Web based Data visualization for an Immersive 3D Therapy Game for Treating Hemispatial Neglect

THESIS

Presented in Partial Fulfillment of the Requirements for the Degree Bachelor of Science at The Ohio State University

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The Ohio State University
2015

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Abstract

Neglect affects an estimated one in four individuals who experience a stroke. Because of its association with overall stroke severity, individuals with neglect tend to have poorer prognosis for recovery. Treatment of neglect in acute stroke can yield greater recovery of a person's ability to successfully perform activities of daily living. However, most individuals have insufficient access to effective treatments. Hemi-spatial neglect is a type of brain problem after stroke that people with this problem is living in a one-side world, which means they can only recognize one side of the object they see in their eyes, and automatically ignored the other side. Current existed treatment which is called Constraint Induced Movement Therapy (CI therapy) is to Hemi-spatial neglect is having the patient staying at hospital and repeat being forced to look at the side they tend to ignore by a doctor. This traditional treatment for hemi-spatial neglect is very tedious and a repetition of a motor practice thus has little effect on patients. Recently, game-based treatments for neglect have shown some important progress. We, as a team, designed an immersive 3D video game, which has very user-friendly interface and driven by eye gaze, in order to train them to look at the other side so that they may get a better chance to recover as normal people. This will provide direct, intensive, and implicit training of visual attention, while enabling real-time assessment of performance and feedback. The game is calibrated with The Eye Tribe Eye Tracker as a monitor to the movement of eyeballs and based on 3D modeling technology: Autodesk Maya with the assistance of Adobe Photoshop for creating game assets, and imported them to the Unreal Game Engine 4.0 and program the game with C++ and BluePrint visualized language.

Dedication

This document is dedicated to my love and friends.

Acknowledgments

I would like to express my gratitude and appreciation to all those who gave me the possibility to complete this report. A special thanks to my final year professors。

Many thanks go to the head of the project, Prof. Furrukh Khan whose have given his full effort in guiding the team in achieving the goal as well as his encouragement to maintain our progress in track. I would to appreciate the guidance given by other supervisor as well as the panels especially in our project presentation that has improved our presentation skills by their comment and tips.

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Chapter1: Introduction

Hemi-spatial neglect affects an estimated one in four stroke patient [1]. Hemispatial neglect refers to inattention or decreased awareness of stimuli within one side of visual space, most commonly the left visual field following brain damage to the right hemisphere. Existing treatments aim to increase awareness of the neglected visual space by directing eye gaze and targeting attention to stimuli in the neglected space. Current treatments include patching to obscure the right hemi-field, following moving targets with the eyes, visual scanning of stationary targets, and intentional movement of the contralesional upper extremity provided through Constraint Induced movement therapy. Although the latter treatment is the gold standard treatment for hemiparesis and not designed to address neglect, its benefits generalize to decreased neglect during activities of daily living, whereas other interventions produce positive effects that may not generalize outside the laboratory setting[2].

This evidence suggests that the principles of Constraint Induced movement therapy could be applied to existing interventions for neglect to improve overall effectiveness. The critical ingredients in motor Constraint Induced movement therapy are high-repetition motor practice, restraint of the weaker hand, and daily self-assessment to promote transfer of training to activities of daily living. The visuospatial analogues for treatment of neglect are: high-repetition smooth pursuit eye gaze training via a 3D gaming platform, eye patching, and daily self-assessment of attention to the controversial space during activities of daily living. The advent of new eye tracking sensors allows for low-cost delivery of the proposed intervention, while also

providing an engaging, implicit learning paradigm that generates real-time feedback for the user.

Game-based treatments for neglect have shown initial promise [3]. However, existing treatments provide indirect training of eye-gaze behavior through game play that is driven by motor movement. We designed a treatment whereupon eye gaze drives video game play. This provides direct, intensive, and implicit training of visual attention, while enabling real-time assessment of performance and feedback. This project is testing a novel approach to home-based rehabilitation that utilizes newly developed, inexpensive, and commercially available eye-tracking technology to provide treatment to underserved individuals.

1.1 Project Timeline

There are several phases in this project. The first phase was done in Spring 2014; we planned the whole timeline of the game design and prepared the team with different part. Hardware, Game assets creating, Game programing and development, clinical data testing and gathering. Prof.Khan is the leader of the team, and Dr.Lynne Gauthier is the clinical leader. We first consulted clinical people and set up the type of game to shooting game. After prepared all the game assets inside Maya, Prof.Khan imported them into Unreal Game Engine to complete the game. After hardware group implementing the Eye Tracker to the game, we have tested the game on 30 patients to gathering data. One of the group members, designed a data processing program in Matlab to process the XML file that records the performance of patients, while I designed a web-based application to visualize the data.

Chapter 2: Background Theories

2.1 Description on Hemispatial neglect stroke

Neglect affects an estimated one in four individuals who experience a stroke [3]. Because of its association with overall stroke severity, individuals with neglect tend to have poorer prognosis for recovery [3]. Treatment of neglect in acute stroke can yield greater recovery of a person's ability to successfully perform activities of daily living [4]. However, most individuals have insufficient access to effective treatments. This project will test a novel approach to home-based rehabilitation that utilizes newly developed, inexpensive, and commercially available eye-tracking technology to provide treatment to underserved individuals.

Hemispatial neglect is an ordinary side effect after a brain damage or a stroke. Hemispatial can results directly from brain injury of the right cerebral hemisphere, and learning to a result that visually neglect the left side space. Right-sided Hemispatial neglect is very uncommon, the reason is that the processing of the right space requires more procedure and redundant than the left side. [3]

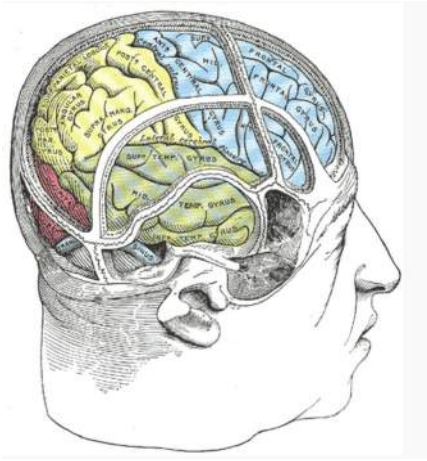

Figure 1. Hemispatial neglect is most frequently associated with a lesion of the right parietal lobe (in

yellow, at top)

Commonly, most stroke patients will experience right-brain lesion and less patients will experience left-brain lesion. Right brain lesion and left-brain lesion are similar, and the rehabilitation technology is close to each other to some extent.

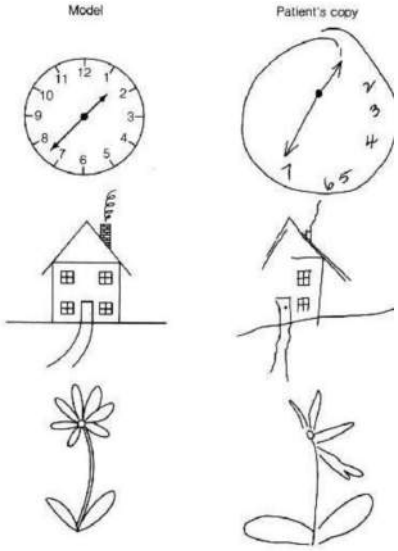

Figure 2. Examples of a patient with neglect drawing from memory

Figure 2 shows the comparison of drawings between a normal person and a person with hemispatial neglect. The first picture is a clock, we can see from the picture that the patient put all the numbers to the right side and leave the left side blank. In the third picture，the patient tends to draw a whole flower, but he appears to draw a flower that only have the right side. Hemispatial neglect can have various bad effects on people's daily life so it needs to be seriously treated.

2.2 Treatment on Hemispatial neglect

2.2.1 Current Treatment on Hemispatial neglect

Current treatment on Hemispatial neglect is called Constraint Induced movement therapy. Constraint Induced movement therapy is to force the patient to look at one direction again and again in one short period of time [9]. This has been used for many years but the effect on this is not as good as expected. This existed problem in traditional treatment on Hemispatial neglect stroke has been addressed for many years. This has become the innovation and motivation of development on game-based treatment.

2.2.2 Innovative Treatment on Hemispatial Neglect

We designed an immersive 3D video game system specifically targeted from the grounds up for treating Hemispatial neglect that will deliver the aforementioned therapeutic ingredients. An eye tracker which will enable us to precisely track the patient's gaze on the computer screen [10]. We developed a novel Gaze User Interface specifically tailored towards visuo-spatial neglect which will provide an intuitive means for the patient to select, pick and use gameplay objects. Furthermore it will not mimic the standard mouse interface since this can produce motion sickness and disorientation for the user [5]. As the game progresses the adaptive nature of the game will encourage the patient to pay more attention to, for example, the left side of an object by restricting part of objects that is sensitive to the patient's gaze.

Chapter 3. Introduction to Software and Project Setup

1.1.Autodesk Maya:

Maya is a 3D animation, modeling, simulation, rendering, and compositing software offers a comprehensive creative feature set on a highly extensible production platform. Maya provides high-end character and effects toolsets along with increased productivity for modeling, texturing, and shading creation tasks. In this project, we are importing game elements mainly from Maya. Ultimately use the strong 3D modeling ability, model making could be much faster and vivid in Maya than in Unreal Game Engine.

1.2.Adobe Photoshop

We are using Photoshop to cooperate with Maya to do the shading and texturing work. Photoshop can allow user to draw patterns directly on a 3D object by using its 3D drawing tool. Although Maya has its own shader tools embedded in, only use Maya for shading and texturing is low efficiency and may result in a lot of impreciseness. With the assistance with Photoshop, 3D model could be done better and more efficiency.

1.3.Unreal Engine 4.0

After making completed models in Maya and shaded in Photoshop, we imported these into Unreal Engine 4.0. Unreal Engine 4.0 is the newest release version of the game engine. In this version, the game engine is written in C++, and it also allows users to programming game in C++ and BluePrint. Blue Print is a visualized programming language that is much easier than C++ in very complex game structure. In this project, we are using both C++ and BluePrint to complete the game.

Chapter 4. Creating Gaming Assets

Autodesk Maya is the world's most outstanding three-dimensional animation production software is one of the very high point and complex three-dimensional computer animation software, which is the Alias Wavefront Inc. was launched in 1998, three-dimensional production software [6]. Is widely used in film, television, advertising, computer games and television games, digital effects creation. Oscar Award-winning contributions to science and technology. The production of 3D Studio Max Autodesk Software Company announced the formal acquisition of production Maya's Alias [5]. So now is the Autodesk Maya software products. Its application areas include three aspects;

1. Plane graph visualization, it is a large graphic design products to enhance the visual effect, the power of the application of open graphic designer perspective
2. Website resources development, three movie stunt (Spider Man, Matrix, Lord of the Rings),
3. Game design elements: MAYA animation software in the film industry have a broad application.

4.1 Creating Models in Autodesk Maya

Maya can create game asset models in many ways: Polygon, Surface, Curves, etc. In this project, I mainly use polygon modeling for creating a train model.

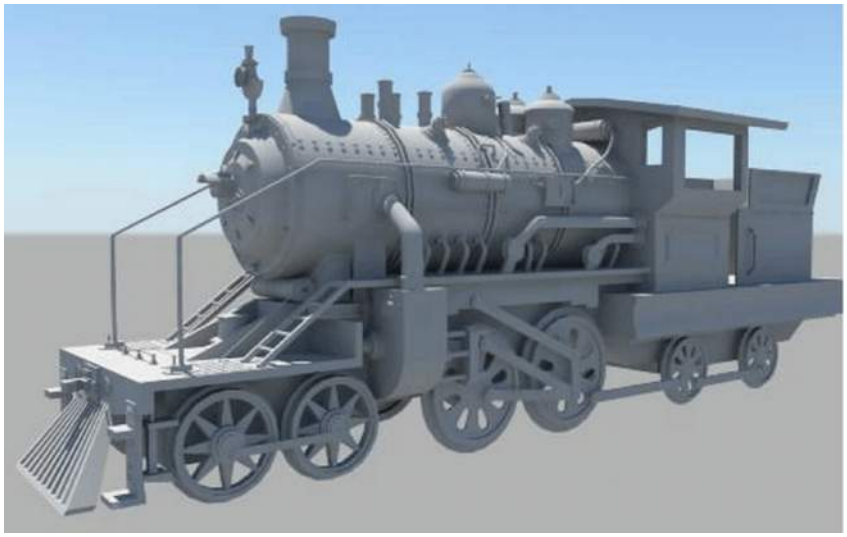

Figure 3: Finished Train Model in Maya

Showing here is the finished train model. I started with the bottom part of the train. Bottom part is using cube manipulation, by adding the line and the extrusion. The most common tool using here for cube manipulation is “Edit Mesh - > Insert Edge Loop Tool” and Edit Mesh - > Extrude (as shown in Figure 4). I use these tool common tools to design the exact shape I want for the base of the train model.

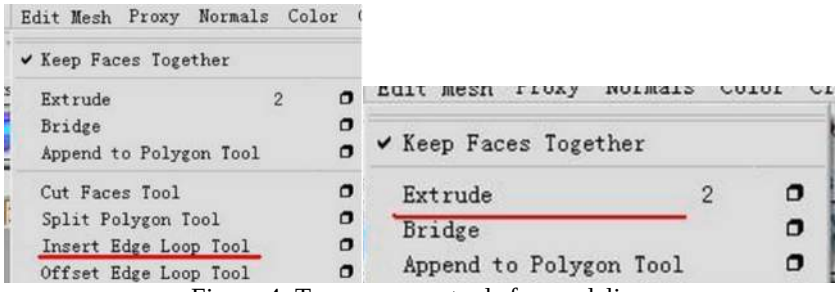

Figure 4: Two common tools for modeling

Figure 5 as shows below is the finished parts of the train base. By doing repeated work of inserting edge loop and extruding the faces of the cube, the cube will be shaped specifically as the bottom of the train. This needs a lot of work since it is the first step of making a model. However, after that procedure, things could go faster than before.

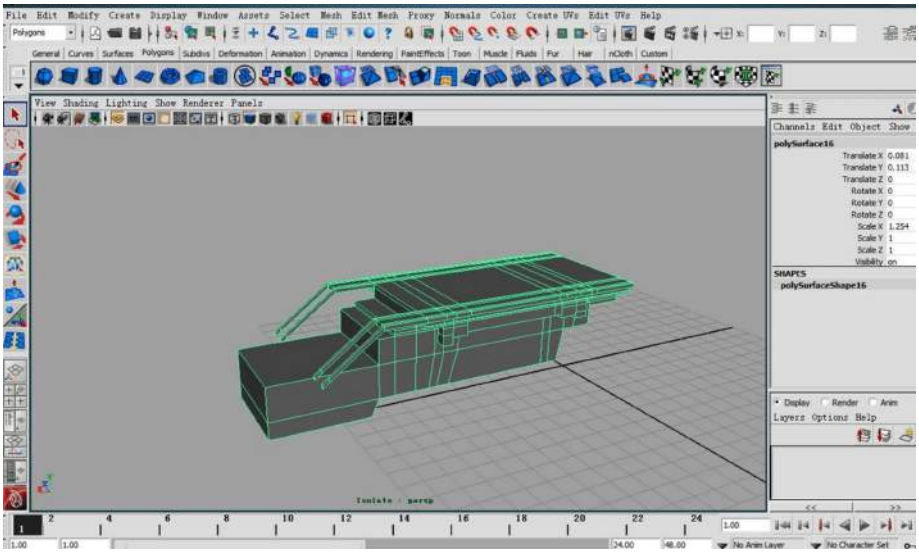

Figure 5(a): Finished parts of the train model

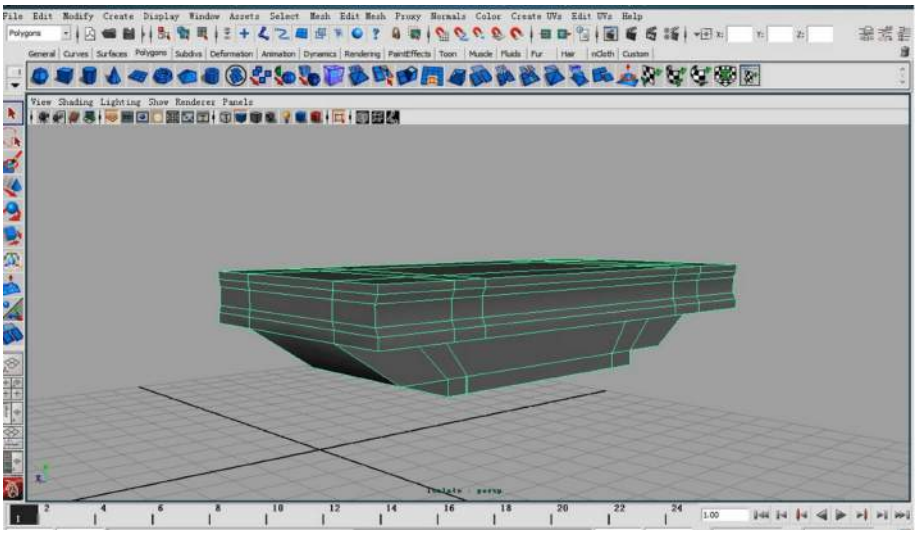

Figure 5(b): Finished parts of the train model

The next step is to make the base after working on the above parts. First start from the part of the train, we can see that the whole front part is a modified cylinder. Look at the front part, make sure parts of it are highlighted and then use the extrusion tool as talked above. Select the surface then using extrusion zoom in. I didn't choose to zoom in directly, because in that way, there will be no effect, it will shape the front part into wrong shape. The right choice is to zoom, then using the extrusion, and then make the circular shape break out. Repeat the step and choose again, then zoom in, and make the circle smaller. Now look at the cylindrical body parts, it should have six raised circular rings. I explored some useful tools to add line, the easiest to do it is to click Edit Mesh - > Insert Edge Loop Tool command. After the addition is complete,

choose then double-click the highlighted part of the face, then pressed on the shift key to run-off, and select the area behind the five round circle, and then use extrusion tool. I didn’t choose the middle of the overall scale, because if I chose the middle the shape will not be round. Following these procedures, the cylindrical part of the car is now ready.

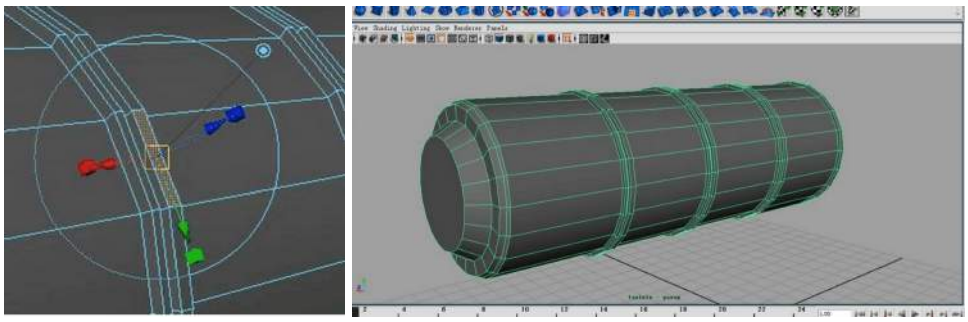

Figure 6: Finished Circular Rings

4.2 Shading Procedure and UV Mapping

After completing the model, I start to do network shading on the model in Autodesk Maya, network shading can be finished in the Maya embedded render: Hypershade The user interface is showing in Figure 7, there are pre-setting of 9 materials inside this shader, but user can still apply their own materials and textures and import them into the shader too.

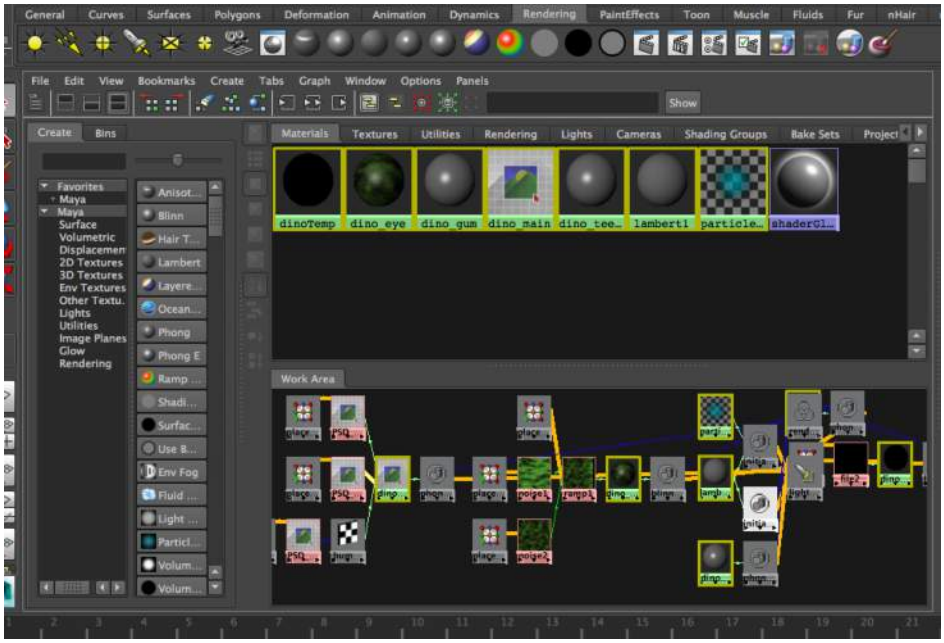

Figure 7:Hypershade Interface in Maya

Hypershade is completely Node based. In this Hypershade interface, we can choose our own material from outside and inside and also choose which material and color we want on the model we created.

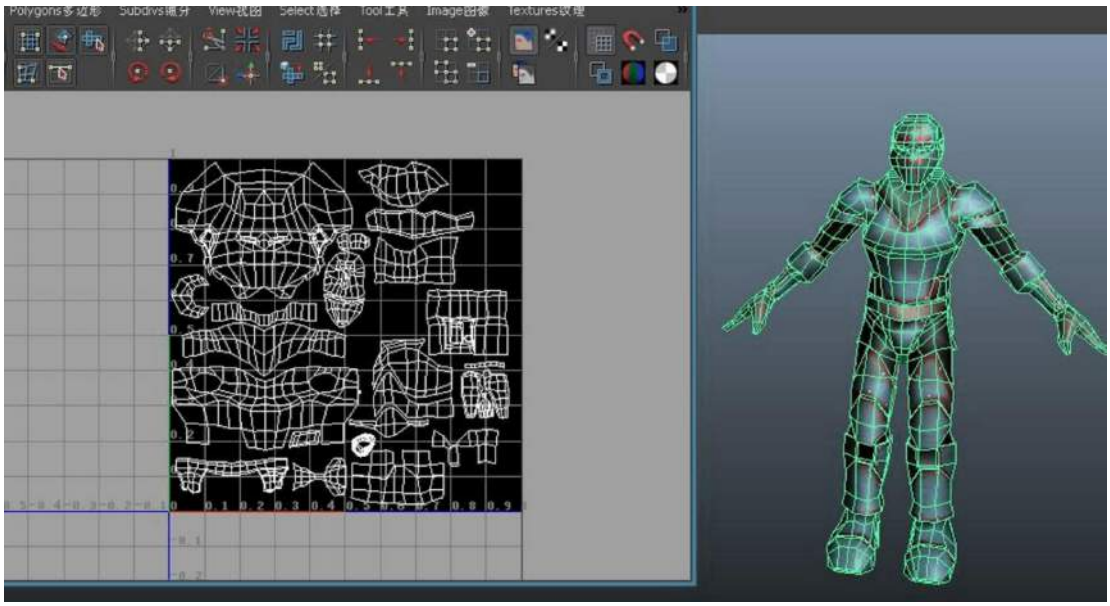

Figure 8: UV Mapping in Maya

As we are doing a 3D model other than 2D, we cannot apply texture directly to the 3D objects as it will get tortured. Instead, we need to fold the 3D object back to 2D object

in order to fit the material. In the picture above, left side is the unfolded 2D texture of the human figure on the right hand.

UV mapping is the 3D modeling process of making a 2D image representation of a 3D model's surface. This game assets creating consists a lot UV mapping process. The notation “U” and “V” means the axes of the 2D texture and notation “X”,’Y” and “Z” is for the axes 3D object in model space. [6]

The UV Mapping process at its simplest requires three steps: unwrapping the mesh, creating the texture, and applying the texture. The above figure shows the UV Mapping process on a 3D object. UV texturing mapping allows polygon models get painted with color from a picture or an image. The image used for texture is called a UV texture map. The whole process of UV mapping is manually assigning pixels in the image to the surface of the polygons programmatically. Without UV mapping, the texture tile in 3D space will be carved out of the space.

Chapter 5. Introduction to Two Major Game Engines

5.1 Unreal Game Engine

The Unreal Engine is developed by Epic Games, it is the first showcased in 1998 for the first-person shooter game Unreal. It has been used for other genres also, for example, Stealth, MMORPGs, and other RPGs. Unreal Engine 4 is also a complete suite of game development tools made by game developers, for game developers. From 2D mobile games to console blockbusters and VR, Unreal Engine 4 gives you everything you need to start, ship, grow and stand out from the crowd. Its inner structure is written in C++, it have very high portability and very popular theses days.

5.1.1 BluePrint Visualized Language

Unreal Game Engine has its own unique visualized programming language called BluePrint. It provides an intuitive, node-based interface, which can be used to create newer types of script level events and actors. It allows designers and gameplay programmers to quickly create and iterate in Unreal Editor without writing a single line of code. Also, it can be as powerful as C++, Blueprint visualized Language can do anything whatever BluePrint does.

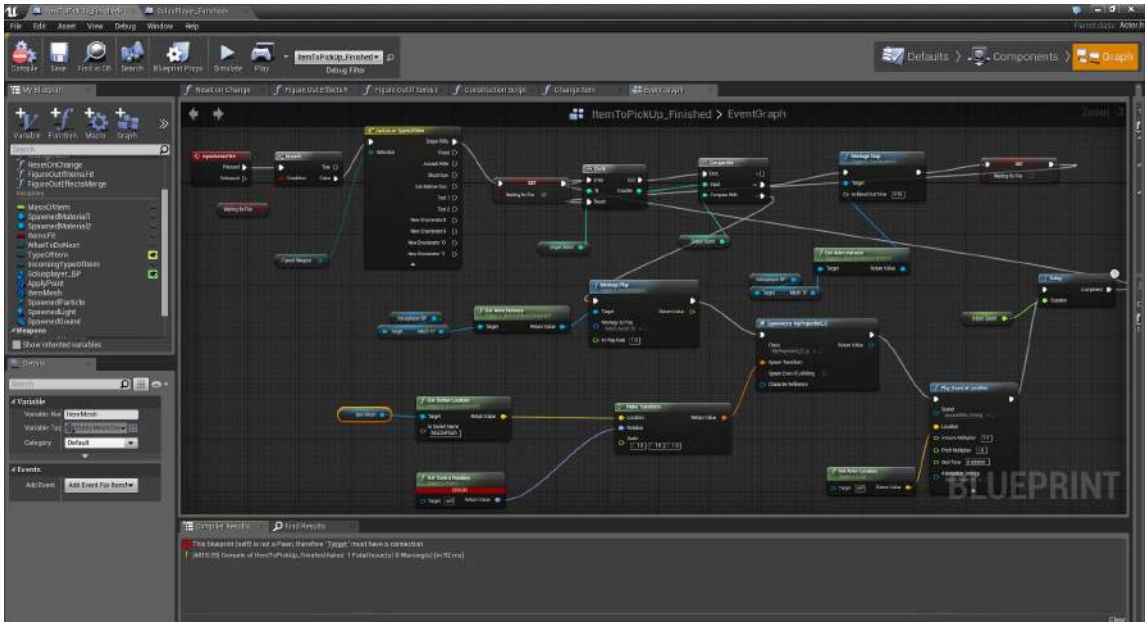

Figure 9: an overview of Node Based Blue Print Visualized Language

5.1 Unity3D Game Engine

Besides Unreal Game Engine, Unity3D is very popular in recent years too, it is a cross-platform capability development engine, being loved by the game developers. In the current Android mobile application development circles, Unity has almost become standard Android tools [7].

This article shows a Unity of the software to the whole process of designing and developing Android Tower Defense game. Along the lines of game development, from relevant knowledge by testing, game design, game achieved step by step work, and completed the graduation design of the final product. The focus of this paper will describe in-game to achieve this step, starting from the first scene to establish, to import the model about details such as script writing, until the project is completed in Unity3D software, the game tests, were done on the PC and on your Android device to test and analyze the test results. [7]

Chapter 6. Recording Players Performance in XML File

6.1 XML File Generated From the Game

The Shooting Game we developed will generate an XML file automatically, recording the performance of the player. Such as whether the left side or the right side shot it.

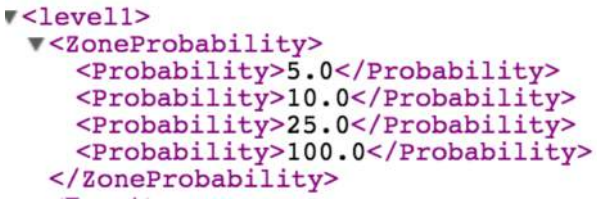

Figure 10: Level Label in XML File

The screenshot show above is the game generated xml file. Under the Zone Probability label, it tells the different probability of the explosion between these four zones. Because for the patients, they tend to ignore the left side, so the initial game setting set the rightmost probability least, whereas the left most probability largest. So when player select the object in the right most area, it probably won't explode because they are supposed to select it in the left most area. As a result, if they select it on the left most area, it would explode immediately as the probability of the explosion is 100%.

Figure 11: Event Label in XML File

Inside event label, it records the exact time when the event happens, this will later show in the web application program as a timeline that can simulate back the performance of player. There are two EventType: Selection or MissedEvent. Selection means player actually clicker on an object, where as Missed Event means player didn't click on anything at all. This is very important for tracking the patient performance on neglect. Inside the SelectStimulus lable, there are several features that recorded. HitPosition specifically records the actual position in X, Y axis and it remembers whether the selected object exploded successfully or not. The BoundingBox is the collision boundary size of the object since each object was created inside Maya, it originally comes with the specific bounding box when import to the game. Materials can vary; we use different materials and colors to test, which is more attractive to patient or whether they will have a preference on ignorance. Speed label is the relative speed of how fast the object flies when got selected. The rotation label indicates whether the object is rotating or not. In most cases, emitter is the gas or steam following the object.

Chapter 7 Introduction to Web Programming Language

In the Web-Based Application for processing and visualization data, I chose to use three types of language: HTML, JavaScript, and CSS. In JavaScript, I particularly chose to use Jquery and Ajax to process the XML file that coming from the game.

7.1 HTML- HyperText Markup Language

HTML is HyperText Markup Language, commonly referred to as HTML, is the standard markup language used to create web pages. HyperText markup language, always observed as hypertext mark-up language, is that the commonplace markup language used to produce websites[13]. With the increasing development to the Internet technology and the constantly rising of the computer performance, users also begin to enjoy the Internet in the constantly changed ways. More and more application can be directly use in the way of opening the browser, data are stored in the clouds, and therefore it's more safe and reliable and continent for users to share data. In the same time of various application continuously. HTML5 is the most giant leap of Web standards in nearly 10 years [13]. HTML5 is not only used to express the content of the Web, meanwhile, its mission is to bring the Web into a mature application platform, on which the video, audio, image and animation, and the interaction of computers are all standardized.

7.2 CSS-Cascading Style Sheet

```
table td {
    border:1px solid black;
}

table tr {
    height:40px;
}

#firstfieldset {
    background:#efdddd;
}

#secondfieldset {
    background:#f5ebea;
}

#thirdfieldset {
    background:#fbf7f6;
}
```

Figure 12: Cascading Style Sheet part in the program

Cascading Style Sheets (CSS) is a kind of style sheet language, and it is used for describing the look and formatting of markup language written language such as HTML [12]. In the previous part of my web-based application, I set up the whole frame structure using HTML. However, only using HTML to change the style and format of is very complicated and inflexible. So I chose to use CSS to design the interface of my web-based application.

7.3 JavaScript

JavaScript is a dynamic computer programming language. It is most commonly used as part of web browsers, whose implementations allow client-side scripts to interact with the user, control the browser, communicate asynchronously, and alter the document content that is displayed. It is also being used in server-side programming, game development and the creation of desktop and mobile applications.

7.4 JQuery and Ajax

JQuery is a compatible browser JavaScript libraries jQuery is a library written in JavaScript that provides cross browser DOM traversal, manipulation, data, ajax, event handling and effects for creating modern web applications.

Ajax is a group of web development technologies that are used on the client side (browser) to create more dynamic web pages by allowing small amounts of data to be sent from the client to the server in real time without the need to reload the entire web page[14]. Ajax is a client-side script that communicates to and from a server/database without the need for a post-back or a complete page refresh [14]. Ajax itself is mostly a generic term for various JavaScript techniques used to connect to a web server dynamically without necessarily loading multiple pages [14]. In a more narrowly-defined sense, it refers to the use of Xml-Http-Request objects to interact with a web server dynamically via JavaScript.

Chapter 7 Processing Data in Web-Based Application

7.1 Web-based Programming Application

We design a web-based program to visualize the data from XML in order to give the clinic people a more direct way of doing research on their performance.

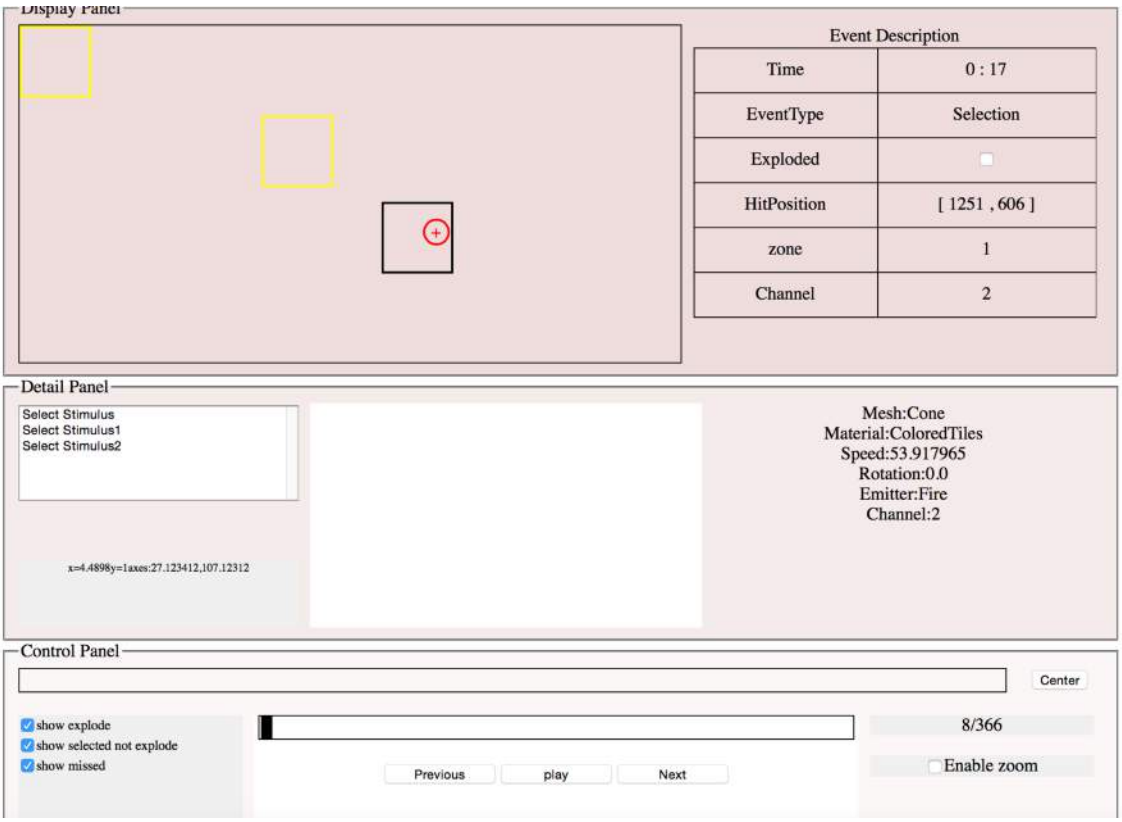

Figure 13: Web-based Application Graphical Interface

This is the Graphical User Interface of my web-based program. I programmed it with HTML, Javascript, Jquery Ajax, and CSS. The web application can process the XML that generated from the game and monitoring its data and simulate it in the box above to get a flash back of the patient performance that records in the XML file during a short time of period.

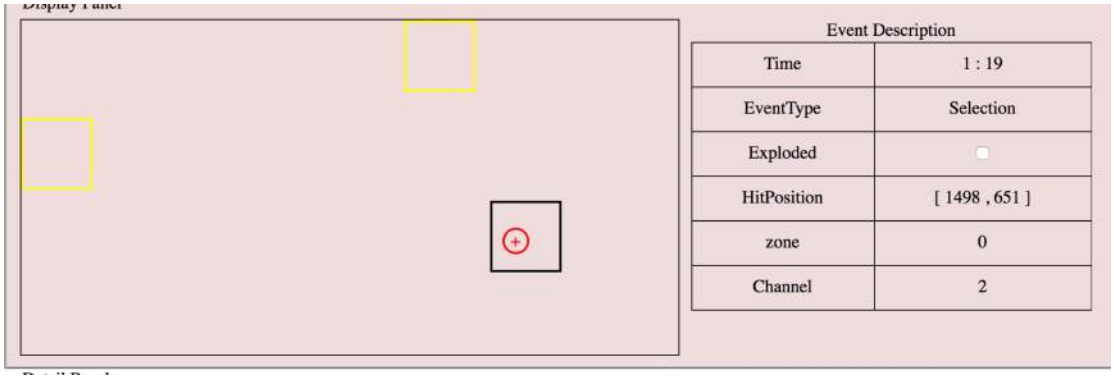

Figure 13: Upper Web-based Application Graphical Interface

This is the top left part of the graphical user interface. The function of this part is stimulated by the position and movement when the player played the game. The yellow box means the player didn't select the area of the black box. The right table shows the features stored in the xml file corresponding to the selected object.

Figure 13: Lower Web-based Application Graphical Interface

This is the lower part of the graphical user interface. It's a timeline that keep the time order of the event. In this particular xml file, it records 366 events for around 10 minutes. So this web application will show one by one from the first to the last, this time line is showing how many has gone through at this particular moment.

Chapter 8: Conclusion

Hemispatial neglect is a brain problem along with stroke. People with hemispatial neglect can only see the right or the left half of the world. The traditional treatment for hemispatial neglect is very low efficiency so we provide it with a game-based treatment which the game is driven by eyes using an eye tracker. We created the game assets using Autodesk Maya and programmed the game in Unreal Game Engine using their own programming language: BluePrint. The game can generate an XML file that records the performance of player. So we designed a graphical user interface to processing the data from XML file and visualize data for future analyses.

Appendix: Web Application Code

```
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=UTF-8" />
<script type="text/javascript" src="jquery.js"></script>
<title>js</title>
<style type="text/css">
body {
    padding:0px;
    margin:0px;
    background: url("./images/bj.png") no-repeat;
    font-family: acmebold,"SF Automaton Bold","SF Arch Rival Extended
Bold","Microsoft YaHei" ! important;
}

#wrapper {
    width:1000px;
    margin:0 auto;
    background-color: rgba(255,255,255,0.5);
    padding-left: 40px;
    padding-top: 30px;
    padding-bottom: 40px;

}

#Display_position {
    float:left;
    width: 590px;
    height:300px;
    position:relative;
    overflow:hidden;
    background-color: #fec200;
    margin: 0px;
}

#p_black {
    position:absolute;
    border:0px solid black;
    width:60px;
    height:60px;
    top:-30px;
    left:-300px;
}

#p_red {
    position:absolute;
    border:0px solid red;
    border-radius:50%;
    width:40px;
    height:40px;
    line-height:40px;
    text-align:center;
    top:-300px;
    left:-300px;
    color:red;
```

```
    background: url("./images/jspsd_10.png") no-repeat ;
    background-size: cover;
    -moz-background-size: cover;
}

#p_yellow {
    position:absolute;
    border:0px solid yellow;
    width:60px;
    height:60px;
    top:-300px;
    left:-300px;
    background: url("./images/jspsd_03.png") no-repeat ;
    background-size: cover;
    -moz-background-size: cover;
}

#p_yellow2 {
    position:absolute;
    border:0px solid yellow;
    width:60px;
    height:60px;
    top:-300px;
    left:-300px;
    background: url("./images/jspsd_07.png") no-repeat ;
    background-size: cover;
    -moz-background-size: cover;
}

#Display_event {
    float:left;
    width:360px;
    margin-left:10px;

}

#Display_event .title {
    text-align:center;
    height:20px;
    line-height:20px;
    color: #fff;
    margin-bottom: 10px;
}

#Display_event .frame {
    overflow: auto;
    height:280px;
    overflow: auto;
}

table {
    border:0px solid black;
    border-collapse:collapse;
    width:100%;
    text-align:center;
    color: #fff;
}

table td {
```

```
    border:0px solid black;
}

table tr {
    height:40px;
}

#firstfieldset {
    padding: 0px;
    border: 0px;
}

#secondfieldset {
    border: 0px;
    padding: 0px;
}

#thirdfieldset {
    border: 0px;
    padding: 0px;
    color: #fff;
}

#secondfieldset .frame1,#secondfieldset .frame3,#secondfieldset .frame2 {
    float:left;
}

#secondfieldset .frame1 {
    width:250px;
    height:200px;
}

#secondfieldset .frame2 {
    width:350px;
    height:200px;
    margin-left:10px;
    background:#fec200;
}

#secondfieldset .frame3 {
    width:340px;
    height:200px;
    margin-left:10px;
    text-align:center;
    color:#d21e2f;
}

#secondfieldset .frame1 .select {
    height:120px;
}

#secondfieldset .frame1 select {
    width:100%;
    background-color: #fec200;
}

#secondfieldset .frame1 .xy {
    background:#fec200;
    height:60px;
```

```
    font-size:10px;
    text-align:center;
    margin-top:20px;
}

#thirdfieldset .frame1 {
    overflow:hidden;
}

#scale {
    float:left;
    width:880px;
    height:20px;
    border:1px solid black;
    background-color: #fec200;
}

#scalebutton {
    float:left;
    margin-left:20px;
}

#thirdfieldset>.frame2 {
    margin-top:20px;
}

#thirdfieldset .frame2 .frame1 {
    float:left;
    width:200px;
    height:100px;
    background:#fec200;
    font-size:12px;
}

#thirdfieldset .frame2 .frame2 {
    float:left;
    width:540px;
    height:100px;
    margin-left:10px;
    text-align:center;
}

#thirdfieldset .frame2 .frame3 {
    float:left;
    width:200px;
    height:100px;
    margin-left:10px;
    text-align:center
}

#thirdfieldset .frame2 .frame3 .item {
    background:#fec200;
}

#scroll {
    height:20px;
    border:1px solid #fec200;
    width:530px;
    margin: 0 auto;
```

```
    position:relative;
    overflow:hidden;
    background:#fec200;
}

#block {
    position:absolute;
    top:0px;
    left:-10px;
    height:20px;
    width:10px;
    background:#aa2360;
}

#thirdfieldset .frame2 .frame2  .button{
    margin-top:20px;
}

#thirdfieldset .frame2 .frame2  .button input {
    width:100px;
}

.head-title{
    display: inline-block;
    width:150px;
    height:25px;
    line-height:25px;
    background:-moz-linear-gradient(top,#d21e2f,#f5960e);/*火狐*/
    background:-webkit-gradient(linear, 0% 0%, 0% 100%,from(#d21e2f),
to(#f5960e));/*谷歌*/
    background: -webkit-linear-gradient(top, #d21e2f, #f5960e);
/*Safari5.1 Chrome 10+*/
    margin: 10px auto;;
    color: #fff;
    padding-left: 20px;
}
.btn{
    width:50px;
    margin: 0px;
    padding: 0px;
    border: 0px;
}
.select-tr{
    background-color: #d21e2f;
}
.none-select-tr{
    background-color: #fec200;
}
</style>

<script type="text/javascript">
$(function(){
    $.ajax({
        'url':'Level1Data_2015.01.24-22.41.07.xml',
        'async':false,
        'dataType':'xml',
        'success': function(xml) {
            xmlObj = $(xml);
            //xmlObj.children('level1').find('Event').each(function(){
```

```
            //
            //})

            var eventObj = xmlObj.children('level1').find('Event');
            var eventSize = eventObj.size();
            var scrollWidth = $("#scroll").width();
            var blockWidth = $("#block").width();
            var scrollScale = Number((scrollWidth/eventSize).toFixed(8));

            var positionWidth = $("#Display_position").width();
            var positionHeight = $("#Display_position").height();
            // X=2000?? Y=1000
            var xWidt = 2000;
            var yWidt = 1000;
            var xScale = positionWidth/xWidt;
            var yScale = positionHeight/yWidt;


            var currentIndex = 0;
            var t = setInterval(function(){
                var currentObj = eventObj.eq(currentIndex);

    $('#time').text(currentObj.children('Min').text()+':'+currentObj.childr
en('Sec').text());
                $('#select').text(currentObj.children('EventType').text());

                $('#explode').attr("checked",function(){
                    if ($.trim(currentObj.find('Exploded').text()) ==
'true') {
                        return true;
                    } else {
                        return false;
                    }
                });

    $('#HitPosition').text('['+currentObj.find('X').text()+','+currentObj.f
ind('Y').text()+']');
                $('#zone').text(currentObj.find('Zone').eq(0).text());
                $('#Channel').text(currentObj.find('Channel').eq(0).text());

    $('#Channel2').text($.trim(currentObj.find('Channel').eq(0).text()));

    $('#Mesh').text($.trim(currentObj.find('Mesh').eq(0).text()));

    $('#Material').text($.trim(currentObj.find('Material').eq(0).text()));

    $('#Speed').text($.trim(currentObj.find('Speed').eq(0).text()));

    $('#Rotation').text($.trim(currentObj.find('Rotation').eq(0).text()));

    $('#Emitter').text($.trim(currentObj.find('Emitter').eq(0).text()));

    $('#Emitter').text($.trim(currentObj.find('Emitter').eq(0).text()));



    $('#p_red').css('left',Math.ceil(xScale*parseInt(currentObj.find('X').t
ext())-$('#p_red').width()/2)+'px');
```

```
                $('#p_red').css('top',
Math.ceil(yScale*parseInt(currentObj.find('Y').text())-
$('#p_red').height()/2)+'px');
                currentObj.children('SelectStimulus').each(function(){
                    var BoxMinX =
Math.ceil($(this).children('BoundingBox').children('BoxMinX').text());
                    var BoxMinY =
Math.ceil($(this).children('BoundingBox').children('BoxMinY').text());

                    var BoxMaxX =
Math.ceil($(this).children('BoundingBox').children('BoxMaxX').text());
                    var BoxMaxY =
Math.ceil($(this).children('BoundingBox').children('BoxMaxY').text());


    $('#p_black').css('left',Math.ceil(xScale*parseInt(BoxMinX))+'px');
                    $('#p_black').css('top',
Math.ceil(yScale*parseInt(BoxMinY))+'px');
                });


    currentObj.children('OtherStimulus').each(function(index,value){
                    var BoxMinX =
Math.ceil($(this).children('BoundingBox').children('BoxMinX').text());
                    var BoxMinY =
Math.ceil($(this).children('BoundingBox').children('BoxMinY').text());

                    var BoxMaxX =
Math.ceil($(this).children('BoundingBox').children('BoxMaxX').text());
                    var BoxMaxY =
Math.ceil($(this).children('BoundingBox').children('BoxMaxY').text());


                    if (index==0) {

    $('#p_yellow').css('left',Math.ceil(xScale*parseInt(BoxMinX))+'px');
                        $('#p_yellow').css('top',
Math.ceil(yScale*parseInt(BoxMinY))+'px');
                    } else if (index==1) {

    $('#p_yellow2').css('left',Math.ceil(xScale*parseInt(BoxMinX))+'px');
                        $('#p_yellow2').css('top',
Math.ceil(yScale*parseInt(BoxMinY))+'px');
                    }
                });

                currentIndex++;
                $('#block').css('left',(scrollScale*currentIndex-
blockWidth)+'px');
                $('#processShow').text(currentIndex+'/'+eventSize);
                if (currentIndex == eventSize) {
                    clearInterval(t);
                }
            },1000)
        }
    });
})
</script>
</head>
```

```
<body>
    <div id="wrapper">
        <div class="head-title">Display Panel</div>
        <fieldset id="firstfieldset">
            <div id="Display_position">
                <div id="p_black"></div>
                <div id="p_yellow"></div>
                <div id="p_yellow2"></div>
                <div id="p_red">+</div>
            </div>
            <div id="Display_event">
                <div class="title">Event Description</div>
                <div class="frame">
                    <table>
                        <tr class="select-tr">
                            <td>Time</td>
                            <td id="time">0 : 0</td>
                        </tr>

                        <tr class="none-select-tr">
                            <td>EventType</td>
                            <td id="select">Selection</td>
                        </tr>

                        <tr class="select-tr">
                            <td>Exploded</td>
                            <td><input type="checkbox" id="explode" /></td>
                        </tr>

                        <tr class="none-select-tr">
                            <td>HitPosition</td>
                            <td id="HitPosition">[ 000,000 ]</td>
                        </tr>

                        <tr class="select-tr">
                            <td>zone</td>
                            <td id="zone">0</td>
                        </tr>

                        <tr class="none-select-tr">
                            <td>Channel</td>
                            <td id="Channel">0</td>
                        </tr>
                    </table>

                </div>
            </div>
        </fieldset>

        <div class="head-title">Detail Panel</div>
        <fieldset id="secondfieldset">
            <div class="frame1">
                <div class="select">
                    <select size="6">
                        <option class="select-tr">Select Stimulus</option>
                        <option>Select Stimulus1</option>
                        <option class="select-tr">Select Stimulus2</option>
                    </select>
```

```
                </div>
                <div class="xy">x=4.4898y=1axes:27.123412,107.12312</div>
            </div>
            <div class="frame2"></div>
            <div class="frame3">
                <div>Mesh:<span id="Mesh">Rock</span></div>
                <div>Material:<span
id="Material">MetalDiamondPlate</span></div>
                <div>Speed:<span id="Speed">34.0468</span></div>
                <div>Rotation:<span id="Rotation">0</span></div>
                <div>Emitter:<span id="Emitter">Smoke</span></div>
                <div>Channel:<span id="Channel2">0</span></div>
            </div>
        </fieldset>

        <div class="head-title">Control Panel</div>
        <fieldset id="thirdfieldset">
            <div class="frame1">
                <div id="scale"></div>
                <div id="scalebutton"><input type="button" value="Center"
class="head-title btn" /></div>
            </div>

            <div class="frame2">
                <div class="frame1">
                    <input type="checkbox" checked="checked" />show
explode<br>
                    <input type="checkbox" checked="checked" />show selected
not explode<br>
                    <input type="checkbox" checked="checked" />show missed
                </div>
                <div class="frame2">
                    <div id="scroll">
                        <div id="block"></div>
                    </div>
                    <div class="button">
                        <input type="button" value="Previous" class="head-
title btn" />
                        <input type="button" value="play" class="head-title
btn"/>
                        <input type="button" value="Next" class="head-title
btn"/>
                    </div>
                </div>
                <div class="frame3">
                    <div class="item" id="processShow"></div>
                    <div> </div>
                    <div class="item">
                        <input type="checkbox" />Enable zoom
                    </div>
                </div>
            </div>
        </fieldset>
    </div>
</body>
</html>
```

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Figure1: "Hemispatial Neglect." Wikipedia. Wikimedia Foundation, n.d. Web. 14 Apr. 2015. <http://en.wikipedia.org/wiki/Hemispatial_neglect>.

Figure2:"Science Junkie - Neurosciencestuff: The Man Whose Brain Ignores..." Science Junkie - Neurosciencestuff: The Man Whose Brain Ignores... N.p., n.d. Web. 16 Apr. 2015.