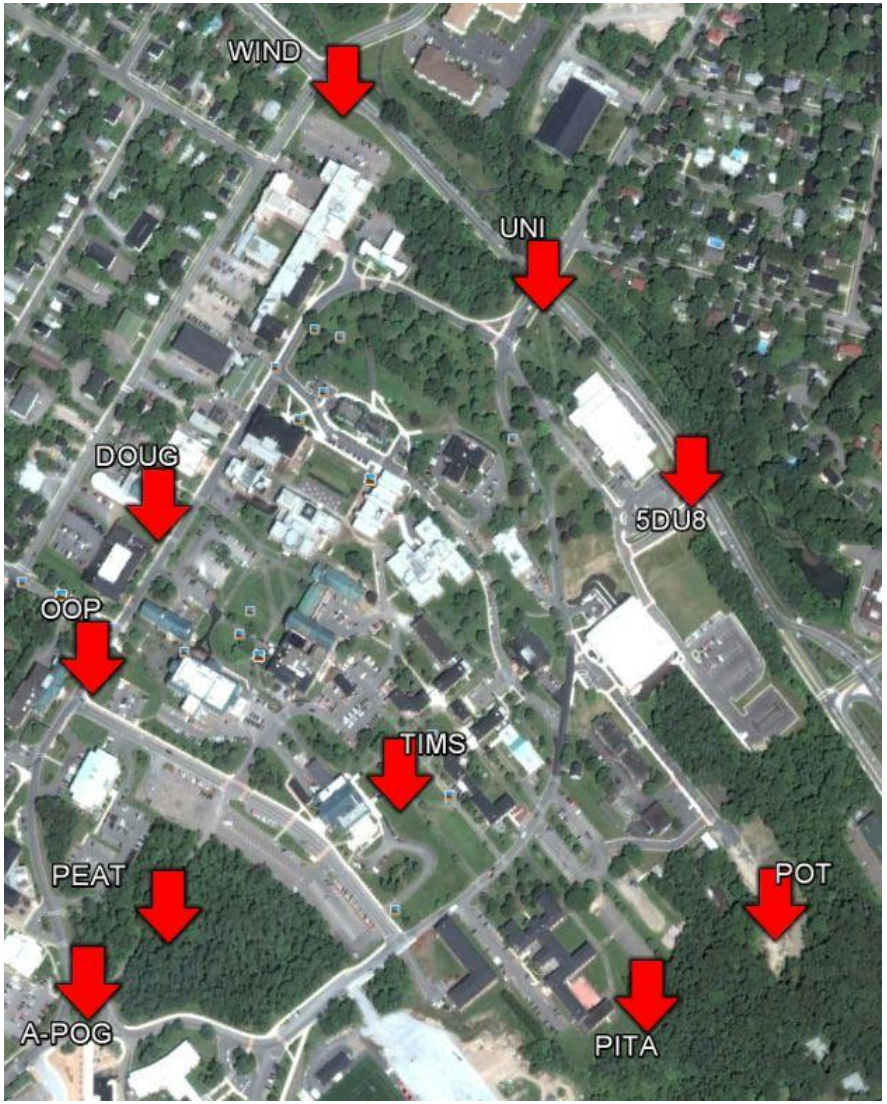


Figure 1. Disturbed Survey Monument (From:http://en.wikipedia.org/wiki/File:WD_Ordnance_Survey_Marker_Bermuda.JPG, by Aodhdubh, under CC BY-SA 2.5)

Fieldwork



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Processing Methodology and Best Practices

1. Calculate point stability.

$$W^0 = I$$

$$d^0 = S^0\, d$$

$$W^{k+1} = \mathrm{diag}(1/d^k)$$

$$d^{k+1} = S^{k+1} * d$$

repeat until : $d^{k+1} - d^k < \mathrm{delta}$

$$\mathrm{Stability} = 1/W_{ii}$$

2. Choose a series of models that might fit the data.

Processing Methodology and Best Practices

3. Preform a least squares adjustment on the data.

4. Choose the best model.

$$\hat{\sigma}_0^2 = \frac{\mathbf{v}_d^T \mathbf{P} \mathbf{v}_d}{r}$$

5.Graphically represent the data.

Results

- Campaign was successfully started.

- Students will obtain practical experience for the fieldwork and processing of deformation monitoring surveys.

Limitations

- Precision requirements were not met.
- Long term results are difficult to determine.

Conclusion

- Finding the precision requirements are essential to the design of the survey.
- Properly analyzing and interpreting collected data can be difficult.
- This project will help the next generation of geomatics engineers and will provide opportunities for future projects.

Acknoledgments

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