Unreal Projects: Visualizing Sugar Land and the Imperial Sugar Company

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B. Project Summary

Picture yourself approaching a now-defunct industrial heritage site that today lies on the edge of one of the nation's largest cities. Now imagine it bustling with activity. Perhaps you are aware that this was once a privately owned enterprise, a flourishing company town in a rural area that housed both industrial and residential activities. You recognize the architectural form of the mill, the smokestacks, the worker housing and the original machinery. You walk inside the refinery and around the boilers. You know the place, but the time is different: this is not a tour of the site in the 21st century, but during the peak of its production—during the heyday of early 20th-century industrialization. Shifting seamlessly and effortlessly over a series of decades, you explore the post-industrial environment as it undergoes transformation, adapted for new used. This comparison affords you a better understanding of how urban space evolves over time, of place and space as evolving processes. How is this possible? You are experiencing industrial heritage through immersive visualization (IV), a form of virtual reality.

Our team of faculty in Architecture, Land and Property Development, and Construction Science, proposes to conduct architectural, archaeological and urban historical research through virtual heritage visualization of a quintessential factory town: Sugar Land, the former headquarters of the Imperial Sugar Company, the first sugar refinery in Texas and the state's oldest extant business. This town, with an identity and a history intimately connected to the sugar industry, has been slowly losing its connection to its origins, and the industrial heart of the town is on the cusp of a large redevelopment project. If the redevelopment project fails to reflect the rich history of the people and the sugar industry, much of the history and identity of this town and its people will be lost. In order to minimize the loss and preserve history and culture, this project plans to construct digital models of the factory town and explore the industrial heritage environment in IV. Digital technology has progressed to generate experiences of places and spaces that are otherwise difficult or impossible to access. The results of this project will serve as both archeological documentation and as an aid to the community of Sugar Land to help in the identification, conservation and interpretation of the city's industrial past. To test the value and viability of this research we will use the Building Information Modeling (BIM) CAVE, an interactive, immersive environment devised by Dr. Julian Kang, to enable small groups of people to navigate through the digital models produced by the team. The BIM CAVE makes use of commercially available software that is used widely in architecture and the construction industry. BIM software enables the quick modeling of 3D architectural and urban spaces and the ability to embed non-graphic information into the model to control the visualization. Navigating freely through the simulated world of IV enriches our understanding of history and culture; inhabiting this unreal world will convey a greater understanding of and offer deeper insights into the issues and practices associated with industrial heritage than can be obtained by other types of media and other types of experience.

The project will comprise four main activities: (1) Documentation, which will include compilation of textual and iconographic datasets, and interviews conducted with residents, preservationists, and professionals in charge of the redevelopment plan; (2) Fieldwork, which will cover the data collection of the physical remains; (3) producing measured drawings of the facility using CAD (Computer-Aided Design) and BIM software to generate virtual reality models from the survey data that will contribute to the development of first- and third-person walkthroughs in the final phase of the project. (4) Dissemination of the results through exhibitions, presentations, and publications. An exhibit will be prepared and made available to local and national venues for display.

C. Application Narrative

1. Documentation of need for the Project: What is the proposed project's significance to industrial heritage?

Picture yourself approaching a now-defunct industrial heritage site that today lies on the edge of one of the nation's largest cities. Now imagine it bustling with activity. Perhaps you are aware that this was once a privately owned enterprise, a flourishing company town in a rural area that housed both industrial and residential activities. You recognize the architectural form of the mill, the smokestacks, the worker housing and the original machinery. You walk inside the refinery and around the boilers. You know the place, but the time is different: this is not a tour of the site in the 21st century, but during the peak of its production — during the heyday of early 20th-century industrialization. Shifting seamlessly and effortlessly over a series of decades, you explore the post-industrial environment as it undergoes transformation, adapted for new used. This comparison affords you a better understanding of how urban space evolves over time, of place and space as evolving processes. How is this possible? You are experiencing industrial heritage through immersive visualization (IV), a form of virtual reality.

Our team of faculty in Architecture, Land and Property Development, and Construction Science, proposes to conduct architectural, archaeological and urban historical research through virtual heritage visualization of a quintessential factory town: Sugar Land, the former headquarters of the Imperial Sugar Company, the first sugar refinery in Texas and the state's oldest extant business. This town, with an identity and a history intimately connected to the sugar industry, has been slowly losing its connection to its origins, and the industrial heart of the town is on the cusp of a large redevelopment project. If the redevelopment project fails to reflect the rich history of the people and the sugar industry, much of the history and identity of this town and its people will be lost. In order to minimize the loss and preserve history and culture, this project plans to construct digital models of the factory town and explore the industrial heritage environment in IV. Digital technology has progressed to generate experiences of places and spaces that are otherwise difficult or impossible to access, such as spaces that are no longer existent. The results of this project will serve as both archeological documentation and as an aid to the community of Sugar Land to help in the identification, conservation and interpretation of the city's industrial past.

Sugar Land was incorporated in 1959, when it became a public municipality, and the Imperial Sugar Company's main refinery and distribution center were closed in 2002. In 2007, Johnson Development Corporation commissioned a Texas-based firm to envision a master plan on the recently purchased 650-acre area that surrounds the plant (the plan proposes the adaptive reuse of the historic Imperial Sugar, which also calls for retails, hospitality, restaurants, office, and residential uses, and 235 acres of open spaces, wetlands, and parks). In early 2010, demolition work began on the former refinery campus for structures that are not part of the preservation plan. The majority of the machineries and industrial equipment were removed. Later in December industrial buildings were partially imploded. The documentation, study, and preservation of the Imperial Sugar heritage are especially significant in light of the current changes and redevelopment plan.

In order to test the value and viability of this research we will use the Building Information Modeling (BIM) CAVE, an interactive, immersive environment devised by Dr. Julian Kang, to enable small groups of people to navigate through the digital models produced by the team. The BIM CAVE makes

use of commercially available software that is used widely in architecture and the construction industry. BIM software enables the quick modeling of 3D architectural and urban spaces and the ability to embed non-graphic information into the model to control the visualization. Navigating freely through the simulated world of IV enriches our understanding of history and culture; inhabiting this unreal world will convey a greater understanding of and offer deeper insights into the issues and practices associated with industrial heritage than can be obtained by other types of media and other types of experience. We anticipate that use of an IV facility can become a standard for excellence in teaching about historic, contemporary, and future environments in architectural disciplines, core curricula, and other disciplines.

The experience of the BIM CAVE is novel and stimulating. As an education-oriented study, the importance of this project is twofold: to provide scholars with non-traditional research and teaching tools capable of uncovering new knowledge, and to explore new means of communication that might reach a broadly diversified audience of all ages and backgrounds. Therefore it will promote research, teaching enhancement, and community service engagement.

2. What research methods will you employ?

The methodology for this project was designed to document and visualize changes in Sugar Land over time: from sugar plantation, model company town, newly incorporate town, when the activities ended, and the post- industrial site under transformation for new uses. The methodology will be based on our research project "Unreal Projects: Using Immersive Visualization to Learn about Distant and Historical Locales", which proposes to construct digital models of places remote in distance or time to enable students in core curriculum courses to enhance their spatial and sensory understanding of place.

This project will comprise four main activities:

1. Documentation, which will include interviews conducted with professionals in charge of the redevelopment plan and research in the historic archives of Sugar Land Heritage Foundation to create a database by compiling textual and iconographic datasets, including historical map, drawings, plans, and photographs. While in Sugar Land, we will count with the support and collaboration from SLHF. We plan to track and redraw maps of five stages: 1. as a sugar plantation, around 1909; 2. as a model company town with the new refinery (Char House), around 1929; 3. following the incorporation in 1959; 4. After the end of Imperial Sugar's activity in 2002; 5. and currently in 2014.

2. Fieldworks, which will comprise of visual inspection, recordation, and data collection (sketching, photograph, photogrammetry, scanning, and measurement) of the physical remains of the Imperial Sugar complex, with emphasis on three historical landmarks: the Char house, the Three-Bays warehouse, and the water tower.

3. Producing measured drawings of the facility using Computer-Aided Design (CAD) and Building Information Modeling (BIM) software to generate virtual reality models from the survey data that will contribute to the development of first- and third-person walkthroughs in the final phase of the project. We plan to execute five digital models - three at urban scale and two at building scale - tracking changes and important stages of the facility and town - around 1909, 1929, 1959, 2002, and 2014.

4. Dissemination of results through exhibitions, presentations, and publications. The 3D models will be used to produce still images and videos showing the site in its heyday. We will invite students and local community to experience immersive visualization (navigating through the digital models), and to understand heritage using the *BIM CAVE*[1]. The BIM CAVE, invented and implemented by Dr. Julian Kang and his students, provides particular advantages that enable this project to be practical. The BIM CAVE makes use of commercially available software that is used widely in the architecture and construction industry. BIM software enables the quick modeling of 3D architectural and urban spaces and the ability to embed non-graphic information into the model to control the visualization. A student may watch a building being constructed, or inspect it at different phases of its history, or see highlighted the structure or other technical characteristics. The modeling software is available free of charge to all of our students and faculty, and the BIM CAVE is proprietary to Texas A&M. An exhibit will be prepared and made available to local and national venues for display.

The research is summarized below with expected durations of tasks, start days and completion days.

Table 1. Activities

Task Name	Duration	Expected Outcomes
Documentation	One week	Survey: by compiling textual and iconographic datasets. Project network/contact: professionals, archives, Sugar Land Heritage Foundation
Data Collection: Sugar Land	Two weeks	Visual inspections - Sketches, Measurements, Photographs
Interviews with Texas-based professionals	One week	Interviews; documentary research on redevelopment plan and adaptive reuse projects
CAD drawings, 3D modeling	Ten weeks	Technical Drawings, and 3D Model and Renderings of Sugar Land and the Imperial Sugar
Presenting Data	Two-Four weeks	Technical and analytical report; selecting and editing graphics and videos for exhibit, journal article, and website

3. Who is responsible for your project?

The local collaborators for this project are faculty members of Texas A&M College of Architecture responsible for the "Unreal Projects: Using Immersive Visualization to Learn about Distant and Historical Locales": Gabriela Campagnol (PhD, Assistant Professor, Department of Architecture); Mark J. Clayton (PhD, Professor, Department of Architecture); Stephen Caffey (PhD, Assistant Professor, Department of Architecture), Julian Kang (PhD, Professor, Department of Construction Science), Geoffrey Booth (Associate Professor, Department of Landscape Architecture and Urban Planning), Nancy Klein (PhD, Associate Professor, Department of Architecture), and Kevin Glowacki (PhD, Assistant Professor, Department of Architecture). The current project is an education-oriented study of the use of immersive visualization to support education in history of architecture. It contributes the "BIM CAVE", an immersive visualization facility that makes use of architectural design

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[1] BIM CAVE refers to the modeling technology used in the building industry, Building Information Modeling, and an early and influential immersive visualization environment, Cave Automatic Visualization Environment.

software for modeling structures, and faculty expertise. The principal researcher will be Dr. Campagnol, who has been working extensively on the documentation and preservation of the industrial heritage, in particular on the sugar heritage, both in US and in her home country, Brazil. She is a faculty fellow of the Center for Heritage Conservation (CHC), Texas A&M University, and one of the founder members of the Brazilian committee for conservation of the industrial heritage (TICCIH-Brazil).

Each member of the team has well-defined roles and tasks. Professor Booth has a record of developing learning outcomes and educational assessments in collaboration with the Center for Teaching Excellence and will lead the preparation of assessment materials. Professor Clayton will lead the production of 3D digital models using BIM technology, while Professor Kang will lead the preparation of models for the BIM CAVE and management of the BIM CAVE. Dr. Glowacki and Dr. Klein, with an archeology background, together with Dr. Caffey and Dr. Campagnol, will oversee the data collection, documentation, and prepare lesson plans and exercises about the various stages of the environment. Professor Booth will advise in the production of lesson plans to assure content is included that relates to sensory perceptions of space, including sight, sound, smell, taste, and touch. (Campagnol's CV attached)

The Center for Heritage Conservation (CHC) will offer support for data collection and recording - 3D scanner, total station, and photogrammetry -, and assistantship through graduate students for visual inspections and information technology.

The Sugar Land Heritage Foundation (SLHF), which is located within the former Imperial Sugar facility, is supportive of this project. The SLHF will assist in our documentation and fieldworks (letter attached).

4. What tangible products do you expect to produce with this project?

This project will produce:

1. 3D models, three at urban scale around the industrial core of Imperial Sugar, and two at building scale of the Imperial Sugar facility, using CAD and BIM technology.
2. Videos about the community interaction through immersive visualization of the proposed models.
3. The results will be presented in a peer reviewed journal article, exhibit, and website. An exhibit will be prepared for public display. The models will be part of the Sugar Land Heritage Foundation archives for public access, and may be displayed as part of its museum collection.

D. Budget

"What is the quantum of grant required?

The funds requested will be used for personnel, equipment, and travel, as detailed in Table 2.

To complete this project, we propose to conduct fieldwork to document the Imperial Sugar Company in Sugar Land Texas. In Sugar Land, with the collaboration and technical support from Sugar Land Heritage Foundation, the CHC (Center for Heritage Conservation) and scholars from the College of Architecture of Texas A&M University, we will initiate the documentation of the Imperial Sugar buildings and investigate the redevelopment plan and preservation proposals. The trips to Sugar

Land will comprise of site visits for visual inspection and research in local archives. While in Texas, we will visit and conduct interviews with architectural firms in charge of the redevelopment plan and rehabilitation project.

The digital models are expected to require about 200 hours of modeling time. Graduate students committed with our current project will assist in preparing the models for the BIM CAVE, and maintaining the hardware and software for the BIM CAVE. The modeling software is available free of charge to all of our students and faculty, and the BIM CAVE is proprietary to Texas A&M.

We are requesting $3,000 with matching funds from our College of Architecture grant, for a total of $3,964.

Table 2 - Budget

Ground transportation College Station – Sugar Land: 15 trips @200 miles/trip @ $0.315/mile	$945.00
Ground transportation College Station – Austin, Houston: 5 trips @ 250 miles/trip	$346.50
Per Diem - Texas: 17 days @ $25.00/day	$472.50
Research support visual documentation – drawings and 3D modeling (200 hrs)	$2,000.00
Miscellaneous (photocopies, sketch book, editing, etc)	$200.00
Total:	**$3,964.00**
Total requested from SIA Grant	**$3,000.00**

College Station, March 1st 2014.