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Capstone Reflection Essay

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Rochester Steampunk AR

This capstone project is centered on Rochester Steampunk AR, a location-based narrative experience for mobile devices. Users select a scenario and visit different locations around the city of Rochester as a historical-themed narrative plays out. The original design of this project was created by a group of students for an independent study. They had two prototypes that demonstrated how narrative elements can be tied to locations. The Esri prototype can be viewed here. This capstone focused on porting the work of previous students into the Unity game engine. The minimally viable Unity port would allow players to experience a narrative via location-based game mechanics, be available on mobile devices, and have a closed game loop. After porting the app and creating a functioning build, I had to revise the structure of the Unity project to be dynamic in nature. The main game should be able to handle new content like images, text, and coordinates; allowing a future team to add content to the project in a relatively short timeline. In addition to reworking the project, I created a developer manual for working with the project and adding new content. Future student groups would be working to expand the framework and create new narrative content with the project. The project was successful overall; a functioning build was created and I gained experience working on location-based games and mobile development.

Research

Before I started thinking about porting the app, I needed to research digital storytelling, location-based games, and how to utilize the Mapbox plugin for Unity. I used RocketBook for digitizing and transcribing my notes from the following books:

Designing Games, Tynan Sylvester : a handbook for engineering the experiences players have within games. My main takeaways from this book centered around the motivations that drive players and creating knowledge within a game. Chapters on narratives and decisions helped describe ways to implement concepts mentioned in other books. The development-focused approach this book takes helped me plan the systems Rochester Steampunk AR uses to display information to players and design the User Experience (UX).

Creative World Building, Trent Hergenrader : this book serves as a step-by-step walkthrough of the process of creating a world and the systems that allow others to add content. This information was used when I made decisions about how to design the project as a tool for others to use when adding content and creating experiences with their narratives. The concepts covered helped me think about how narrative elements should be tied to real-world locations and the story worlds being created within each scenario.

Interactive Storytelling, Chris Crawford : the experimental genre of interactive storytelling gave an interesting look into example projects and a genre that could be the successor of current games. The listed shortcomings of modern games helped define the systems this capstone project would rely on for conveying a narrative. Crawford extensively covers the process of creating a narrative and expressing it through mechanics, not just game mechanics.

Digital Storytelling, Carolyn Miller : like Crawford's interactive storytelling book, but more focused on the vehicles used to convey a narrative within digital mediums. Interactive storytelling is more of an experimental genre, while digital storytelling covers current techniques being used in the game industry. Chapters on the various uses for narratives in digital mediums helped in finding target audiences for this project and designing the systems that manage the narrative's story segments.

Thesis on Location-Based Games for Tourism, Jessika Weber : this thesis is a perfect basis for the use cases of this capstone. What does the user want? How can the real world element of location-based gaming be used to create a unique experience? What works in location-based games? What does not? This book directly influenced the design of the app port, and additional features to be added in later builds. The developer manual tips for creating location-based content also drew from this thesis (ie. don't place your waypoints at uninteresting locations, keep distances between them minimal).

Mapbox Documentation : this is my second project using Mapbox and its documentation is extremely lacking for beginners trying to learn how to use the Mapbox API. However, the in-depth documentation covering the scripts and inner workings of Mapbox helped immensely once the project got underway.

Porting the App

After the research was complete, the initial part of this project was creating a port based on the designs of the previous group that worked on this project. The previous group had created a scenario with a narrative, graphical elements, and dialogue interactions. This scenario focused

on a central event through the perspectives of three Democrat & Chronicle (Rochester, NY newspaper) reporters covering different factions within the city of Rochester. The factions are historically relevant to Rochester and include the mafia, suffragettes, and church of light. They used two tools, Aris and Esri, for prototyping the project with location based elements. Esri was used for tying the story elements to key locations in the city, while Aris was used for prototyping dialogue events and NPC interactions. Both tools are web-based and use location services to track interactions with game elements. There was also additional documentation on the plans they had for the project, creating narrative content, and steps they would have taken if they continued development.

My job was to take the main features of Aris and Esri, and build them into a Unity project. While existing code was mentioned in the group's final write up, there was no way to access their Aris prototype or the scripts they wrote for it. This means that the scripts I needed for Rochester Steampunk AR were made from scratch (not including plug-ins). Mapbox was selected as the tool to be used for handling map data and location tracking. I had worked with Mapbox on a previous project and the group that had worked on Rochester Steampunk AR earlier had listed its use as a future development decision.

The initial build of the Rochester Steampunk AR app had the following features from previous group's prototype designs: a narrative that can be experienced from start to finish, location-based gameplay consisting of waypoints and user location tracking, and multiple paths the user can choose from for each scenario. Users select the scenario they want to play from a main menu, then walk around downtown Rochester as they interact with waypoints to collect pieces of the narrative. The game loop consists of selecting a scenario, completing a path within

that scenario, completing the other paths, then returning to the main menu. Based on the research I completed, I made sure to keep the experience as linear and guided as possible. Waypoints are enabled one at a time, based on the story progression. The goal of Rochester Steampunk AR's UX design is to ensure that the user experiences narrative segments in consecutive order, so allowing them to visit all waypoints at any time wasn't an option. The only feature from the original project that didn't make it into my port was a dialogue-based NPC interaction system. Adding this feature would have involved creating a dialogue system that would serve as a tool for other creators to be able to easily add dialogue through formatted text files (separate from the narrative segment file used in my build). A new type of waypoint would have to be added, and a new UI for these interactions designed. The dialogue-based narrative written by the previous group for Aris was less cohesive than the narrative summaries written for the Esri prototype. Porting Rochester Steampunk AR to Unity went smoothly, but as soon as I started adding additional features to enhance the base experience, I encountered roadblocks that took a couple of days to figure out.

Additional features added to Rochester Steampunk AR made the gameplay more familiar to those with experience playing location based games. The most difficult feature to implement was a camera system that allowed users to switch between a view that followed their character from behind, to a 2D perspective that would be useful for viewing map data and finding waypoints. The combination of getting the camera states to function without error, then pairing them with a map-based panning and zooming controller took about a week to figure out. Most of the bugs I experienced after adding this feature stemmed from either the camera states or the pan/zoom controller. Other features added on top of the original port are: UI designs for menus,

custom Mapbox map styles, compass UI element that rotates based on the user heading, and a cutscene-style event that shows users where the next waypoint is. There were more features not added, but listed in the development chart for future builds. Most notable is a feature called Tour Mode, which allows users to see waypoints displayed at key buildings and locations around the city of Rochester. Instead of displaying narrative elements, the waypoints can be populated with snippets of information or links to informational pages about historical sites in Rochester. Additional features for later builds include: 3D buildings extruded from the map, 3D models for POIs (characters, buildings), custom mapbox datasets and styles, interactive content modules (videos and games/puzzles), progress/game data saving, and AR functionality (world space building/character models and directions).

Creating a Tool for Future Development

The next stage of this capstone project involved development covering the backend functionality of the app, and streamlining the process of adding content to the Unity project. The goal was to create a Unity project that a group of students with different technical backgrounds could work with to create a new narrative scenario. My first step was to focus on dynamic designs when creating systems that handle new narrative data like story text or significant location coordinates. The game scene in the Unity project should be able to handle new text, coordinates, and other content from any scenario added to the project with minimal development on existing systems. An example of this is the formatted text and JSON files that allow writers to add their content to the project without having to program or interact with Unity. The scripts that populate the data of objects, like waypoint coordinates and text fields, parse these files at

runtime. Pointers in the files assign information to the correct location at runtime. All story segments connected to the demo scenario are tagged with a number representing that scenario. Each path in the scenario has its own index to differentiate player decisions. Finally, each story segment is linked to a location that it is automatically assigned to. This system was initially static, meaning that it was specifically designed to handle just the content of the first scenario. There are still some parts of the project that remain static/hardcoded. While these can be changed to accommodate other narratives, it takes more work. It would be more efficient to replace with a dynamic system. The other option I had when developing the file parsing system was to create multiple scenes within Unity, each one linked to a specific narrative. While there is no issue going this route, it makes the project more difficult to work with. A single scene that can accomodate all narratives is easier to manage than a project that expands every time someone wants to add narrative content. The framework of Rochester Steampunk AR enables groups of mixed technical backgrounds to collaborate on adding content and improving the project as a tool for others to use. Students that want to learn about digital storytelling can focus on writing a narrative for a location based game, artists can create content for the narrative, and students with a technical background can work on implementing that content, testing it, and developing the tool in areas where adding that content proves difficult.

While improving the usability of the project for other groups, I had to write a developer manual that walks through the process of setting up the project, testing the app, working with Mapbox, and adding new narrative content to the project. This was the most time consuming part of the capstone, as the manual required extensive detail to make each step as clear as possible. While writing this manual, I was able to identify some areas in the project that were still

semi-static/hard-coded, and would make adding content more difficult. I addressed these areas in the end of the document, and listed the changes that would be needed to streamline the process. The developer manual also includes a build chart that breaks down which features should be added to each part of the development timeline, and features that could be added after key functions are implemented. I relied on my experience writing design documents for previous projects to create clear and concise instructions.

Deliverables

There were many deliverables for this capstone, and I was successful in completing each of them. Digital deliverables included the final build for android devices, a zipped version of the unity project folder, and a gameplay video recorded from running the app on my phone. I used Rocketbook to digitize all of my research notes, but the transcription function didn't work too well. Two posters were created for each section of the capstone, porting the app and creating a tool for others to work with. My writing deliverables included weekly blog posts on what/when work was completed, the developer manual for working with the Unity project, a summary of the current state of the Unity project, and my reflection paper. I was able to playtest my final app version and get some feedback that was also included in the developer manual. The overall impression of the app was excitement and interest, as there aren't many location based games that focus on historical events and locations. I consulted a current Unity developer when it came to revising the developer manual I created.

Conclusion

Compared to the last time I worked with Mapbox, I greatly increased my skills using their API with Unity. Most of the issues I encountered on the last project stemmed from not fully understanding how to implement the Mapbox API with my own scripts, which I was able to figure out this time around. I also improved my skills in testing and developing for mobile devices with Unity. I have been developing with Unity for ~6 years and haven't gotten Unity Remote (testing app for mobile devices) or iOS builds to work before this. I was able to get both working during this project, even though the current version of Unity has issues with creating xCode projects that can be compiled to iOS devices. While I experienced some setbacks when porting all features of the previous groups designs into the current build, the overall concept of telling a narrative through location-based gameplay was achieved. Planning the future development of the project helped me analyze areas of the project that would need to be addressed in order to improve the user quality of experience, and developers' ability to create new content in the span of a semester. There are many possible uses for this framework: the narratives can cover different timelines and locations, Mapbox datasets can be used to add sponsored content to gameplay sessions (ie. restaurants and shops to visit that are on the player's path or in historical buildings), and the app can serve as a virtual tool guide for the city of Rochester. The widespread use of location-based games is still relatively new, and there aren't many tools/apps like Rochester Steampunk AR available to users.

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