Assignment 01

Site Modeling with LiDAR and Physical Fabrication

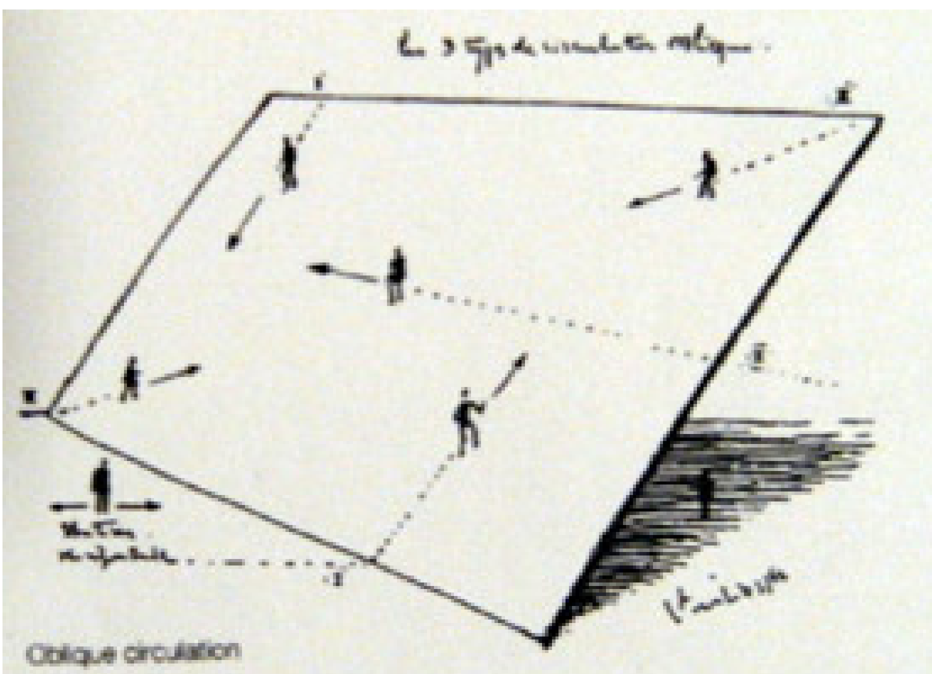
Course: Arch 565 - Advanced Computer Applications II
Due Date: Tuesday, September 16th
Weight: 25% of final grade

Overview

This assignment challenges you to combine emerging digital documentation technologies with traditional physical modeling techniques to create a hybrid site model. Using LiDAR scanning, you will capture a portion of the built environment and its topography, process the data into a clean 3D model, and translate it into a physical representation through digital fabrication methods. The goal is to develop skills in spatial accuracy, digital-to-physical workflows, and critical reflection on the role of computational technologies in architectural practice.

Objectives

- Gain hands-on experience with LiDAR-based site documentation.
- Process point cloud data into usable 3D models for architectural analysis.
- Integrate digital modeling and computational fabrication to produce a physical site model.
- Reflect on the accuracy, limitations, and opportunities of LiDAR technology compared to traditional site modeling.



https://spacesymmetrystructure.wordpress.com/rheotomic-surfaces/

Assignment Tasks

1. **Site Selection & Scanning**

   - Gather LiDAR data for your project site through publicly available sources.
   - OR:
     - Select a small urban or landscape site (approx. 50’ x 50’ minimum).
     - Use a LiDAR-enabled device (iPad Pro, LiDAR scanner, or equivalent) to capture the site, including topography, vegetation, and built features.
     - Perform multiple scans to ensure complete coverage and minimize data gaps.

2. **Data Processing & Digital Modeling**

   - Import the LiDAR data into appropriate software (e.g., Autodesk Recap, CloudCompare, Rhino, Grasshopper).
   - Clean and align the point cloud, removing noise and filling gaps.
   - Generate a simplified but accurate 3D model suitable for fabrication (surface mesh or contour model).

3. **Physical Fabrication**

   - Translate the digital model into fabrication-ready files.
   - Use laser cutting, CNC milling, or 3D printing to produce a physical site model at a scale of your choosing
   - Assemble and finish the physical model, ensuring clarity and legibility of site features.

4. **Documentation & Reflection**

   - Submit a short (2–3 page) illustrated report or journal documenting your workflow, including scanning process, data cleaning, model preparation, fabrication, and assembly.
   - Critically evaluate the strengths and limitations of LiDAR technology in architectural site analysis and how it compares to traditional surveying and hand-built modelin

Deliverables

- **Digital Submission:** Cleaned point cloud, processed 3D model, and fabrication-ready files (.3dm, .dwg, or .stl).
- **Physical Submission:** physical site model assembled and finished.
- **Report Submission:** PDF (2–3 pages) with workflow documentation, images, and critical reflection

Evaluation Criteria

- **Technical Proficiency (30%)** – Accuracy and clarity of LiDAR scanning, data processing, and digital modeling.
- **Craft & Fabrication (30%)** – Precision, scale accuracy, and finish of the physical model.
- **Workflow Integration (20%)** – Clear translation between digital and physical methods.
- **Critical Reflection (20%)** – Depth of analysis in the written report regarding opportunities and limitations of LiDAR in architectural workflows.

Grading Rubric (100 points total)

Criteria	Excellent (A: 90–100)	Satisfactory (B–C: 70–89)	Needs Improvement (D–F: <70)
Technical Proficiency (30 pts)	Point cloud capture is complete, accurate, and well-processed; 3D model is clean, detailed, and fabrication ready.	LiDAR data is captured with minor gaps; 3D model is serviceable but contains simplifications or minor errors.	LiDAR scan is incomplete or poorly processed; 3D model is inaccurate, messy, or unusable for fabrication.
Craft & Fabrication (30 pts)	Physical model is precise, clean, and well-assembled; scale and features are legible; fabrication techniques are skillfully applied.	Physical model shows reasonable accuracy but has noticeable imperfections or assembly flaws; scale legibility is adequate.	Model is poorly fabricated, incomplete, or unclear; features are illegible; craftsmanship is lacking.
Workflow Integration (20 pts)	Seamless translation from LiDAR to 3D model to physical fabrication; workflow demonstrates clear understanding of digital–physical integration.	Workflow is mostly clear but has gaps; some inefficiencies or issues in moving between digital and physical steps.	Workflow is fragmented, incomplete, or shows little understanding of how digital and physical processes connect.
Critical Reflection (20 pts)	Report clearly documents workflow with images; reflection demonstrates deep, critical insight into opportunities and limitations of LiDAR vs. traditional methods.	Report documents workflow but with limited detail; reflection is descriptive rather than analytical, with surface-level critique.	Report is incomplete, unclear, or missing; reflection lacks insight, depth, or meaningful evaluation.