**CS 490 Final Paper Graham Welsh**

The Elizabethtown College Residence Life website contains pictures of floor plans for each room and a list of provided furniture. However it doesn’t provide any information about the dimensions of the furniture or how it can be arranged in the room. It is very difficult to plan the optimal location for the furniture. I plan to add functionality to the website to allow students to select their room and arrange the given furniture on the room’s floor plan. This would help students determine the best location for their beds and desks near outlets to plug in their electronics. This would also allow them to add their own furniture if they desire. This extra functionality will allow students to determine if they have enough room for any extra lights or tables or seating they might want to bring.

There are some tools similar to this concept available online such as designyourdorm.com. This website allows you to pick your and design your room from many different colleges and universities, however Elizabethtown College is not available. This arranger would be more focused on Elizabethtown campus rooms with no registration required. Other tools may have extra features but many are luxuries and may not help. Some tools link to shopping sites to buy furniture, but don’t consider furniture students may bring themselves.

The additional goals of this project are to demonstrate knowledge of computing and mathematics relevant to the discipline, involving common data structures and basic algorithms.

Also to examine and analyze problems and identify and define the necessary computing requirements appropriate to implement the solutions. In addition, design, implement, and evaluate a computer-based system, process, component or program, including operating systems and database systems, to meet required needs. Lastly, I intend to practice effective communication with a broad range of audiences and to engage in continuing professional development.

This idea of creating floor plans that are editable has been embraced by many companies such as real-estate agencies to assist clients in designing rooms in their houses. Many of these applications that involve designing floor plans of rooms are linked with furniture retailers to integrate their products and streamline the process. The recurring problem seems to be the fact that it is difficult to accurately replicate real-world dimensions onto an online template. This can cause an issue if, for instance, two pieces of furniture in a room need to be a specific distance apart from one another. The distance between the pieces of furniture may seem as if it is accurate, but it is a challenge to set a reliable conversion between the different distances. Therefore when the furniture is placed in the room the distances might be off and the design may need to be redone.

In my research I found there are two recommended methods to develop a room planner with JavaScript, canvases and SVG. Similar projects have been done and those developers have established pros and cons for both solutions. Canvases are fast and simple method for drawing different objects. There are also useful events handlers built in for utilizing mouse events. The canvas object also includes useful libraries such as EaselJS, FabricJS and KinectJS.

SVG on the other hand is scalable; the images won’t lose quality when zooming in and out is used. SVG also makes it simple to import graphics from outside programs such as illustrator. However there are not as many useful libraries and SVG makes it more difficult to work with image objects such as .pngs.

This website will display the dorm room floor plans of the different residence halls on campus. There will be a drop down menu to pick the building, floor and room number. Once the room is selected I will use a canvas to display the floor plan and an outer canvas to hold images of the furniture. The floor plans will detail features of the room such as Electrical outlets and Ethernet ports. In the event that students do not know how they want their room arranged, there will be a second tab in the website that will include example room layouts to demonstrate possible furniture locations in different rooms.

I plan to use a combination of HTML5 and JavaScript to develop the room arranger website. The canvas element in HTML5 will be used to represent the different dorm rooms and hold the images of furniture that are a part of the room. The page will contain a canvas surrounding the room that will be used to serve as a starting position for the furniture. The animations and elements such as drop down menus can be coded in JavaScript. This will allow for a seamless and modern feel to the website. I chose JavaScript due to its vast compatibility with different platforms and its vast number of libraries. Additionally, it is fairly easy to present functional content if end users do not have access to JavaScript.

In addition to my research into JavaScript, I also researched Flash as a method for animation. However, I found several issues that would cause problems later. Flash animations and other features don’t translate well between non-Microsoft products. On other platforms Flash is either not available or doesn’t work very well, JavaScript will function well across browsers and platforms. The other problem Flash has is its poor degradation; if an end user has an outdated version of Flash or no Flash at all the page will look unwelcoming or stop functioning properly. With JavaScript’s integration with HTML it is possible to work around any outdated features and still create a functional and pleasing experience.

In the initial couple of week I intend to finish planning this project. I will include a rough sketch of the website’s outline, navigation and information included on each page. I will also conduct research on drag and drop web animation, including the different methods and determining the best method to use in implantation. I intend to use articles and blogs obtained from sources such as Stackoverflow, Wikipedia, w3schools and other resources related to web programming and website design.

The next step in the design stage will be to start programing image animation in the canvas. The next phase in the project design will be compiling the different parts of the website and ensuring that the required specifications of the rooms are obtained. These items include dimensions of dorm furniture and locations of elements of the room including heating or cooling units and electrical sockets. Following that I will finalize the details of the website design, including layout of the pages and website navigation.

In the implementation phase the first stage will be adding specific dimensions to the rooms in each building and adding the animated furniture to the website. Once the behind the scenes reprogramming is complete I will move onto the implementation of the website. I will set up the designed layout and site navigation. Starting with the HTML5 elements, I will finally add the JavaScript animation and other elements.

In the debugging and testing stage I plan to have fellow students navigate around the website and test the furniture arranging features. I will ask for feedback focusing on look and feel of the website and ease of use of the different features of the room arranging. Finally I will ask the Residence Life department to assess and test the website and its features. Then the website can be deployed for use by students and prospective students.

As the project progressed it became clear the best course of action was to build a new website from scratch the website for the department of Residence Life has very little extra space in which to put any more elements. The website was designed with a banner at the top with the logo of the department of Residence Life. There are two dropdown menus using the html <select> tag that are filled by arrays that contain the list of buildings and their perspective rooms. Using the onChange function of the <select> tag the second list is populated with room numbers based on the value of the building of the first dropdown list.

Next there is a submit button that triggers a function which checks the values of the dropdown menus. If a value is not selected in the dropdown menus an error message is displayed and the user must choose a value. Once a room is properly chosen the JavaScript object Room is retrieved. The Room object has a building property, a room property and a floorplan property, which is an image of the room built with Microsoft Visio based on dimensions on the Residence Life website. There is also an array in the Room object for pieces of furniture, which are smaller nested divs; they have furniture images as their backgrounds with labels indicating their type. These divs are contained within the floorplan which is a larger div with a background image of the room’s floorplan. The furniture is prepositioned around the room, and can’t be placed outside of the div. Using the JQuery Easyui library allows the nested divs to be dragged and a global variable lastClicked is used to store the last div that was moved.

Below the floorplan are a series of buttons to control features of the website. There is a button for rotating furniture 90° to the right and another for rotating furniture 90° to the left. There is also a delete furniture button which checks the html class of the selected div which allows user customized furniture to be deleted, but not furniture provided by the college. According to Residence Life policy, college issued furniture must not leave the room.

The last button on the page displays the interface to create custom furniture. The first input field is for the name of the furniture. The next field uses the JSColor script to set the color of the furniture. The last two fields are for the height and width of the furniture, which is measured in pixels. When these new shapes are created their name is displayed within them. On the bottom of the page there are instructions and a note stating that the website functions best in Google Chrome and Mozilla Firefox. This is due to a compatibility issue in Internet Explorer which prevents the furniture from rotating.

There are several other fixes and features that could be implemented. The room furniture could be updated to include high quality images of actual dorm furniture. In addition, the plan includes giving users the ability to upload their own images of their custom furniture. There remain several bugs that need addressing, including the room selection and setting process based on the properties of the Room object. Another missing function is not including some furniture in specific rooms. Such as the ones which come with built-in closets or dressers.

The website would also have a separate page with example room designs to provide suggestions to those who may not know the best way to arrange their room. There would also be a system in place where users can save and share their custom room designs. There would also be functionality allowing multiple users to collaborate on one room for sharing. There could be an added system in which Residence Life could easily add new buildings and rooms or edit current ones, in case renovations are made. This system would also allow for expansion into the on campus apartments and quads.

The website could also be tested more extensively across more browsers, screen sizes and operating systems, including Safari, Mac OS and Linux. The website could also be adapted for use on mobile devices. There are countless possibilities for improvements and expansions.