Unit 5: High Resolution Topography Module Summative Assessment – Student Exercise

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Introduction:

In this unit, you will be evaluated on your survey design, survey conducting, and basic data analysis skills gained from the previous units in the module. Specifically, your survey design, attention to detail in field notes—especially with recording metadata, your ability to work with the software, and your considered and logical interpretation of the data you collect, along with thoughtful responses to the given question—will be evaluated. Remember that this is an assessment—once you have designed the survey and completed the data collection, there is no reason to discuss this material with your peers.

Project Description:

Below is a description of the workflow to follow when working on this project. This exercise is expected to take eight to ten field hours, including some time in the evening to make measurements and interpretations about your collected data.

NOTE: *All survey instruments should be treated with care. These instruments are used by many scientific researchers and may be on loan from a community pool maintained by UNAVCO or your institution. These instruments are in high demand, so careful and cautious handling of the equipment is essential, both for the success of the immediate project but also for others who depend on the equipment being in excellent working condition at the end of the day.*

Survey Design:

Break into teams. Spend 15–20 minutes discussing the survey design you think is best as a team. Teams will then present to the group and you will vote to select the survey or combination of survey elements you think is best. Keep in mind this survey should be replicable; if a class came back next year, they would be able to do the same survey again to compare your data to theirs.

Field Notes and Metadata Collection:

Record field notes and metadata as you would at any outcrop. In your final write-up, you will need to list the features present in the scan and rank them based on the likelihood of the features changing, so make necessary notes. Fill out the scan resolution parameter worksheet only for the scan your team conducted.

Data Exploration and Analysis:

Keep in mind the skills that you learned in the previous units on how to work in RiScan Pro or Agisoft. Your instructor will hand out a list of detailed questions you need to answer for the specific survey you conduct.

Write-up:

At the end of the survey and data analysis, create a write-up detailed below about the specifics of survey design and results of data analysis.

Project Report:

Part A: Survey Design Description

In this section of the report, describe the research question and the motivation for using geodetic imaging technique(s) to answer this research question.

1. How did you design this survey to highlight the area of interest?
   Provide a map of the camera locations / collection path or scan positions, target, and GPS locations with annotations justifying and explaining why those locations were chosen. Include any limitations on camera locations / collection path or scan, target, or GPS positions.
2. If doing TLS survey: Use the scan resolution worksheet completed in the field to calculate scan resolution parameters for the detailed scan, including a diagram of the geometries of one detailed scan, calculation of spot size and shape at key locations on the scan section, and a comparison to the resolution expected from the scanner.
3. If doing a TLS survey: Describe the target tie-point verification process, including a plot of the tie-points from RiScan Pro and the degree of correlation of the points. Use this information to discuss the goodness of fit of the merged data sets and what could have been done to increase the goodness of fit.
4. If doing an SfM survey: Provide a map of camera locations. Based on the calculated camera locations from the software, how could you have designed the survey better to highlight the feature of interest? Are any important portions missing or blurry? Use the function in the SfM software to generate a map of photo density. Does this map show you successfully surveyed the feature of interest? Why or why not?
5. If doing an SfM survey: Complete a worksheet to calculate the needed number of photos to cover your area of interest. How does the resolution of your model compare to the ground sampling distance you calculated? Did you take the number of photos needed?

Part B: Data Analysis

Questions for this section will be given to you by your instructor to specifically assess the feature you surveyed.

Write a paragraph answering the following reflection questions:

1. What is the societal impetus to study this feature?
2. What are the pros and cons of the geodetic imaging method(s) used to address the question?
3. What other geological research questions would you like to apply a geodetic survey to and why?

Scan Resolution Parameter Worksheet

Use this worksheet to determine the optimal and realistic scan times based on desired scan resolution.

Beam diameter at instrument: _____m (RieglZ620 = 0.014; RieglVZ400 = 0.007)

Beam divergence: _____radians (RieglZ620 = 0.00015; RieglVZ400 = 0.0003)

Constants for a given scanner

Table 1. Scan spacing

Scan site and scan number	Distance to target (m)	Spot size (m) [Dist*Diverg]+Diameter	Angle of Incidence to target	Ellipse max diameter (m): Spotsize/sine[Angle]	Optimal measurement spacing (m)	Actual spacing used (m)	Comments
	Min						
	Max						
	Mean						
	Min						
	Max						
	Mean						
	Min						
	Max						
	Mean						
	Min						
	Max						
	Mean						

Table 2. Scan time

Scan site and scan number	Horiz scan dist (m)	Optimal # horiz measurements	Vert scan dist (m)	Optimal # vert measurements	Time for optimal scan [#horiz * #vert * time/measurement]	Time for actual scan

Unit 5 Rubric – High Resolution Imaging Module Summative Assessment

This rubric covers the material handed in for Unit 5 student assignment and is the summative assessment for the unit.

Component	Exemplary	Basic	Nonperformance
General Considerations	Exemplary work will not just answer all components of the given question but also answer correctly, completely, and thoughtfully. Attention to detail—as well as answers that are logical and make sense—is an important piece of this.	Basic work may answer all components of the given question, but answers are incorrect, ill-considered, or difficult to interpret given the context of the question. Basic work may also be missing components of a given question.	Nonperformance occurs when students are missing large portions of the assignment, or when the answers simply do not make sense and are incorrect.
Part A: Survey Design Description **(10 points)**	9–10 points: Survey design to highlight scarp (2 points) Map with camera locations / collection path or scanner, target, and GPS locations with justifications (2 points) Scan resolution material including a worksheet for their scan, diagram of geometries, calculation of spot size/shape, comparison to scanner resolution (2 points) Target tie-point verification, including a figure, degree of correlation, and explanation of the goodness of fit and how it may improve (3 points) OR reflection on collection path / camera locations with figure showing photo overlap and some discussion of how survey design may improve (5 points) If all of the above is included and the material is presented in a clear, concise and well-written fashion (1 point)	5–8 points: Missing 1–2 of the listed characteristics for an exemplary report and may be poorly written/unclear; AND/OR All characteristics are present but lack detail or are incorrect, showing a lack of comprehension	0–4 points: Missing 2–4 of the characteristics, may be poorly written and unclear; AND/OR Most characteristics are present (1–2 missing) but are incorrect, showing a lack of comprehension

Part B: Scientific Question Analysis **(10 points)**	9–10 points: Depends on feature scanned (7 points) Detailed and thoughtful answer to reflection question about learning experience (2 points) If all of the above is included and the material is presented in a clear, concise, and well-written fashion (1 point)	5–8 points: Missing 1–3 (depending on which ones) of the characteristics for an exemplary report and may be poorly written or unclear; AND/OR All characteristics are present but lack detail or are incorrect, showing a lack of comprehension. In addition, answer to reflection question is not thoughtful/considered.	0–4 points: Missing 3–5 of the characteristics, may be poorly written and unclear; AND/OR Most characteristics are present (1–2 missing) but are incorrect, showing a lack of comprehension. In addition, reflection question is not answered.