SCHULICH SCHOOL OF ENGINEERING
Geomatics Engineering Department

The Necessity of Cadastral Capstone Projects in Geomatics Education

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Introduction

- Here to discuss Cadastral Capstone Projects
- Why they are important for the Land Surveying area of the Geomatics Profession
- How they can be used as a tool to apply and ground theoretical knowledge for a variety of undergraduate course areas, including:
  - Geomatics Networks,
  - Engineering Design,
  - Estimation, and
  - Error Propagation and Survey Practice

Introduction

- They provide unique project applications akin to real world scenarios
- Their importance for students planning on a career in Land Surveying
  - Hit the ground running (field to final product experiences)
  - Accelerated career opportunities from experiences
- Helps the continuation and legacy of the Geomatics Departments network for course delivery

About Me & Relevance

- I am a Sessional Instructor for the Geomatics Engineering Department
- I am a Professional Engineer and Land Surveyor
- My research interests vest directly in the cadastral domain
- I often run the cadastral capstone projects
- I am an alumni of the program and one of these styled projects

U of C Capstone Project

- Akin to most undergraduate engineering programs students are required to undertake a final year long design project

- Geomatics Engineering has a large diversity of overarching disciplines that students can do projects under such as,
  - GNSS Navigation and Estimation
  - Remote Sensing
  - Geodesy
  - Cadastral
  - GIS
  - Inter-disciplinary (often in collaboration in a minor)

- Projects have a variety of deliverables regarding reports, presentations, and final project requirements (unique to the discipline)

Applications of Cadastral Education

- Applications of cadastral research and practice related domains can be applied to the capstone projects to support future land surveying professionals

- Past projects that the department has supported include:
  - Baseline Establishment, Assessment, and Deformation
  - High Precision Networks
  - Subdivision and Land Use Community Development

- For the past few years the project has been a High Precision Network that supports the undergraduate curriculum and delivery of the cadastral concentration
  - Each year has had their own unique emphasis and project objectives

- Future Projects are to potentially include inter-disciplinary applications of cadastral and minors such as biomedical, software, and aerospace

Why Cadastral Projects Matter for Education

- Assists in reinforcing knowledge students receive during their earlier undergraduate experiences (courses) in a real-life styled environment (a practical survey)
- Application of theory in a multi-faceted project allows students to master concepts in the geomatics and cadastral domains
- Provides challenges and problems that come up during the project that allow the students to apply their knowledge to designing solutions that can ensure the project objectives are met
- Time Management is an Essential Learning Point
  - Year Long Survey requires good planning (especially in Calgary during the Winter)

The Approach

- Hands on approach is the most effective to learning all of the skills required to being a practitioner
- Students learn throughout the project through a sliding scale of supportive versus Socratic ideologies
  - Initially to get them going a larger degree of support is provided (direction, perspectives, opinions)
  - Around the 3-month mark as the planning has been completed and the actual field work begins, the approach transitions into a more Socratic methodology
  - In the final months very little direct support is provided in terms of how to complete the project
    - Discussion turns into more collaborative forum where students take charge and the supervisor's role is much less directly involved
- The responsibility of the project deliverables coupled with the team environment allows for a real-world like learning environment

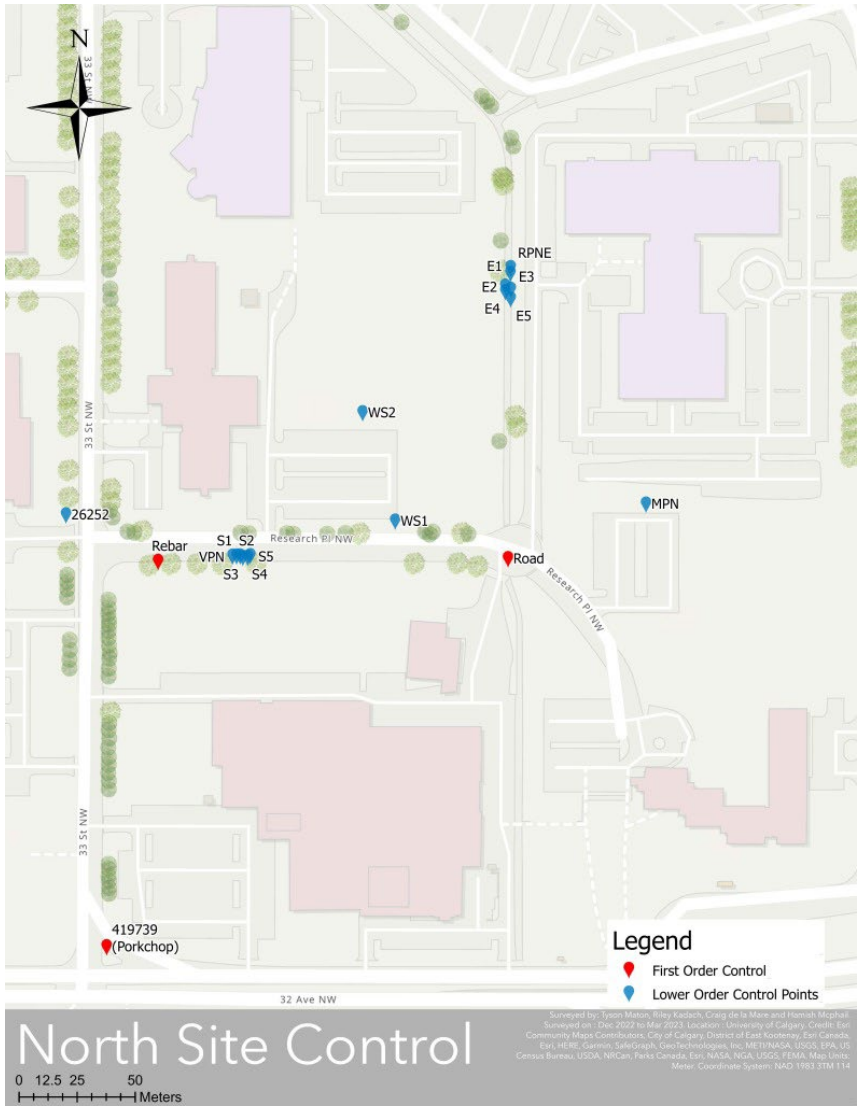
High Precision Network

- Often tasked with retracing the University of Calgary High Precision Network (UC-HPN), re-establishing or restoring control points as needed, and provided an area to expand their own portion of the network

- Additionally includes validation of higher order network architecture to ensure continued confidence in university control

Photo - de la Mare, Craig, Hamish McPhail, Riley Kadach, and Tyson Maton. 2023.

The Problem and Tasks



- Calibrate and Assess equipment
  - Based on design requirements relating to precision
  - Equipment includes conventional (total stations), GNSS receivers, and high precision levels
- Design how to fix damaged or destroyed control as well as integrating expanded network control
- Applying Geomatics Networks, Error Propagation, High Precision Survey Methods, and Spatial Data Analysis in completing deliverables
- All inclusive of reports, field records, computations and processing data, and presentations

Photo - de la Mare, Craig, Hamish McPhail, Riley Kadach, and Tyson Maton. 2023.

Project Outcomes

- Students develop grounded skills in applying field to finish methodologies to high precisions survey projects
- Team environment fosters positive working relations and individual accountability to project deliverables
- Helps the department maintain its survey control infrastructure while enabling direct student involvement and learnings from these tasks

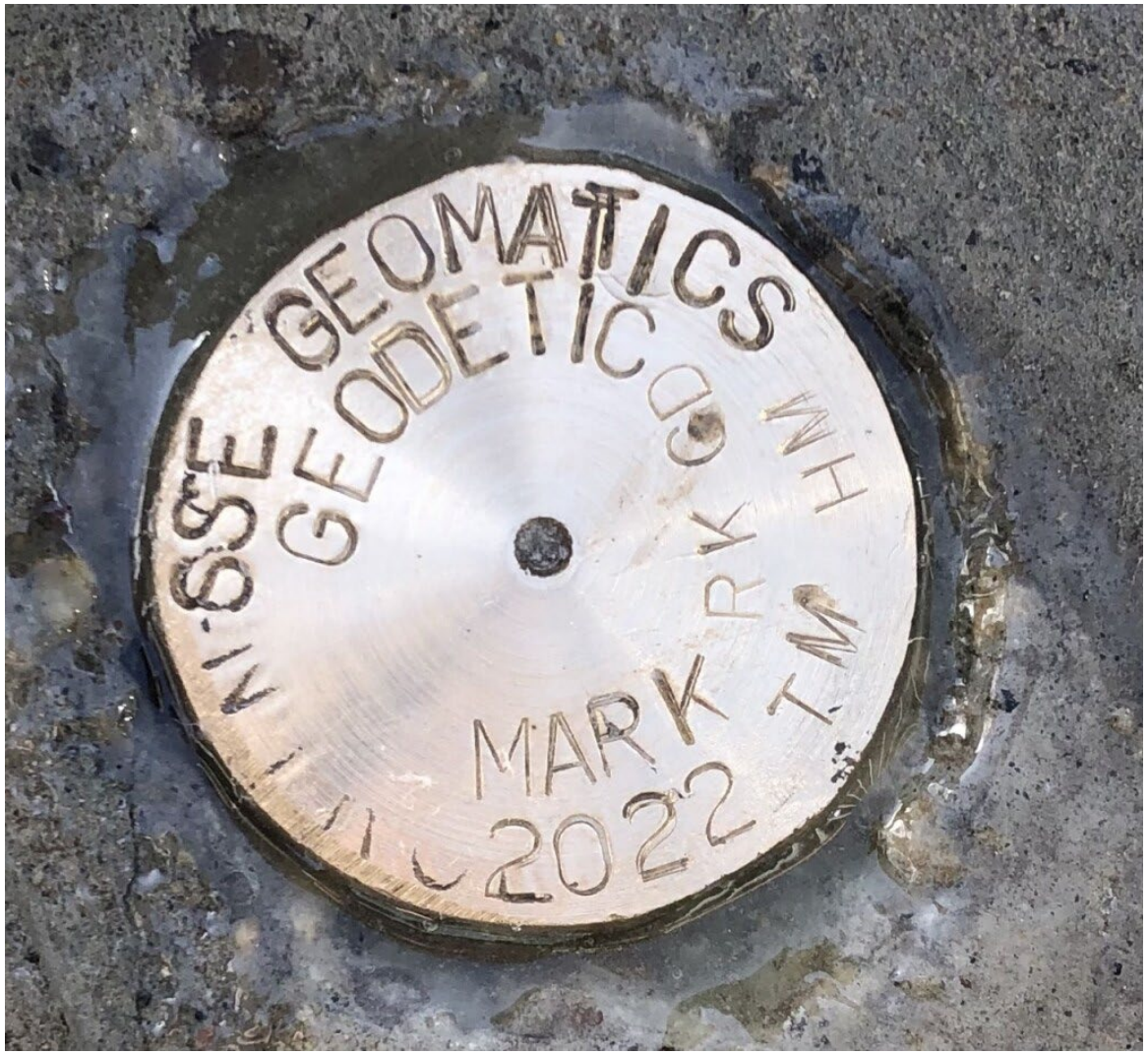


Photo - de la Mare, Craig, Hamish McPhail, Riley Kadach, and Tyson Maton. 2023.

Continued Success

The Cadastral Capstone projects have placed very well in the annual Schulich School of Engineering Capstone Design Fair

- F’22/W’23 Cadastral Capstone
  - Gold Medal
- F’23/W’24 Cadastral Capstone
  - Silver Medal
- F’24/W’25 Cadastral Capstone
  - Gold Medal

Photo - Brennen, Cameron, Eric Ingalls, Tyler Unger, and Wendy Yu . 2025.

Student Successes

- Three of my previous cadastral capstone students have already begun their articles in Alberta and British Columbia
- Approximately 80% of graduates that undertake the Cadastral Capstone (in the past three years) have undertaken careers in the Land Surveying Profession
- Cadastral Capstone project continues to be a popular project for students who are in the Cadastral Concentration, pursuing their CBEPS certificate, and are thinking about a career as a professional land surveyor

Photo - de la Mare, Craig, Hamish McPhail, Riley Kadach, and Tyson Maton. 2023.

Thank You

- For taking the time to hear about Cadastral Capstone Projects in Geomatics Education
- To SaGES for the opportunity to present and collaborate at this excellent venue
- For your roles in the continuation of Cadastral Education Initiatives
- For supporting Geomatics Education

References and Acknowledgements

- The University of Calgary Geomatics Engineering Department
- University of Calgary High Precision Network (Established F’13/W’14)
  - Matthew Clampitt, Brendan Lee, Rory Mekaal, Matthew Sakatch, and Jesse Vanneste
- Recent Capstone Groups – High Precision Network

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