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Utilizing 4X Gaming as a Framework for Humanities Digital Media

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ABSTRACT

While much attention has been given to first-person shooters and puzzle games in academic scholarship, large-scale *Civilization*-style games (known colloquially as 4X games) have received comparatively scant attention. The map-based nature of these games, with an emphasis on socio-political, socio-environmental, cultural and military activity, is particularly well-suited as a medium to express historical knowledge. However, to adapt a medium designed to entertain players to a scholarly medium for the analysis of historical processes requires a thorough understanding of the structure of 4X games and the manner in which historical processes are represented in a map-based space. This paper analyzes the spatial and processual systems in *FreeCiv* and the *Civilization* series of games—specifically, an examination of the use of container-oriented, tile-based maps contrasted with modern historical GIS based on point and polygon data reveals best practices from the entertainment gaming community that may prove highly suitable for adoption in the digital humanities. The creation of tiled maps using defined environmental and social terrain and unit types may also provide accessibility to non-coding scholars to academic commons-based peer collaborative creation of new humanities digital media. The defined interaction between game objects, such as cities, irrigated farmland and military units, provides a second entry point for scholars, who through critique of existing game dynamics can define a more historically accurate system subject to peer-review. As a digital humanities medium, such a system would also prove suitable for the integration of multi-paradigm modeling techniques.

Categories and Subject Descriptors

I.6.8 [**Simulation and Modeling**]: Types of Simulation – *Gaming*.

General Terms

Algorithms, Measurement, Design, Human Factors, Theory

Keywords

Game Studies, Software Studies, Historical GIS, modeling

1. INTRODUCTION

Popular entertainment software, notably the map-based strategy games known colloquially as 4X, grand strategy and discrete strategy games,[1] have a long history of presenting humanities knowledge in a spatio-temporal and relational framework. The value of this framework is apparent when compared to digital humanities research and presentation in the field of Historical GIS. This paper will examine the structure and presentation of knowledge within map-based strategy games, focusing on the *Civilization* series and *FreeCiv*—the open-source map-based strategy game inspired by the latter—in comparison to the structure and presentation of knowledge in Historical GIS with a discussion of how such a framework can be harnessed to present scholarly humanities knowledge. While not intended to replace the layered information style of Historical GIS, the nested information framework of map-based strategy games provides a compelling alternative in presentation and structure. The modularity of knowledge in map-based strategy games, their dynamic interactivity with both the user and elements within the game, the commons-based peer collaborative benefits of their map and unit structures and the multiple points of view into the presented data all would prove beneficial not only for visualization but also analysis and content creation.

This paper attempts to distinguish between map-based strategy games as digital maps and as abstracted social simulations. While there are obvious ties between these two visions of map-based strategy games, the former presents a much more achievable first step for translation into academic digital media than the latter. It also allows for an examination of map-based strategy games in comparison to the various methods of spatial representation and analysis performed in the humanities (both digital and otherwise).

While many games use some kind of map or maps in their gaming experiences, map-based strategy games are defined by their focus on the manipulation of spatially-oriented game elements where the spatial character of their structure is the primary determinant of possible actions. The *Civilization* series—the most popular

[1] Among other descriptive terms. In First Person, for instance, the terms 'Military Strategy' (Pearce, pp. 148), 'Turn-Based Strategy' (Eskelinen, pp. 40) and 'God Game' (Aarseth, pp. 52 and Jenkins, pp. 122) are all used to describe the *Civilization* series. Different terms have different, often overlapping members. In this paper the term "map-based strategy game" will be used to refer to this genre. The variety of terms reflects the offhand nature in which these types of games are referred to by scholars, who tend to bring up the *Civilization* series only as a contrast to the genre they are exploring.

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both commercially and for scholarly examination—allows for manipulation of resources on a map within a certain radius of the player's cities, allows for units to attack each other if they occupy adjacent spatial locations, determines game effects based on areal political control, modifies behavior based on the existence of elements within other elements and otherwise imbues most activities with an overt spatial nature.

The other defining aspect of these games is the modular nature of their elements. The various game elements fall into broad classes, with stealth bombers and horse-mounted archers considered to be fundamentally the same kind of object with varied attributes indicating differences in movement and combat ability. These classes have an inherent spatial nature to them as well, and can be grouped together based as much on their class similarities as where they are represented spatially:[2]

Table 1. Selected elements of map-based strategy games[3]

Element	Attributes	Spatial Characteristics
Terrain	Modifies movement and combat options	The underlying basis of a map
Map-based Resources	Provide materials necessary for production and maintenance of units and population centers (Iron Ore, Wheat) or modify production and movement (Irrigation Works, Roads)	Displayed above ***on*** the terrain of the map.
Urban Centers	Have population, hold structures, produce units, create wealth	Displayed ***above*** any map-based resources
Structures	Modify urban center attributes, allow for production of different units	Displayed ***within*** urban centers
Units	Engage in combat/espionage/trade, create urban centers, exert zones-of-control	Displayed ***within*** urban centers or ***above*** any map-based resources

These elements have numeric and Boolean attributes that determine how they interact with other elements, based on designer-created methods of interaction. These attributes are at times represented graphically, such as for population in the *Civilization* series, which may seem to be one or more 'population units' but are actually representation of a numeric value of a city's population, sorted by its division into laborers, entertainers, scientists, et cetera. Interaction takes place not merely as combat (the most visible form) but through modification of terrain, creation of new elements and modification of the attributes of existing elements.

By envisioning this style of humanities knowledge display as part of the Digital Humanities, it is clear that it fulfills the requirement to be "qualitative, interpretive, experiential, emotive, generative" allowing "attention to complexity, medium specificity, historical context, analytical depth, critique and interpretation." [21] The audience for these games has already demonstrated such a belief, evidenced by a quick search of After Action Reports (AARs), which serve as narrative explanations of the historical change and conflict experienced by *Civilization* series players. A sample of such an AAR, detailing the (obviously counterfactual) preparation for war between China and Russia from a popular forum is presented here with only limited spelling corrections:

> Russia was a relatively small country, located on an island south of the Chinese border. In their ignorance they completely overlooked a vast amount of Sal[t]peter deposits located in the heart of their land (it might be due to their lack of technology). De[sp]erate to secure at least one source of Sal[t]peter, China started mobilizing for war. Vast amounts of Galleys were built and production was shifted to horsemen and archers. [11, pp. 368]

Combined with this sense of qualitative narrative is the willingness shown by players to play and replay particular setups, whether in the form of scenarios or saved games. These setups, which include elements located in particular spatial arrangements as well as set conditions of conceptual elements, such as available technologies, can be viewed as simple social simulation laboratory experiments. Each played and replayed game, from this perspective, becomes a tested hypothesis based on the agency of the actors available constrained by the conditions of their world, what is popularly referred to as a historical counterfactual.

2. GAMESPACE AS MAP

Spatial representation of knowledge did not, obviously, begin with map-based games. While the map-based strategy games analyzed within this paper uniformly represent geography using square or hexagonal tiles, this is no more or less the proper way of representing geography than the kind of raster or polygonal representation of political geography found in other games, such as the polygonal subdivision of the world in Paradox Interactive's *Europa Universalis* series of games or in traditional or digital mapping, or in the tripartite point/polygon/raster framework found in ArcGIS.

The societies described by these games present a highly abstracted vision of historical complexity. This is only a problem if we consider map-based strategy games to be created for the purpose of understanding, visualizing and analyzing historical change. They are not. Just as a subway map is not designed to show accurate distances, "all maps, and indeed all representations, can be related to experience... instead of rating them in terms of accuracy or scientificity we should consider only their 'workability'... what is their range of application." [20, pp. 42] The stated goal of these games, used in most critiques of analysis

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[2] For example, in the *Civilization IV* Manual, units are explicitly defined as "anything that can move around the map" (pp. 32)

[3] This list is not meant to be comprehensive but rather focused on the map-based aspect of the game. Obviously missing from this list are the technologies that make up a large part of gameplay, as well as the player elements themselves. In the first two versions of civilization, resources are represented within code as distinct terrain subtypes whereas in *Civilization III* and *IV* they exist as a separate resource layer, but the result displays the same semiotic theory.

of historical change presented by them, [17] is in presenting enough historical and socio-political realism to satisfy their audience, and based on sales they have succeeded in that.

But the range of application is not merely the stated goal of a game, such as conquering the world. Resisting the temptation to play a map-based game and interacting with it as a digital map reveals that the software allows for visualization and analysis of terrain, units and resources with a degree of complexity rarely matched by current spatial digital history projects. This information is revealed to the user through different points of view represented by a variety of interfaces that stratifies information [3, pp. 1-2] and creates a fluid dialectic between user and simulated world as well as frames the type of historical questions and answers available within that world. In doing so it reflects a longstanding theoretical aspect of cartography:

> Discourses set the agenda of what kind of questions can be asked, what kind of answers are 'possible', and equally what kind of questions and answers are 'impossible' within the particular discourse or text... Maps, like theories, have power in virtue of introducing modes of manipulation and control that are not possible without them. They become evidence of reality in themselves and can only be challenged through the production of other maps or theories. [20, pp. 54]

Without even moving a unit, engaging in combat or founding a city, the user is confronted by claims that the *Civilization* series makes about the nature of the environment, urbanization and social structure. You cannot pursue a pastoralist lifestyle in the *Civilization* series, your Settler unit will never agitate to found a city on its own despite your protestations and, if you simply move your lone unit around the map, avoiding the impulse to create your first city, you'll find that your people never die, never disperse, never think up new technologies or theories and never create a wealth of cultural tradition that outlasts their foolish, primitive existence.[4]

In sharp contrast to map-based strategy games, detailed academic visualizations are often static and do not allow the user to examine the data from multiple angles or resolutions. [15] This is the primary distinction between knowledge presented in map-based strategy games versus traditional maps and even historical GIS. While the latter presents data using traditional maps, graphs or tables of attributes, the use of relational containers found in map-based strategy games is almost completely absent.[5] These containers fulfill the "tripartite model of space" as Huber describes it, allowing the user to move between Cartesian space (on the map), relative space (elements that share the same container and therefore exist simultaneously in the same space) and relational space (where elements exist within a certain conceptual construct, such as "The West"). [9] This latter space is the most fertile for development of humanities knowledge, as evidenced by the oversimplification of such conceptual elements in the *Civilization* series, such as the presentation of early historic cultures as states with the kind of stability, bureaucratic control, boundaries, et cetera, found only in very modern state entities. [22, pp. 10]

3. INTERACTIVITY

As others have noted, map-based games such as *Civilization* are not about playing a particular leader, despite what the manual may say, [5, pp. 5] but about playing the State Entity itself. In the course of directing this State Entity, the player interacts with a variety of data layers, notably the terrain, resources and units that exist on it, which may exert mappable effects, such as modifying the behavior of nearby elements. With the level of manipulation of the game elements, any played game of *Civilization* is a product not only of the game designer but of user input to create unique narratives within design constraints. [18, pp. 171-2] High-level, static narratives exist (time marches on, geography determines destiny) but at a smaller scale, the narrative of each game is determined as much by the user as the designer.

In comparison, typical Historical GIS users perform analytical, interpolative and extrapolative techniques on layers or expert analysis of visualizations. A typical GIS manual will frame analysis as a step-by-step procedure with the processing of data—the interactive element—performed as a distinct event. [14, pp. 11] While GIScience applications do involve modeling, these applications do not seem to have penetrated into the Digital Humanities.[6]

The player in a map-based strategy game also relies heavily on expert analysis (choosing suitable terrain and resources for the placement of their next city or moving military units to their most advantageous position) but also constantly interacts with the simulated world through modification of the environment, placement of roads and structures. From a GIS perspective, the player can be envisioned as modifying or creating new layers of spatial data to affect future interaction.

One result of representing knowledge using this interactive form comes from its effect on the player, who begins to adapt their thinking to the abstracted constraints of the world they interact with. [18, pp. 175] The decision to place cities and modify environmental conditions is based on future game effects, constrained by the design of the game and the manner in which its historical processes function. For example, climate change and ecological degradation are notably lacking in the *Civilization* line of games, except for cursory treatment of modern pollution, and

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[4] It is tempting to focus on the non-individual nature of society in the *Civilization* series and point out that you cannot live a life of dissipation or ascetic disavowal of your materialistic culture. But, as is addressed later, the player of these games does not take on the role of a leader but rather the motivating force of the society itself, acting as sort of a guiding spirit of a particular state entity. As such, the inability to experience the world as an individual is not a failure of the game, but a conceit.

[5] From another sense, it is the most common occurrence in one popular spatial application: Google Earth. The 'pushpins' act as a container of text or images for the user to annotate a map. However, these containers cannot hold true map-based elements, hence my initial definition of their absence.

[6] Assumably, the rise of social simulation models will result in the creation of similar versions for history, philosophy and other humanities pursuits. What is presented in this paper is one possible pathway to integrate the techniques used in social simulations into the Digital Humanities.

as a result there is no motivation for the player to limit agricultural and population intensification.

The kind of deep socio-environmental ties that are present in historical and anthropological research on the subject cannot simply be tacked on as minor variations but must be built into the model of historical representation. Attempts at modeling ecological resource availability and environmental change in customized *FreeCiv* games (such as the failed Guns, Germs and Steel project), have demonstrated that this constraint to interactive discourse is deeply embedded in the *Civilization* series structure.

The design of elements within games is as much a limitation on the scope of discourse available within the media as the choice of spatial representation. Take ethnicity, for example. If a unit has no designed attribute to represent ethnicity, then there can be no exploration of the effect of ethnicity on activity. Even if an element has its ethnicity mapped, then the choice of representation of ethnicity constrains the results, especially in the case of a poorly defined abstraction. Further, every form of interaction that may be influenced by ethnicity must be accounted for within the algorithms that determine the results of interaction between elements. But there is a final gap, even in the case of a putative design that accounts for ethnicity, with a well-researched definition and a variety of weights and designed interactive methods: The representation would be incomplete if all these design issues failed to take into account a changing concept of ethnicity, such that a further layer of design would be necessary to model how the changing concept changes the tracking of attributes, the manner of defining the core concept and the changing possibilities for interaction of elements based on different concepts of ethnicity. Defining such concepts in a dynamic manner not only reflect the possibility of changing attributes, but also allows for the exploration of differing conceptualizations proffered by various theories.

4. COMPETING THEORIES

The *Civilization* series has created a social world that operates in a manner best described as Hegelian determinism filled with "ethnocentric depictions, appearing in a rather erratic manner, and betraying a lack of serious research behind the concepts of the game" [18, pp. 166] However, the cause of that oversimplification of history is not the media itself but the abstraction of historical processes in an oversimplified manner oriented toward entertainment. This is acknowledged implicitly by the *Civilization* series itself, which already best typifies differing views of historical processes and spatial representation of humanities knowledge in the competing theories presented with each iteration of the *Civilization* series.

Throughout the series, the abstraction of historical processes changed alongside changing presentation of spatial data. What began as a pure 2D representation of the world using 12 different terrain square tiles became isometric in *Civilization II*, grew to 13 tiles in *Civilization III* and took on a 3D form in *Civilization IV*. *FreeCiv*, befitting its open-source nature, eschews a single map format and allows developers to present either square, diamond or hexagonal tiles in an isometric or top-down perspective.[7] Likewise, the representation of technology, units, and historical processes has changed throughout the series, mirrored by a variety of optional calls within the *FreeCiv* structure. Early on in the series, these changes were primarily ones of scope with larger maps and more technologies available in *Civilization II* compared to *Civilization I*. Later, the game modified the manner in which it presented society, with the introduction of special units particular to each civilization[8], such as the War Elephant (available only to the player if the Indian culture is selected) or the Zulu Impi. Likewise, the concept of Wonders (great structures loosely modeled after Herodotus' list) was modified so that there were, later in the series, national wonders that allow each society to create their own version of, complementing the already existing worldwide wonders of which only a single instance could be created in each game. These changes, along with later simulations of religion, culture (envisioned as a spatially mappable influence) and health, demonstrated a conceptual abstraction of society that tracked not only the popular notions of history surrounding each iteration of the *Civilization* series but also particular understandings of nationhood that envisioned a people statically destined to produce Panzers regardless of their particular dynamic history (*Germans* as a nation as opposed to the people occupying a place called Germania and later Germany). It is this tension between presentation of historicity and gameplay that undergirds the various debates about the educational merits of the *Civilization* series (and other popular historical media) touched on in this paper.

Scholarly digital media, in comparison, has never garnered the kind of audience that entertainment software has, and so any design must have the scholarly designer in mind as much as the end user. Given that synthetic worlds are best suited to quantitative questions informed by theory, [4, pp. 290] the abstraction necessary to create workable map-based scholarly media benefits the scholar by forcing the abstraction of qualitative claims into defined, software-functional processes. This abstraction will never be perfect, but that should not be the goal. Map-based strategy games, as simulations, are naturally abstractions, and it serves to echo here what has been said before, that to criticize models for being abstract is nonsensical. [3, pp. 9] [4, pp. 274] One benefit of this abstraction is the development of intellectual rigor in the presentation of historical theory. Modeling the deep historical processes that drive societies and historical actors—like modeling physics in flight simulators or what Chris Crawford refers to as the "dramatic laws of physics" in storytelling [1, pp. 46]—is only possible if scholars explicitly describe their theory in a rules-based manner and design the software to reflect those theories. That forced explicitness of theory creates a new dialectic before the digital historical media is even finished or interacted with. Explicitness should not be confused with scientificity, though. The challenge of creating the equivalent of post-processual conceptualizations of historical change should be welcomed rather than given as a reason not to pursue the translation of narrative-style theory into algorithms.

The first version of *Civilization* was primarily "military, economic and technological, whereas subsequently it also became cultural" [18, pp. 171] but what never changed throughout the series was a

[7] From "Perspective" in the FreeCiv Wiki at http://freeciv.wikia.com/wiki/Perspective

[8] A rather simplistic representation of ethnicity, as if the knowledge of high-quality armored warfare vehicles was somehow imprinted on the Teutonic genome.

concept of development from primitive into modern society. This concept of development, as it came to be understood after 1945, was based on a theory of societal stages resulting in a model state based on modern Western or Soviet (depending on the origin of the theory) style society. [22, pp. 10] In designing a more nuanced simulation of the world, scholars would be forced to quantitatively define the qualitative terms they have grown so used to dealing with; the proletariat, the core-periphery system and famine theory, to name but a few, will need to be abstracted as software-intelligible processes.

As touched on earlier, the presentation of competing theories is not so easy as changing the unit and terrain attributes (in the manner consistent with mods, or third-party partial and total rewrites of rulesets in games) because much of the theoretical distinction between major schools of historical or anthropological thought, at their core, represent differing views of interaction between elements as well as fundamental differences in the definition of what constitutes these elements. There has been no noticeable equivalent of an anti-positivist, postmodern revolution in the representation of society and culture in map-based strategy games. Of the commercial successes, the closest in resembling a postmodern view of history would seem to be Ozark Softscape's *Seven Cities of Gold*, with its emphasis on self-contradictory goals and rewards. While sharing many of the spatial features of the *Civilization* series (notably the tripartite spatial organization focused on a tile-based world map) the historical processes of *Seven Cities*, at least insofar as the response given to the player for their mistreatment of the natives, is purposefully ambiguous.

While the method of spatial representation in the *Civilization* series would be readily usable as a framework for exploring, for example, a World Systems Theory analytical approach to historical processes, the underlying design of nation-states, trade, and resources would require a near total rewrite. If such a model also looked to include World Systems Theory's growing socio-environmental scholarship,[9] such a rewrite would extend to the spatial representation due to the need to track a host of environmental factors such as non-anthropogenic climate change and ecological degradation. Work in environmental science already emphasizes the overlap between methods of spatial representation and designed interaction between elements and would serve to provide a host of other best practices beyond the scope of this paper.

5. ENVISIONING FUTURE MEDIA

While the representation of history within the *Civilization* series is 'workable' for a game, it becomes misrepresentation when the purpose of the media is to visualize and analyze scholarly humanities knowledge. Given the nature of maps as representative relational networks of knowledge that can vary by culture, [8, pp. 90] [20, pp. 31] then along with pointing out that these are games meant to entertain, an equally suitable response to the presentation of history in *Civilization* is that it represents a particular cultural view of the course of history. Taken from this view and coupled with Turnbull's argument that maps are theories that must be argued through the production of other maps, then the debate over the damage caused to historical understanding by games such as *Civilization* can be viewed as a call to scholars to produce compelling digital responses that better explain historical change.

The presentation of humanities knowledge, specifically history, using dynamic maps, has been an ongoing effort by numerous scholars and institutions.[10] Primarily these take the form of animated maps or web-based implementations of traditional GIS-style data. Animated maps are used to highlight change in spatial characteristics of states and groups, migration, et cetera. GIS-style data relies on overlays to provide the user with the ability to present various datasets to and perform visualization and simple analysis of spatial trends.

The kind of dynamic maps produced based on the framework provided by map-based strategy games would be fundamentally different. From a practical perspective, the data would be presented as a tiled map, with each tile representing a particular spatial zone of the Earth. An immediate difficulty present throughout mapping is the distortion of distance, direction, and area present in any flat projection of the spherical Earth. While such a tiled map could eventually be presented as a large, spherical polygon, the technical issues of representing such information in an accessible format may militate toward choosing an agreed upon projection that acknowledges distortion. Commons-based peer collaboration is promoted by lowered barriers to accessibility, and the requirement that a user download a particular browser required to interact with such a 3D Earth may significantly reduce the number of users willing to interact with a purely server-based solution. The game *Travian*, for example, which utilizes PHP and displays map-based data conveniently in a browser window with no additional software, boasts a registered user base of over 150,000.[11]

Tiles would store only the most basic data—latitutudinal and longitudinal extent; altitude; terrain type and date-range within which that terrain type exists.[12] The remaining elements exist 'on' a particular tile (such as a city), 'within' a particular element (such as a skyscraper in that city) or as 'part-of' a conceptual class of elements (such as that city existing as part of a conceptual element known as 'The United States of America'). All of these relationships are also given a date-range, within which that relationship holds true. With no limit to the number of mapped relationships between entities, this is a highly scalable representation of spatially oriented information.

Following the map-based strategy game model, spatially-located resources would exist on the tiles. These resources would be more complicated than the system found in the *Civilization* series, which tracks classically-envisioned exploitable natural resources such as iron or wild game. A system that begins with tracking soil can be designed to correlate existing environmental systems, such

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[9] See the excellent The World System and the Earth System, edited by Hornburg and Crumley, or Sing Chew's World Ecological Degradation and The Recurring Dark Ages.

[10] The Vision of Britain, for example, at http://www.visionofbritain.org.uk/.

[11] http://www.travian.com/ accessed 8-26-2009

[12] A more ambitious implementation could also track the applicable date range of the altitude of the tile, were a developer interested in also representing geologic scale change.

as the depth of a monsoon, the shifting El Nino or North Atlantic Oscillation, to track dynamically changing carrying capacity.

Population centers rest on top of these map-based elements and contain within them structures defined as historically important or representative of population levels. Individual population units would exist within population centers or on the map, following thematically with the representation of primarily military units found in the *Civilization* series. In this framework, a mechanized infantry corps is fundamentally no different than a group of hunter-gatherers or bureaucrats.

Finally, conceptual elements, which do not exist on or in the map-based world but act as membership groups for the previously defined elements, would allow for groupings of state-like entities (all units, terrain and population that exist as part of *The Zhou Dynasty*) or temporal events (the *Battle of Gettysburg*).[13] This method would also allow for a new conceptualization of technology outside the simplified method developed for the *Civilization* series. Language and ethnicity would also better be served as conceptual elements that population units could hold membership in, rather than attributes of each population unit.

With individual elements defined by time-based attributes, the production of on-the-fly animated maps would be a simple endeavor of refreshing the map with new, timestamped locations of units or changes in those units. By tracking the temporal data on soil as well as environmental systems, this media could display environmental change concurrently with demographic and political change.

While this kind of visualization would allow for expert analysis by scholars, an important next step is the modeling of interaction between elements within such a dynamic space. Defining the causes of change in units and terrain allows for the modeling of different theoretical explanations for change. With a large enough populated world, historians could compare a traditional Marxist theoretical explanation versus a World Systems theoretical explanation for historical change.[14] As addressed earlier, these models would also serve to improve structural rigor in the quantification of theory based on the explicitness of processual definitions required for their translation into code. Rather than a "garden of converging paths" or one that "merges all the possible paths into the master narrative of the Western success" [18, pp. 166-8] users could create competing models that better, or simply differently, explain historical change.

It is not lost on the author that creating humanities digital media based on the best practices of map-based strategy games would initially lose the interactive aspect between elements within a game that necessarily makes it a game. Nevertheless, it would still be interactive, allowing for what Zimmerman refers to as "Meta-Interactivity" as opposed to the "explicit interactivity" [23, pp. 158] that would exist if users could actually play out different scenarios within the structure of the media. The user can still interact with the simulated world in the way that an amateur or professional scenario designer does so. The ease of placing a new structure or city or of delineating the temporal characteristics of soil using multiple points of interaction is a vast improvement over the limited interactivity in currently available dynamic maps and has a proven audience based on the number of amateur scenarios and maps created by the gaming community. Simple population of a world with time-notated elements would allow for animation of the growth and decline of a city or state, the recession and growth of a desert and the movements of people. While lacking the analysis available with the defined processual interaction between these elements, the visualization of such change can allow for analysis by experts and the lay public to a degree currently unavailable outside of specialized environmental and social models.

Ultimately, any digital humanities media that utilizes this framework would neglect its greatest strength if it did not eventually include historical process modeling. As discussed earlier in this paper, the interactive element of map-based games reinforces and reifies the understanding of particular historical realities. In the same way that integrating GIS into historical analysis forces a scholar to address heretofore unthought-of issues of spatiality, [12, pp. xvii] defining historical processes and actors forces scholars to consider issues of abstracted attributes and interactions that may have been assumed but ill-defined. [17, pp. 114] Judged as scholarly media, the *Civilization* series is best described by Poblocki: "basing computer simulation on nineteenth-century models of natural history is not adequate to explore contingencies of human history." [18, pp. 174] But this is a condemnation of the nineteenth century models represented by a particular piece of software and not the medium as a whole.

The framework provided by map-based strategy games is also a framework for exploring multi-paradigm models of history, which integrate different modeling techniques based on suitability to the process modeled so that environmental processes are modeled using, say, systems dynamics methods while active units are modeled using agent-based techniques. [2, pp. 18-9] The suitability of defined unit structures from games for agent-based modeling is already well established, even if the gaming industry has avoided complexifying its approach to game AI by using Agent-Based Modeling techniques. [7] [19, pp. 4] Conversely, systems dynamics techniques are already used to determine the few environmental processes modeled by this style of game. The innovation that can be provided by scholarly digital media production is not through the introduction of new techniques but by designing more historically accurate and complex processes so as to more accurately examine the interaction between society, culture, demography, and environment. Like any highly abstracted system, the more simplified the environment of the synthetic world, the easier it is to measure system changes but the harder it is to apply the experimental results to the real world. [4, pp. 281] The goal of scholarly digital media then would be to either fashion suitably scaled questions or provide suitably high levels of detail to achieve sound analytical results.

This media would also be particularly suitable for leveraging peer-based collaboration in the creation of new content. Large-scale academic digital media projects that offer incentives for

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[13] Differing memberships based in similar conceptual elements could then be used to analyze and visualize the difference between, say, *The Great Patriotic War*, *World War II* and *The War of Japanese Aggression*. While some may consider these events synonymous with each other, they have different members as well as spatio-temporal scope.

[14] Or any other set of 'competing theories' such as changes in population and agriculture from a Malthusian versus a Boseruppian explanation of population intensification.

collaboration can leverage the growing number of media producers [13] to multiply content and content-checking. Familiarity with map-based strategy games among the gaming community provides a ready audience of spatially literate users to populate worlds. That the spatial data can be simultaneously envisioned in gazetteer style allows for more opportunity for user input and interaction by users unfamiliar or uncomfortable with the map-based strategy game framework, as well as importation of readily available spatial data from gazetteer-style sources such as Wikipedia or the Pleiades Project. By storing element location data as on/within/part-of relationships, it even opens up interesting opportunities for text mining. The rise of pixel art as a popular genre[15] provides a ready source of artists capable of producing the numerous and varied representations of structures, units and terrain necessary for such a project.

Manovich has challenged the Digital Humanities to produce visualizations that "provide rich information presented in different formats... placed in larger contexts...". [13] The most attractive and deft spatial visualizations of historical change have so far come out of the entertainment software industry. They have succeeded in attracting a fanbase that should make any author of popular history jealous. Their financial success has led to ever larger teams of designers, artists, and programmers creating ever more ambitious spatial visualizations of historical change. Their only real weakness—the lack of complexity of historical processes presented in their products—is a boon to the digital scholars looking for a framework within which to create novel, exciting, explanatory media who avail themselves not only of the opportunity to create compelling visualizations but to integrate a host of lessons learned from historiography, geography, spatial analysis and systems modeling.

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[15] Take, for example, the Pixel Art category found in the Digital Art section of http://deviantart.com