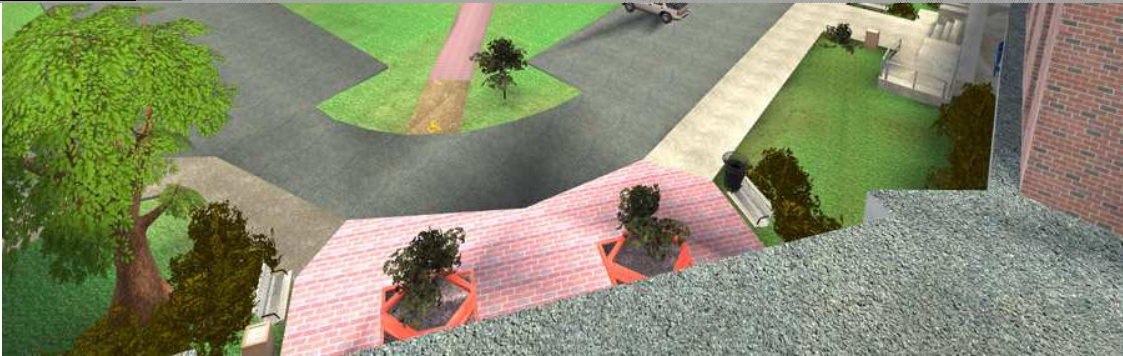3/10/2008

WORCESTER
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THE WPIMAP CAMPUS TOUR IQP

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ABOUT THE WPIMAP CAMPUS TOUR

This project consists of a physical kiosk located in the Bartlett Center as well as a 3D interactive tour created using the Unreal game engine. The write-up, postmortem, and accompanying materials are located on the web at http://wpimap.com.

Beginnings:

One might wonder how such a large project comes to fruition. It all took place fairly quickly. Beth and I were thinking about a subject for our Interdisciplinary Qualifying Project (IQP). The initial idea to make an interactive tour of campus was first thought up by Beth and refined by Alex. The first iteration of the project concept included no engine specification, but just that there would be a way for users to interact with the 3d campus, be it through the web or game engine. First, we thought of recreating the campus in Second Life. This idea seemed like it could work, but after some advisement, we soon realized it might cast a negative light on the campus. In Second Life, if there isn't something fun to do or interact with, there will not be a crowd of people around looking at the campus at all times. This potential 'ghost-town' caused us to shy away from Second Life as a medium for the project and we looked into current-generation game engines to run the simulation. Because the campus tour was eventually planned to be distributed through the Internet, we wanted to choose an engine that would be widely compatible. It was finally decided that Unreal would be a good choice for the WPImap, and the system specs were low enough that mid-range PCs could run the simulation without problem. An engine like C4, Half Life 2, or something next-generation would limit our user base and therefore UT2004 seemed like the best choice. After committing to UT, we pitched our idea to the head of WPI Admissions. The appeal for Admissions was that prospective students would be able to tour the campus, see the layout of the buildings, learn some interesting facts about the university, and see the kind of environment they could be a part of if they chose WPI as their future college. It also appealed to current students as an impressive showing of the capabilities of Interactive Media and Game Development (IMGD) students. Only days after the initial pitch, we were granted the okay from Admissions and were assured the financial backing we needed to create the kiosk and build the computer that would be running the simulation.

Project Summary:

The project, which has been fully sponsored and condoned by WPI Admissions, consists of a public kiosk that allows prospective students and current students alike to interact with the 3d

campus model. In a slight shift from the Halo map, this use of the WPImap is more of an informational and exploratory purpose than its predecessor. Participants can walk up to the kiosk, grab the joystick and trackball, and navigate around the 3d environment in real time, viewing all of the buildings and campus landmarks in photorealistic detail. Another big change is the introduction of an interactive 3d tour. Outside of the virtual Bartlett Center, players will notice a Segway human transport vehicle. Upon entering the vehicle, a full tour of campus begins, complete with a virtual tour guide and a scripted path through all of the academic and residential buildings on campus.

Technical Specs:

Before the WPImap Campus Tour there was an old map of campus that we worked on as a personal project for the Game Development Club called the WPI Halo map. Everything was very simple and less than ¼ completed. The first most noticeable change from the old map of campus is the level of detail. The amount of detail has really been stepped up, with an increase of over 1,400% the amount of polygons compared to the previous halo model. With hundreds of new textures at resolutions as high as 2048x1024 pixels, the campus looks better than ever. Older seamless textures have been redone and made more realistic, and loads more new ones have been added. In order to optimize such a high detail environment, the Unreal Engine 2 has been utilized to its fullest. In a departure from massive merged meshes, each building was created from the ground up as a separate static mesh in Autodesk's Maya. This allows for proper engine culling and enables better performance from the engine.

Post-Mortem:

With the kiosk only days away from going live, all but the final tweaks and kinks have been ironed out. In doing a project of this scope, we both learned a great deal about scope issues, time management, content management, and team building.

From the beginning the largest issue was always the immense scope. It is easy to talk about all of the things you think you are going to accomplish but it is another thing to get it all done. Roadblocks come up every week in this project and it is very important to develop a project like this with the mindset that not everything will go right and one cannot trust that everything will fall into place according to schedule. More often than not, right before our weekly advisor meeting for the project, something would go wrong and we would have to troubleshoot either Maya, UnrealED, or UnrealScript content we had created that week. We soon learned that you cannot create loads of content for import into an engine and expect it to go smoothly. There are always problems. Whether the normals of a face are reversed, degenerate faces prevent triangulation upon export, or UnrealED is crashing, it is always a challenge. If you learn to take content creation step by step and import as you go instead of doing huge blocks all at once, the troubleshooting time is lessened and the last minute stresses can be reduced.

Another lesson learned is that Subversion (SVN) is an invaluable tool for anyone working on a team project. While sequential backups can prevent loss due to file corruption or crashes, it can

only do so much. Subversion allows your whole team to check out and commit files from a global repository, preventing overlapping work from occurring. It comes down to the simple fact that only one person can work on a file at one time, and especially in large groups, interpersonal communication just isn't enough. Without SVN, this project never could have been completed in time, and more data would have been lost if it weren't for the redundant backups of older versioned files on the server. The ability to roll back to a previous build is essential on a project where an incorrect save or crash can easily corrupt a file beyond repair. No matter what content management system is being used, we learned it is always important to save often.

Both Beth and I also learned a thing or two about team skills and time management. Having weekly meetings with our advisor helped us by giving us an incentive to create hard and fast deadlines for our own work. Without clear goals, it would have been much harder to manage all of the work that needed to be done. With so much to do and not much time with all of our other classes and obligations, it sometimes became very stressful to work on the project. What helped us was to segment our to-do lists into weekly goals. This also gave us a rough estimate on overall progress through the project. Time management was one of the hardest parts of doing a large-scale mod like this. Issues often came up last minute that needed to be resolved. Many nights were spent working late on the map and fixing unexpected problems, and we both learned to expect problems when creating new features and content for the project. We tried to stay positive and keep working, and our hard work has paid off.

Future:

While the project is essentially over for Beth and I in terms of the Interdisciplinary Qualifying Project (IQP), it is far from complete. This project can never be considered 'finished' because there is always more that can be added. A project such as this can continuously evolve over time, adding additional complexity and detail. However, that does not necessarily mean that it will just be the two of us working on it. Next year in the Game Development Club (GDC), Beth and I will be leading a development group that will work toward bettering the 3d campus model, whether for use in the tour or for other uses. A 3d representation of a location such as a college can be used for numerous purposes such as entertainment, informative purposes, teaching materials, and many other interactive uses. The map will be developed under the supervision of Beth and I, offering guidance and advice to those who want to be a part of this ongoing effort. Who knows, in 10 years the campus could be completely remodeled with the map updated to reflect those changes. Even 'East Hall', which exists in the current build of the map as just crossbeams and sheet metal could be updated once building construction is complete. The campus is continuously evolving and the virtual representation should reflect that.

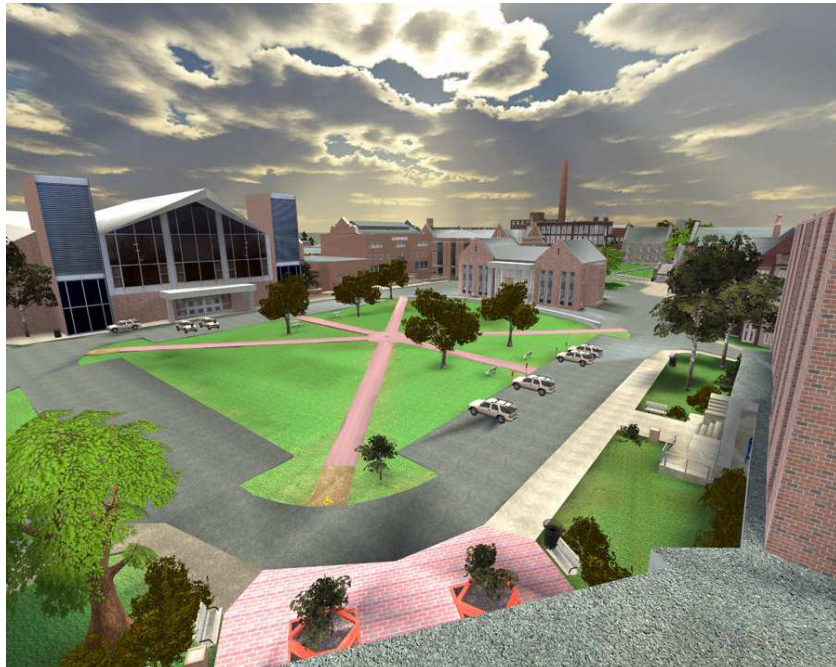**We would also like to thank the following people:**

- Thanks to Hazel Whorley for the Terragen skybox.
- Thanks to Rachel Cordone (Angel Mapper) for moral support, scripting, path movement, and UT2004 troubleshooting.

SCREENSHOTS

Welcome Menu

Aerial Shot of the Quad

Atwater Kent Laboratories

Salisbury Labs

Start of the Campus Tour near the Bartlett Center

Higgins Labs

A Model of the Real-Life Kiosk in the Bartlett Center

The Fountain

Freeman Plaza between Salisbury and Washburn

Segway for the Campus Tour

Founders Hall

Institute Hall

Boynton Hall

Earle Bridge

CDC Sign and the Fountain

Daniels and Morgan Hall

Inside the Bartlett Center

Stratton and Higgins

The Parking Lot from Fuller Labs

Aerial Shot of Higgins, Stratton, and Boynton Hall