

The Revealing Cooperation and Conflict Project

A Detailed Proposal for the *University of Texas at Austin's MappiMundi*

A Prototype Model of *Virtual Plasencia*

8 March 2014 - Revision 1.0

✿ Dr. Roger L. Martinez (University of Colorado) ✿ Dr. Victor Schinazi (ETH Zurich) ✿
✿ Dr. Paddington Hodza (University of Wyoming) ✿

Brief Overview

We are proposing to create a prototype, interactive, Internet-based model of a critical section of the medieval city of Plasencia, Spain. Known as *Virtual Plasencia*, the dynamic GIS and 3D visualization of the community will re-generate and energize the long-lost interactions of Jews, Christians, and Muslims in this city within the Spanish Kingdom of Castile and Leon (1390-1450 c.e.). By presenting short historical narratives that are “click-accessible” in *Virtual Plasencia*, users will experience the intimate nature of the community. Combining the unique and interdisciplinary expertise of visualizers, geographers, historians, and artists, we will begin our first crucial steps in revealing the unusual collaborative and conflicting political, religious, and economic relations of these three faith groups. These relationships are particularly meaningful because they occurred during a time of increasing anti-Jewish/Muslim animosity in the emerging imperial power that would become Queen Isabella and King Ferdinand’s Catholic Spain.

Although work in the digital humanities is novel by its nature, its tendency to rely exclusively on internal university staff and resources to implement projects is antiquarian. Our approach is a new one that recognizes that the Academy must collaborate with external partners to: (1) complete work in the most cost-effective manner possible and (2) rally the unique talents of independent artists and specialists. In this manner, we are generating new processes that recognize and adopt distributed, globalized work. Through the successful execution of five discrete deliverables, commencing on March 15, 2014, our team will deliver an Internet published prototype of *Virtual Plasencia* by July 15, 2014. We respectfully request \$12,590 in seed-funding from *MappiMundi* to complete the proposed work.

As *MappiMundi* will be a significant investor and initial funder of our initiative, the *Revealing Cooperation and Conflict Project* will describe itself as follows -- “The *RCC Project* is an independent scholarly endeavor organized within *MappiMundi*, a digital humanities initiative of the University of Texas at Austin. *MappiMundi* graciously provided seed-funding for the creation of *Virtual Plasencia*, as well as ongoing intellectual and technical counsel.” In all of its promotional and scholarly reports, *MappiMundi* is granted permission to claim *Virtual Plasencia* as one of its collaborative endeavors.

Deliverables - What Will Be Accomplished:

For this discrete effort, which will occur from March 15 - July 15, 2014, we will deliver the following elements of *Virtual Plasencia*:

- *Deliverable 1. Develop a 2D base map of the medieval walled-city of Plasencia.* This 2D map will include multiple layers of information including: landuse and landcover, property ownership, jurisdiction (city, church, seignorial, religious), streets and foot pathways. (Managed by Paddington Hodza). Budget: \$2,600.00
- *Deliverable 2. Commission original graphic artistry.* These will present the front facades of the Iglesia de San Nicolas (church), the Plaza de San Nicolas (public space), the sinogoga (Jewish synagogue), and the Palacio de los Marqueses de Mirabel (seignorial palace), as well as three (3) interchangeable building facades (backgrounds and non-descript buildings). (Managed by Roger Martinez.) Budget: \$2,800.00
- *Deliverable 3. Model several 3D exterior facades of prominent structures and spaces* (including the Iglesia de San Nicolas (church), the Plaza de San Nicolas (public space), the sinogoga (Jewish synagogue), the Palacio de los Marqueses de Mirabel (seignorial palace), and a portion of Calle/Rua de Zapateria (street). (Managed by Victor Schinazi). Budget: \$4,450.00
- *Deliverable 4. Prepare ten brief historical narratives that note key intercultural moments and events that occurred in these buildings or public spaces that are derived from close readings of fifteenth century Spanish manuscripts* (Managed by Roger Martinez). The narratives will be tied back to digital imagery of the source manuscripts. Budget: \$1,000.00
- *Deliverable 5. Publishing a Prototype of Virtual Plasencia.* Integration of all components on a web-platform hosted at *ETH Zurich* and with supplemental historical information and detail hosted at www.revealingcooperationandconflict.org. Budget: \$1,740.00

The total budget for all five deliverables is \$12,590.00. The subsequent pages describe these deliverables in substantial detail, including: an expanded description for each deliverable, the managing scholars, start and completion dates for each task, staffing levels, supplies, and detailed budget amounts.

Thank you for your consideration.

Detailed Work Processes and Tasks:

Deliverable 1: Building a 2D World - The GIS Foundation of Virtual Plasencia

<i>Managing Scholar:</i>	Dr. Paddington Hodza, University of Wyoming
<i>Start Date:</i>	March 15, 2014
<i>Completion Date:</i>	May 5, 2014
<i>Staffing:</i>	<ul style="list-style-type: none">✿ 40 hours project supervision and management by Dr. Hodza✿ 100 hours graduate student assistant
<i>Budgeted Amount:</i>	<ul style="list-style-type: none">\$2,600 for staffing and supplies✿ \$500 for map (5m DEM to buy from http://www.intermap.com/)✿ \$1,000 honorarium for Dr. Hodza✿ \$1,100 honorarium for grad. assistant (100 hours@\$11.00 hour)

On the GIS front, we will build a robust geodatabase that will serve two purposes: one to provide the data layers for creating a 2D base map of Plasencia and the other to support the analytical production of information to understand the interaction between Plasencinos and their built and natural environments. Only the former will be achieved in this project. It is anticipated that the geodatabase will be populated by the data listed in *Table 1* derived from multiple sources including the OpenStreetMap web mapping service, photographs and pre-existing analog and digital map products. Capturing and integrating data layers from these sources will be challenging in that the sources vary greatly in scale, detail, date of creation and quality.

We will employ multiple methods to capture data from the different sources using the combination of ESRI's ArcGIS GIS software and other software. We will import the multi-layered OpenStreetMap web mapping service into ArcGIS, extract relevant thematic layers and update geographic feature attributes where necessary. For analog data sources, we will go through the following generic steps: (1) scan hardcopy map; (2) import scanned map into ArcGIS; (3) georeference map; (4) digitize point, line and polygon geographic features on-screen; and (5) attach feature attributes. For non-georeferenced digital maps, we will follow the last three steps. To ensure a quality database, we will implement a quality control plan that will check for and fix, for example, any feature digitizing and attribution errors. With the high resolution (5m) elevation dataset available from Intermap.com, we will create a hillshade on the surface of which we will drape relevant map layers to visualize Plasencia in more intuitive 2.5D.

Table 1: Proposed data layers for 2D map of Plasencia

Layer Name	Example of Features	Feature Geometry	Attributes	Data Source(s)
Streets	-	Line	Name, Length	<i>Callejero de Plasencia</i> , c. 2013, (Ex. Ayuntamiento de Plasencia); <i>Plano de poblacion Plasencia (Caceres)</i> , c. 1900-1910. (Biblioteca Digital Hispanica, Biblioteca Nacional de Espana); <i>Plano de Plasencia, MSS. 2650</i> , c. 1590, (Universidad de Salamanca); Cordero Alvarado, Pedro. <i>Plasencia: Heraldica, Historica y Monumental</i> . Plasencia: IEHGE, 1997.
Footpaths	-	Line	Length	OpenStreetMap
Buildings (footprints)	-	Polygon	Area, Owner1, Owner2, OwnerN[1], Year	OpenStreetMap and ArcGISOnline web mapping services
City boundary	-	Polygon	Name	<i>Callejero de Plasencia</i> , c. 2013, (Ex. Ayuntamiento de Plasencia); <i>Plano de poblacion Plasencia (Caceres)</i> , c. 1900-1910. (Biblioteca Digital Hispanica, Biblioteca Nacional de Espana); <i>Plano de Plasencia, MSS. 2650</i> , c. 1590, (Universidad de Salamanca)
Jurisdictions	Church, Seignorial, Religious	Polygon	Name	<i>Actas Capitulares, Libro 1 (1390-1455)</i>

Landuse/ landcover	Streams, Marketplac es, etc	Point[2], Line, Polygon	Length, Area	OpenStreetMap
City gates	-	Point	Name	<i>Callejero de Plasencia</i> , c. 2013, (Ex. Ayuntamiento de Plasencia); <i>Plano de poblacion Plasencia (Caceres)</i> , c. 1900-1910. (Biblioteca Digital Hispanica, Biblioteca Nacional de Espana); <i>Plano de Plasencia, MSS. 2650</i> , c. 1590, (Universidad de Salamanca)
Parcels	-		Area, Owner1[3], Owner2, OwnerN, Year	<i>Callejero de Plasencia</i> , c. 2013, (Ex. Ayuntamiento de Plasencia); <i>Plano de poblacion Plasencia (Caceres)</i> , c. 1900-1910. (Biblioteca Digital Hispanica, Biblioteca Nacional de Espana); <i>Plano de Plasencia, MSS. 2650</i> , c. 1590, (Universidad de Salamanca); <i>Actas Capitulares, Libro 1 (1390-1455)</i>
Elevation	DEM	Grid	Height	http://www.intermap.com/

[1] This assumes that there is information about changes in building ownership over the years

[2] We may need to create multiple layers of features that normally go into this layer

[3] This assumes that there is information about changes in parcel ownership over the years

The specific region we intend to map is presented in *Figures 1* and *2*. *Figure 1* presents a red-outlined zone from the *Plano de Plasencia, MSS. 2650*, c. 1590, (Universidad de Salamanca). *Figure 2*, a contemporary digital map created using Google Maps, presents the same zone with additional modern details and labels.

Figure 1: Target Zone from Plano de Plasencia, MSS. 2650, circa 1590

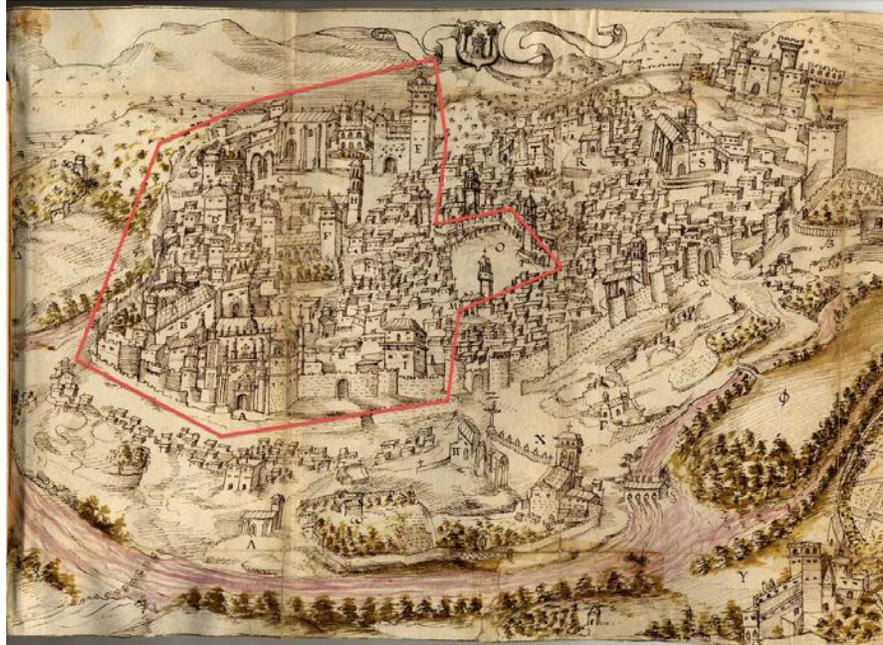
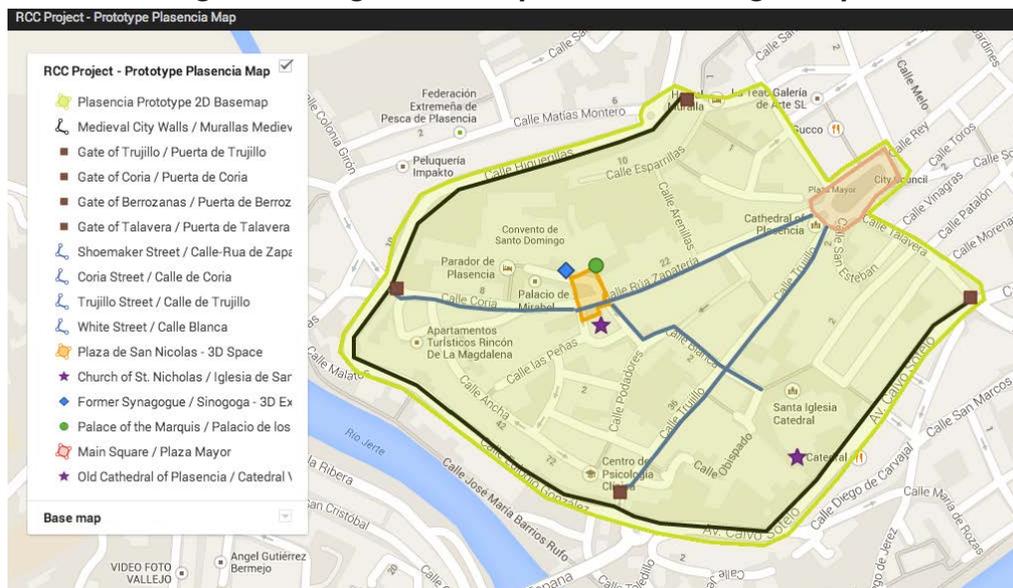


Figure 2: Target Zone Depicted With Google Maps



Deliverable 2: Original Artistry

<i>Managing Scholar:</i>	Dr. Roger Martinez, University of Colorado
<i>Start Date:</i>	March 15, 2014
<i>Completion Date:</i>	May 5, 2014
<i>Staffing:</i>	✿ 20 hours project supervision and management by Dr. Martinez ✿ Fee-for-service artistry prepared by Mr. Seidman
<i>Budgeted Amount:</i>	\$3,000 for artistry ✿ \$0 honorarium for Dr. Martinez ✿ \$2,800 payment to Mr. Seidman. (Mr. Seidman's commercial rate for digital artistry is \$3,000 per portrait. As he is providing our project <u>one painting</u> and <u>several other smaller pieces</u> , we are receiving a discounted service.)

Dr. Martinez will oversee Mr. David Seidman's creation of original digital artistry that captures the "essence" and "feel" of medieval Plasencia. Rather than utilizing contemporary photography to re-create *Virtual Plasencia*, it is our goal to transport scholars and the public into a space that is absent modern artifacts such as power lines, vehicles, and signage. Likewise, this artistry (also known as "concept art") will attempt to depict buildings as they existed in the fifteenth century. One of the challenges of recreating these buildings is that some, like the synagogue, no longer exist. So that we might create artistic visions that tend toward historic accuracy, we will use other imagery of historic buildings such as the synagogues of Toledo, Avila, and Cordoba. We will also review existing scholarship and primary sources for architectural details. To accomplish this work, we are commissioning original artwork from Mr. Seidman who is an accomplished artist.

As envisioned, Mr. Seidman will digitally paint:

- one panoramic portrait of the Plaza de San Nicolas (public space) that includes the detailed front facades of the Iglesia de San Nicolas (church), the Plaza de San Nicolas (public space), the sinogoga (Jewish synagogue), and the Palacio de los Marqueses de Mirabel (seignorial palace).
- Three (3) interchangeable, medieval building facades (backgrounds and non-descript buildings) that can be used to "wallpaper" other buildings in this prototype.

The detailed task that we will complete include:

- Provide source photographs and historical examples of buildings to our graphic artist, David Seidman.
- The graphic artist provides basic digital sketches of buildings for discussion.
- Dr. Martinez approves sketches.
- The graphic artist delivers final digital artistry.
- Dr. Martinez provides the digital facades, which are extracted from the panoramic portrait, to the 3D modeler.

For informational purposes, review these following figures to understand how we intend to move from contemporary photography to digital artistic recreations. *Figure 5* presents a contemporary panoramic of the Plaza de San Nicolas.

Figure 3: Contemporary Panorama



Figure 6 presents the contemporary facades of the Iglesia de San Nicolas and the Palacio de los Marqueses de Mirabel.

Figure 6: Contemporary Facades



Figure 7 presents imagery of existing synagogue structures that can be used to inform a realistic depiction of the temple in Plasencia.

Figure 7: Other Existing Synagogues



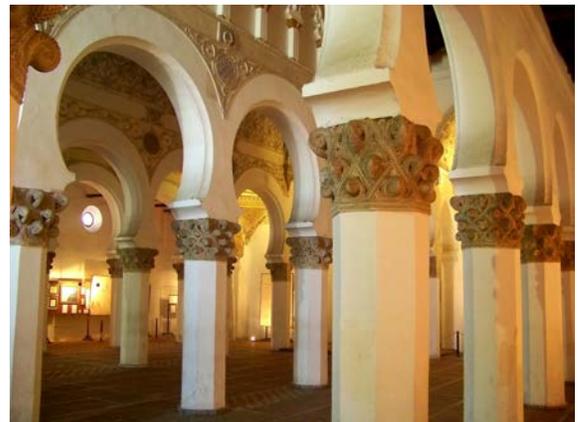
Front Facade of the Synagogue of Avila



Front Facade of the Synagogue of Cordoba



Front Facade of the "El Transito" Synagogue of Toledo



Interior of the "Santa Maria la Blanca" Synagogue of Toledo

In *Figure 8*, you will see some of the historical architectural details from the medieval city.

Figure 8: Sample Architectural Details in Medieval Plasencia



Figure 9 presents sample artistic depictions (“concept art”) of buildings. These are not the artistry of David Seidman. Figure 10 presents some of the relevant artistry of David Seidman.

Figure 9: Sample Depictions of Buildings



Front view



Figure 10: Relevant Artistry of David Seidman



Deliverable 3: Modeling 3D Environments

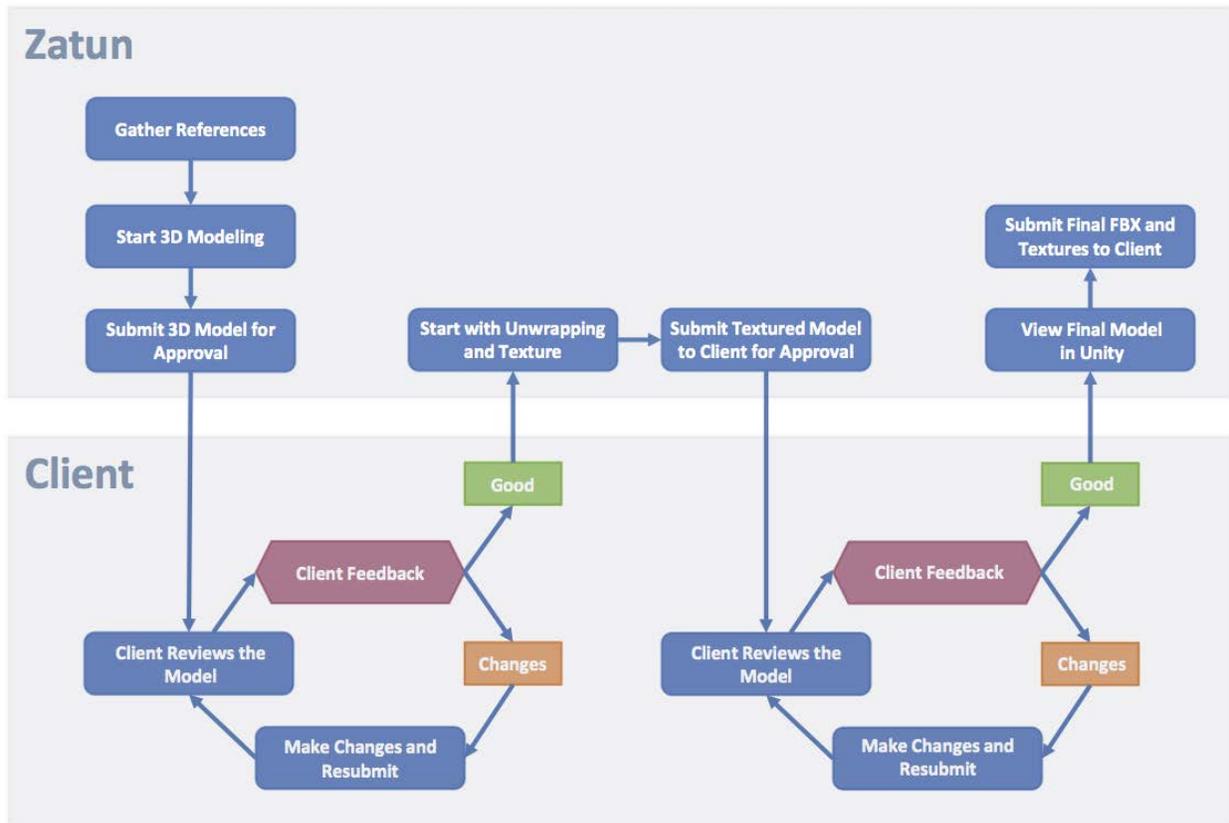
<i>Managing Scholar:</i>	Dr. Victor Schinazi, ETH Zurich
<i>Start Date:</i>	May 5, 2014
<i>Completion Date:</i>	June 15, 2014
<i>Staffing:</i>	<ul style="list-style-type: none">✿ 60 hours project supervision and management by Dr. Schinazi✿ Sub-contractor: Zaton
<i>Budgeted Amount:</i>	<ul style="list-style-type: none">\$4,450.00 for services✿ \$1,000 honorarium for Dr. Schinazi✿ \$3,450 sub-contract for Zaton

The 3D modeling work will be divided between the Spatial Cognition and Architecture group at *ETH Zurich* (led by Dr. Victor Schinazi) and a game developing company in India (*Zaton*: <http://zaton.com>). *Zaton* will be specifically responsible for the design of the 3D models from photographs and artistic concept drawings that will later be used to populate the virtual world. By outsourcing the most time-intensive tasks to *Zaton*, we will realize substantial cost savings. This work will be divided in a series of steps in order to ensure a constant interaction between Dr. Schinazi and *Zaton*. *Figure 11* is a schematic listing the the different steps involved in the modeling of the virtual world. The first step consists of our gathering of all references, drawings and concept drawings (i.e, David Seidman's original artistry, Dr. Martinez's digital photography, the *Actas Capitulares*, the *Plano de Plasencia MSS. 2650*) for the purpose of creating a detailed library for each building and urban element (e.g., street furniture) that will be used to populate the virtual world. This library will be shared a document between *ETH Zurich* and *Zaton*. Once all the necessary images for a specific building is gathered, *Zaton* will then proceed to the modeling stage of the exterior of the buildings. An assigned modeler will use references from the library to make sure the model matches the images. All 3D modeling will be created in 3D Studio Max 2013 and 3D Studio Max 2011.

We will incorporate constant checks in order to ensure continuous communication between *ETH Zurich* and *Zaton*. In the first stage, only three buildings will be commissioned. *Zaton* will continuously submit proofs of the models for recommendations and adjustments. The modeling for the building's exterior will be detailed but efforts will be made to constrain/reduce the number of polygons. Once the skeleton of the first three buildings is complete, these will be submitted for review and approval. Once approved, they will be unwrapped and textured. Low texturing will be used when possible in order to improve gaming performance without compromising the quality of the model.

Textures will be designed to match, as closely as possible the references images and texture atlas will be used to consolidate the various details in one file. These textures will be both hand painted and digital (used from photos/texture libraries, etc). Once the texturing is complete it will be submitted for review.

Figure 11: Interactive Design Process
(The Revealing Cooperation and Conflict Project is the “Client”)



In order to ensure the rapid and accurate production of models, *Zatun* will assign three modelers/artists for this project. Their man day rates are man-day rates are \$100 USD/day or \$12.50 USD/hour. The cost for a simple building exterior is estimated at 3.5 man/day’s work for a total of \$350 USD for each building. The design of detailed exterior buildings is estimated at \$600 USD (6 man-day’s work). In the future, we will model the interiors of buildings. The cost for buildings with both interior and exterior will range between \$800 and \$1,500 USD. Finally the cost for a simple base terrain will be \$50 USD. *Table 2* presents detailed costs for this prototype of *Virtual Plasencia*.

Table 2: Zaton and ETH-Zurich Costs for 3D Modeling of Virtual Plasencia

Modeling Item	Zaton Cost	ETH Zurich Cost	Total
Base terrain (texture of walkways, streets, soil)	\$50.00	\$0.00	\$50.00
360° Exterior Model of the Iglesia de San Nicolas (church, with detailed front facade)	\$600.00	\$0.00	\$600.00
360° Exterior Model of the Sinogoga (synagogue, with detailed front facade)	\$600.00	\$0.00	\$600.00
360° Exterior Model of the Palacio de los Marqueses de Mirabel (palace, with detailed front facade)	\$600.00	\$0.00	\$600.00
360° Perspective of the Plaza de San Nicolas (public space, with concept art “wallpaper” of medieval buildings walls)	\$600.00	\$0.00	\$600.00
Walkable 3D perspective of the Rua/Calle de Zapateria from the Plaza Mayor to the Gate of Coria (minimal architectural detail; concept art “wallpaper” of medieval buildings and walls)	\$1,000.00	\$0.00	\$1,000.00.
ETH-Zurich oversight and direction (Schinazi)	\$0.00	\$1,000.00	\$1,000.00
Total	\$3,450.00	\$1,000.00	\$4,450.00

Deliverable 4: Ten Historical Narratives Illustrating Cooperation and Conflict in Virtual Plasencia

<i>Managing Scholar:</i>	Dr. Roger Martinez, University of Colorado
<i>Start Date:</i>	May 5, 2014
<i>Completion Date:</i>	June 15, 2014
<i>Staffing:</i>	✿ 80 hours primary source analysis and narrative preparation
<i>Budgeted Amount:</i>	✿ \$1,000 honorarium for Dr. Martinez

Energizing *Virtual Plasencia* will involve the careful reading and selection of critical events and persons presented in *Book One (1399-1453)* of the *Capitulary Acts* of the Cathedral of Plasencia, a 300+ page fifteenth century manuscript that Dr. Martinez has studied extensively. Using his research notes database, which he began compiling in 2005, as well as by dedicating sixty hours to new readings of *Book One*, Dr. Martinez will prepare ten historical narratives that describe the intricate relations of Jews, Catholics, and Muslims in Plasencia. For example, one narrative will feature -- *The Strange Bedfellows Alliance of the 1440s: Catholic Archdeacons, Knights, Rabbis, and Chainmail Makers Conspire Against the Duke of Plasencia*. (See Figure 12.)

Figure 12: Sample Short Historical Narrative

The Strange Bedfellows Alliance of the 1440s: Catholic Archdeacons, Knights, Rabbis, and Chainmail Makers Conspire Against the Count of Plasencia.

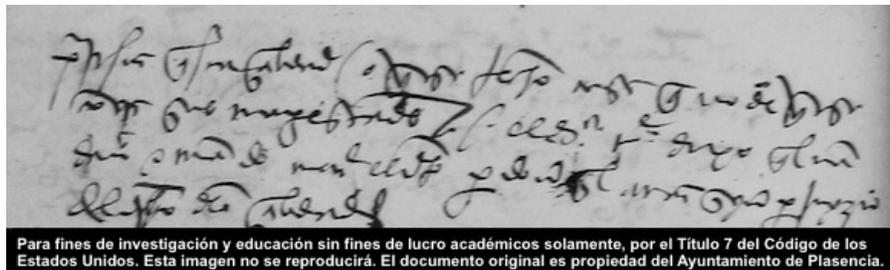
The “strange bedfellows” alliance occurred during 1440s between Catholic clans, converso (Jewish converts to Catholicism) families, Jewish community members, and the church. By assembling a series of events noted in *Book One*, the historical record reveals how the Catholic Carvajal family of knights and church leaders arranged for new Jewish families to migrate and settle in Plasencia. These families, such as the Capas who were chainmail-makers, likely supplied arms to the Carvajal family and financially supported the operations of the Cathedral of Plasencia. To facilitate the Capas’ move into Plasencia, the Santa Maria clan (formerly Jewish) of ecclesiastical leaders, arranged for the lease of a church-owned house near the Plaza de San Nicolas. (The Santa Marias were both extended relatives and political-economic collaborators of the Carvajals.) Co-signing the lease for the chainmail-makers was none other than the Rabbi of Plasencia, Abraham de Loya. By working together, these Jewish and Catholic families simultaneously prevented the locally-detested Catholic Estuniga family, the Counts of Plasencia, from expanding their territorial holdings in the city and secured new arms makers. Fifty years later, during the 1490s, the cold and hot war between the Carvajals and Estunigas came to a conclusion with a running battle that began at the city’s Puerta de Trujillo (Gate to Trujillo) and ended at the city’s castle. The Carvajals were victorious and were honored by King Ferdinand and Queen Isabella with the placement of the clan’s coat of arms alongside of the royal seal on the front of the Puerta de Trujillo. (This commemoration remains physically intact on the gate in present-day Plasencia.)

Users who are exploring *Virtual Plasencia* will be able to access the following “clickable” details:

- Short historical narratives,
- Detailed historical narratives,
- Citable reference sources (primary and secondary),
- Imagery of the original manuscript page sources (See Figure 13), and
- Artistic renditions (and contemporary photography) of the physical locations of events.

By documenting the interactions of noteworthy families, religious organizations, political networks, and economic partnerships, we will reconstruct the quintessential cultural dynamics that underlay the foundation of this Castilian world.

Figure 13: Sample Image of Original Manuscript¹



Upon completing these historical narratives as well as all associated and relevant imagery, Dr. Martinez will provide this information to Dr. Schinazi for inclusion in the prototype of *Virtual Plasencia*.

¹ It should be noted that the *Revealing Cooperation and Conflict Project* has secured all necessary permissions from the *Cathedral of Plasencia*, as well as the *City of Plasencia*, for the use of digital imagery of its manuscripts for *Virtual Plasencia*.

Deliverable 5: Prototype *Virtual Plasencia*

<i>Managing Scholars:</i>	Dr. Victor Schinazi (lead manager), Dr. Roger Martinez, Dr. Paddington Hodza
<i>Start Date:</i>	June 15, 2014
<i>Completion Date:</i>	July 15, 2014
<i>Staffing:</i>	✿ 40 hours project supervision and management by Drs. Schinazi, Martinez, and Hodza ✿ 60 hours computer science graduate/undergraduate student
<i>Budgeted Amount:</i>	✿ \$0.00 for honoraria ✿ \$1,740 honorarium for student assistant (58 hours@\$30 hour)

The final element of our work involves assembling the diverse components of the project into the prototype of *Virtual Plasencia*, which will be hosted at *ETH Zurich*. As previously discussed, a 2D GIS map (Deliverable 1) and all original artwork (Deliverable 2) will have been provided to Dr. Schinazi and *Zatun* to assemble the 3D visualization of Plasencia (Deliverable 3). Likewise, the historical narratives, which communicate the unique history of the city, will also have been completed (Deliverable 4).

Implementing the prototype subsequently involves integrating the ten historical narratives into the 3D world via a game interface approach. Our approach to presenting information to users of *Virtual Plasencia* is akin to players inside a video game. As research and experience demonstrate, game interface design is a critical aspect of game development and it has a direct impact on the “gaming experience”. Good design interfaces will guarantee immersion and smooth gameplay without frustrating the user.

Game interfaces can be divided into 4 categories all of which answer two basic questions (see *Figure 14*).

1. Is the component part of the game story?
2. Is the component part of the game space?

Figure 14: Interface Components

		In the game world?	
		yes	no
In the game story?	no	non-diegetic representations	spatial representations
	yes	meta representations	diegetic representations

(Fagerhol & Lorentzon, 2009)

Virtual Plasencia will make use of a diegetic interface whereby information is provided to the user without distracting them from the the real word. This will be accomplished with a series of “clickable” menus and other interactive elements (i.e., labels) that are directly embedded in the public buildings, spaces and individual residences. In order to keep the experience more immersive and cinematic, these menus will self-activate based on the user’s proximity (a specific catchment radius) to the area of interest.

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Figure 15 presents our conceptual approach to applying the diegetic menus. For example, as a user navigates and approaches a specific building in *Virtual Plasencia*, that user will automatically activate a menu. The user then has the ability to interact with the various choices in the menu (i.e., tree, parchment/quill, networks, etc...). Each icon is linked to a specific “level change” in the virtual world. These level changes are what connect the virtual world to the historical narrative. For example, clicking on the parchment and quill icon will bring the user to a historical description of the building while clicking on the network will provide a visualization of the trade, religious and familial networks.

Figure 15: Conceptual Approach to Clickable Diegetic Representations



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Virtual Plasencia will also make use of non-diegetic and spatial representations². These menus are diegetic because they are not part of the game story and only occupy the game space when specifically “called” through a button press/keystroke. Non-diegetic menus will mainly be used to control the gameplay by giving the user access to a dedicated settings, sound, help files and the controller menu (see bottom left corner of *Figure 16*). Spatial representations such as 2D maps that continuously update the user’s position in the virtual world will be used to help guide navigation (see top left corner of *Figures 15 and 16*). These spatial components will also be linked through dedicated “level changes” to 2D GIS maps as described above in *Deliverable 1*.

Figure 16: Conceptual Approach to Non-Diegetic and Spatial Representations



All game menus will be coded within the *Unity* game engine. *Unity* provides a highly scriptable environment and supports both C# and Javascript. Icons will be carefully designed to follow the narrative. These icons will be either be custom designed or secured from open source gaming libraries. Level changes that link the 3D world to the historical narrative, visualizations and 2D GIS maps will also be implemented in *Unity* through established gameplay scripts. Dr. Schinazi will hire and directly supervise one *ETH Zurich* undergraduate or Master-level student in computer science to assemble these menus. The student will have be selected on the basis of experience with game design in *Unity*.

With the implementation of the Deliverable 5, *Virtual Plasencia* will be hosted at *ETH Zurich* and linked to our project website. Lastly, we will proceed with a press and publicity campaign to solicit users, secure feedback, and to advance the development of future stages of *Virtual Plasencia*.

² Note that both the non-diegetic and spatial menus in *Virtual Plasencia* also share some diegetic characteristics depending on how the user interfaces with them.