Simulating human civilisation and the evolution of society based on factors such as culture, religion, and technology – Project plan

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1. Introduction And Hypothesis

In 1958 the US army commissioned “Bay Model” construction in San Francisco first went into use. The concept of the model was to simulate the affects of modifications to the San Francisco Bay region and did so by physical means – with a 1:1000 horizontal and 1:100 vertical pool filled with water and a topography made to imitate the real-life bay (History of the Bay Model, n.d.). These days, physical models have been almost entirely replaced with computer simulations, which allow for far better customization and measurement of data (among other factors), which is likely the reason the aforementioned bay model ceased usage in 2000. In recent years, simulation has moved past simulating physical matter and now encroaches on the realm of humanity, with systems like neural networks able to generate new works such as music or literature just by analyzing what has been created in the past, with results often becoming uncanny with how believable they are as human-made media.

In October of 2017, inspired by these productions, I began to work on a simulation of my own which I called “Iron Age” (Gorman, 2017), with the concept being to create software that could simulate a world and its history from the view of a political map of nations. This software, in its completed form, was able to generate a new world map filled with different peoples, who over time would develop nations that would expand and develop, eventually waging wars over territory with neighbors.

While this software was successfully created and did complete my initial goal of generating a believable world from scratch, it did not meet my expectations for the project. The final build was filled with errors and performance issues due to my own inexperience at the time, and relied heavily on factors such as random chance which ideally an accurate simulation would keep to a minimum.

This is why for my project for my independent studies module at the University of Derby, I will be making a second attempt at this concept, using my newly acquired knowledge and experience to answer the hypothesis I originally proposed: “*Can human history and civilization be simulated by software to a believable degree using various modelled factors and elements that influenced real human history*?”.

1. Aims and Objectives

As previously mentioned, the aim for this project will be to develop software that can simulate the history of a new world, and populate that world with different peoples and nations, which will expand and shrink depending on factors that will appear as time progresses (Such as culture, technology, and religion). By the end of the simulation, the software should have created a random world map that has been filled with different countries, with their borders being defined by their history. This final product will be defined by the following key objectives which must be completed in order for the project to meet its goal:

1. Develop basic tools for the simulation to make use of, including basic camera controls and rendering methods.
2. Create a new geography as a backdrop for the events of the simulation to take place upon. This map should be entirely randomly generated based on factors provided in world creation
3. Populate this world with various preliminary factors, such as names of locations, cultural regions, naturally occurring resources and prehistoric faiths.
4. Develop the ability for the model to update and change over time, primarily in the form of the borders of nations and relations between said nations
5. Add the ability for conflict to occur over the course of time and allow the map to update to reflect the results of these conflicts.
6. Implement a saving mechanic which allows a user to stop the simulation at any time and resume it using a file created by the software

It should be noted that the artefact developed will not make use of any code or development from the original software, and all references to this pre-existing project will be in the form of comparison in the documentation. My goal in this project is not to expand on what I have already created, but to recreate and reimagine the product using the concept from the original software only.

* 1. Basic tools

For this simulation to be usable, some technical aspects such as engine and functionality should be determined beforehand. For this artefact I will make use of the unity engine as a backbone, this is because in the past project I made use of the basic windows form template provided in visual studio. This past decision ended in the software having severe speed issues, as the tools I had used to display data were not intended to be used in the manner I used them and therefore were not optimized to suit the needs of the software. With the use of unity, this problem will be avoided, as despite unity’s primary use as a game development engine it suits the needs of this project quite well – providing the ability to render constantly-updating objects quickly and efficiently.

Another advantage of the use of the unity engine is its premade tools such as its camera. The unity camera will allow the simulation to be moved and enlarged at the user’s discretion, as well as allowing for the creation of UI elements to properly display additional data about the simulation. The unity engine also incorporates mesh tools, allowing for the displaying of polygons (which will come to represent the borders of nations) on the user’s screen, as well as handling interactions such as mouse button presses on the polygon.

One final example of the use of the unity engine on the project is the ability to incorporate layers, which will be useful in the presentation of the world at a point in time – the geographical world map will be loaded in the backdrop and (depending on the map mode selected by a user) different polygons will be rendered on layers infront of it to represent different information. This means that the entire map will not have to be re-rendered each time a screen update is necessary (as was the case with the previous project).

For this objective to be completed, a prototype project will need to be developed which implements the necessary camera controls (movement, zooming in and out) as well as the ability to render polygons which may be interacted with to display dummy information. This prototype will serve as a technical demonstration of the very basic functionality of the system, and its parts and functionalities will be migrated into the main project where appropriate.

* 1. Geography

For the simulation to be truly distinct, the map the events of the simulation should occur on its own “world” – a randomly generated map with its own unique landmasses and environments. The procedure of generating a map is one that has already been explored in depth in games and other similar projects, and therefore a number of algorithms exist for this functionality.

For this project, I will implement a Perlin noise based world generation algorithm, which should allow for a relatively fast world generator that makes use of various mathematical functions to generate a map using a generated Perlin noise image. While Perlin is used often in 3D environments, the generated map will be in 2D space, and the 3D aspect of the Perlin noise map will be used for factors like water level and simple terrain features. In comparison, the previous project went through three different terrain generation methods, none of which were noise-centric, these generation methods will be expanded upon in documentation surrounding the artefact.

* 1. Preliminary Factors

This simulation will begin at the dawn of civilization, specifically the early bronze age where the first true “nations” began to form. It is important to note that much of the demographics of the world had already been established long before this stage however, which is why before the world timeline even begins, some information will already exist defining the nature of the world.

The primary preliminary factor will be culture. In real life, national borders are often defined by the culture of the people within them - even before the definition of ideas like national identity or patriotism, wars were often fought over land based on the people within them. To replicate this concept, the artificial intelligence behind the nations should prioritize the unification of lands that they identify with culturally. As such, each location on a map should be assigned a culture at the start of simulation, which should be updated over time as the world changes and evolves.

1. References

* US Army Corps of Engineers San Francisco District Website. n.d. History of the Bay Model. *https://www.spn.usace.army.mil/Missions/Recreation/Bay-Model-Visitor-Center/The-Bay-Model-Journey/History* [Accessed 11 October 2021].
* Gorman, J., 2017. GitHub - JaVonox/Iron\_Age. GitHub. *https://github.com/JaVonox/Iron\_Age.*