CS09 – Investigation and Documentation of Modern Heritage

This session will look at some of the range of investigation and documentation strategies that are being applied to a broad spectrum of modern and recent resources. Ranging from investigation into the properties of Oolitic Limestone used in successive construction campaigns from the 1880s to the 1980s in a single building, to the GIS mapping of large mid-twentieth century districts and cultural landscapes, the papers outline how different means and methods of evaluation can enable a variety of desired outcomes.

Order of Papers

1. Oolitic Limestone Use and Restoration on the Manti Temple
2. Philip Johnson’s Brick House – A considered Approach to a Restoration Project using Non-Destructive Evaluation (NDE) Technologies and Targeted Exposures
3. Energy Retrofit of Historic Masonry Structures
4. #D GIS and the Modelling of the Past and future Historic districts and Cultural Landscapes

Core Session/Learning Objectives

- Understand the variety of applications for Investigation and Documentation of historic resources
- Learn value of various Non-Destructive Testing techniques in assessing material properties and existing conditions
- Learn a methodology and a work flow of energy retrofit with qualifying cost-effective improvements for historic buildings.
- Introduce the potential of 3D modelling to enhance visualization and analytical capabilities and to assist preservationists and designers, as well as the public, in exploring potential preservation treatments and design scenarios.

Presentation Outlines:
1. **Oolitic Limestone Use and Restoration on the Manti Temple**

   Dr. Elwin C. Robison, EDI Building Consultants, Inc.

The Manti Temple was constructed from 1877-1888 in the Sanpete Valley of Utah. It was built from a local oolitic limestone quarried only ¼ mile from the building site. Additions were constructed in 1935 and 1984. Following a major restoration of the building interior in 1982-84, the exterior stone was restored in 1995-97. A review of the investigative process and procedures prior to commencing restoration work and the varying stone restoration techniques provides guidance for clients and design professionals contemplating similar stone restoration campaigns.

I. Construction History
   a. Site leveling
   b. Manti and Ephraim quarries

II. Additions and Stone Sources
   a. 1935 Addition—stone quarried from crawl space under the original annex.
   b. 1982-84 Addition—stone taken from the original quarry.

III. Investigation
   a. 1973 study of stone consolidants
   b. Hime & Associates
      i. Sampling from different areas of Manti quarry—definition of oolitic and pelitic weathering characteristics
      ii. Ephraim quarry sampled and tested
      iii. Accelerated weathering tests with siloxane consolidant.
   c. Harry Weese Associates binocular survey

IV. Restoration
   a. Scope of work roughly tripled.
   b. Flashing
   c. Tooling
      i. 1877-88 stone tooling
      ii. 1935 stone tooling
      iii. 1982-84 stone tooling
      iv. 1995 replacement
      v. 1995 recarving
   d. Failure of near surface region
   e. Retaining walls not considered with the main building

V. Summary
   a. Roles of Manti and Ephraim quarries not understood prior to investigation, and quarrying from the actual site for the 1935 addition not understood.
   b. Lack of hands on survey of the building
   c. Economy in replicating tooling should be fully understood by client

Presenter: Alan White, Operations Director – GB Geotechnics USA Inc

Introduction:
Brief discussion regarding the use of NDE including the basic tools and why they should be considered for a restoration and/or preservation project:
- Why was investigation required at the Brick House?
- What are the alternatives to NDE and what are their limitations?
- What were the primary objectives for the project?

The Survey:
- **Cavity Walls**
  Techniques – Radar, Metal Detection, Thermal Imaging & Videoscoping
  Data Overview – The procedures, the experience, the information obtained
  Findings – arrangement and condition of wall ties in cavity, existence and extent of cavity bridging
- **Water Infiltration**
  Techniques – Thermal Imaging & Moisture Level Assessment
  Data Overview – The procedures, the experience, the information obtained
  Findings – Extent of water infiltration and likely sources identified
- **Stud Walls**
  Techniques – Radar & Thermal Imaging
  Data Overview – The procedures, the experience, the information obtained
  Findings – Arrangement and variations in stud wall framing
- **Building Systems**
  Techniques – Radar & Thermal Imaging
  Data Overview – The procedures, the experience, the information obtained
  Findings – Pipework and conduit routing / arrangement and continuity of under floor heating
- **Floor and Roof Structures**
  Techniques – Radar & Metal Detection
  Data Overview – The procedures, the experience, the information obtained
  Findings – Slab and roof construction arrangement

Conclusions:
What was achieved by performing the survey?
- What was presented to the client?
- What were the limitations of the data and information provided?
- How can this information be used moving forward?
3. Presentation Title: Energy Retrofit of History Masonry Structures

Presenter: Namhyuck Ahn

1. Introduction
   a. Barriers to energy retrofit of historic masonry buildings
      i. Building science
      ii. Preservation standards
   b. Whole building energy analysis and deep energy retrofit
      i. Standard retrofit and deep retrofit
      ii. Energy modeling of historic buildings

2. Methodology
   a. Pre-analysis
      i. Archival research
      ii. Field work
      iii. Simulation & model calibration
   b. Work Flow

3. Case Buildings in Austin
   a. Case 1 – Teachers State Association of Texas Building
      i. Describe the case building and its historic significance
      ii. Problems statement
      iii. Retrofit strategies
      iv. Life-cycle costing
   b. Case 2 – North-Evans Chateau
      i. Describe the case building and its historic significance
      ii. Problems statement
      iii. Retrofit Strategies
      iv. Life-cycle costing

4. Discussion
   a. Benefits and limitations
   b. Future research
4. **3D GIS and the Modeling of the Past & Future of Historic Districts and Cultural Landscapes**

   **Dr. Jennifer Minner, Assistant Professor, Cornell University**  
   **Prof. Jeffrey Chusid, Associate Professor, Cornell University**

This presentation highlights research from *Visualizing the Past, Present, and Future of New York City’s 1964-5 World’s Fair site using 3D GIS and Procedural Modeling*, a grant proposal funded through the National Center for Preservation Technology and Training. In this research project we explore, document, and share information about 3D GIS techniques and the ability to generate useful 3D visualizations of past, present, and future landscapes for historic preservation and urban design. We examine the extent to which 3D modeling can support preservation professionals and the general public in understanding landscape change and analyzing design alternatives. The pilot area is a historically significant former world’s fair site— the Flushing Meadows Corona Park in Queens, New York.

**Presentation Outline**

The potential value of 3D modeling
- Preservation is an interdisciplinary practice and it is also a form of urban design.
- There is potential in 3D modeling to enhance visualization and analytical capabilities and to assist preservationists and designers, as well as the public to explore potential preservation treatments and design scenarios.
- 3D modeling may aid in participatory planning, as well as education, interpretation and advocacy.
- We see demand by regulatory bodies for better modeling of proposed developments. For instance, some local governments have explored requiring building information models/3D models. Some Federal and state agencies and local governments have adopted guidelines for the use of BIM.
- Also many local governments use GIS as an urban planning support system to aid in decisions about the built environment.
- However, it can be difficult for members of the public, decision-makers, and even professionals to translate 2D maps into scenarios that can be readily understood in three dimensions, let alone the ability to visualize changes in time.
- Historic preservation and urban design and planning seem to be missing the ability to unite the geographic and architectural, to integrate multiple forms of knowledge toward common goals. Geographic Information Systems technology has the potential to do this.
- We see advances in 3D as a potential way to respond. The potential for a 4D GIS to gather geographic and architectural information and to be used as an interactive design tool. Ability for more than one research team to collaborate, interact with volunteers who can build 3D models (sketchup) crowd-sourcing
- As an example of the power of digital models - compare to a physical model
  - Example of a panorama scale model of all of New York City at the Queens Museum at Flushing Meadows Corona Park - 10,000 square foot model commissioned by Robert Moses at a scale of 1 inch to 100 square feet
  - It is breathtaking - but people must walk around it. They cannot manipulate it directly.
  - There is no way to show change over time without destroying the old model.
  - It’s difficult to refine the model based on new information.
  - Want to be able to show multiple points in time
  - We want people to be able to interact and change the model and to explore how a city may change.

The Technology (and Medium)
- The grant research focused on CityEngine from ESRI. This section describes - what it is and what it does well
  - Creation of fly-through models, the ability to model different architectural features according to rules, and the ability to modify/have attributes (a database) to conduct analytical calculations.
  - Procedural modeling: the ability to create new neighborhoods/urban fabric based on rules
  - Annotation with building reports (energy calculation, solar analysis, shade analysis - modeling features)
  - Degree of Interoperability between formats
    - Maya, Sketchup, Revit (BIM)

The Case Study - Flushing Meadows Corona Park
- Case study ties to broader interest in world’s fair sites, but also relates to interests/need to examine large districts/neighborhood-scale areas which have a combination of urban design and preservation issues
- There are remaining pavilions from the 1964-5 world’s fair and even a few resources left over from the 1939 world’s fair
- It is a cultural landscape with a complex political as well as physical history -
  - Strategic Framework Plan that was insensitive to retention of historic aspects of the landscape (Beaux Arts pathways)
  - Bloomberg era proposal for soccer stadium,
  - Question of how to reuse/adapt New York State Pavilion
  - Benches and Fountains - historic artifacts, landscape elements that may be underappreciated and underutilized
- How we hypothesize the models would be useful not just for representing the past in a static fashion, but as part of the design process.
- Methodology
  - Create use cases
- Create evaluation criteria - including interoperability, crowdsourcing opportunities, etc.
- Examined the ecology of 3D software
- Produced existing conditions model
- Model of the past
- Model of design scenarios

Complications and limitations of CityEngine found during project

- Some users perceive the need to be a programmer. Need for comfort with scripting.
- Loss of geographic information and some building details during import of some 3D model types into CityEngine.
- There is the capacity to add user-defined attributes, but difficult to query. This means that it does not have one of the main advantages of GIS, which is analytical capability. Missing tools such as measurement in 3D space, which was recently added to 3D capabilities in ArcGIS 3.0.
- Does not have crowdsourcing solutions in this software. Design professionals need tools that integrate means of crowdsourcing (similar to Sketchup and Google Earth).
- Most interesting complication – available libraries of building types and some of the procedural modeling tools seem aimed at replicating contemporary architecture that fits standard typologies. Difficult to build vocabulary of the ‘60 era architecture: but makes for interesting possibilities.

What we would like a future 3D GIS application to do

- Give user the ability to store more user-defined information, which can do in 2D GIS.
- Better architectural information more specific to heritage: character-defining features for buildings and landscapes, along with annotation.
- Have more analytical tools available for analyzing spatial relationships in 3D.
- Have compatibility across platforms and software for importing data, crowd-sourced contributions, etc.
- We note that there are still divisions and trade-offs between crowd-sourced, open-sourced modeling, and a professional high-end tool that incorporates engineering, life-cycle calculations.

Visions for future uses of 3D/4D GIS for Historic Preservation

- Prospective uses
  - The hypothetical city - see if it can recreate past eras; can create whimsical visualizations of entire cities built in single era.
  - Potential to unite engineering knowledge in addition to architectural and geographic knowledge and analysis? Analyze tradeoffs - embed life cycles into procedural modeling - materials, volume, etc. Visualize flow of materials and energy in and out of a district, through different preservation, demolition, and redevelopment scenarios.
  - CityEngine best at modeling urban fabric according to rules. Visualization of infill under different regulations/guidelines in historic districts a potentially good use. Generating alternatives for infill in historic districts or parks on the fly at design charrettes.