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Stuff: The Abandoned Land An Interactive Sustainable Role-Playing Game

Chien-Ju Peng

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Stuff: The Abandoned Land
An Interactive Sustainable Role-Playing Game

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A Thesis submitted in partial fulfillment of the requirements for the degree of:
Master of Fine Arts in Visual Communication Design
School of Design
College of Imaging Arts and Sciences
Rochester Institute of Technology
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TABLE OF CONTENTS

Abstract

Introduction

Review Of Literature

Process
  Thesis Project Parameters
  Structure
  Story
  Typography
  Logo
  Intro Animation
  User Interface
  Game Character Design
  Isometric Grid Design
  Game Development

Summary

Conclusion

Appendix (Thesis Proposal)

Bibliography
ABSTRACT

*Stuff: The Abandoned Land* is an interactive role-playing game web application designed to help teenagers and young adults understand environmental destruction and the importance of recycling and reducing waste. We are part of the production and consumption cycle but we can instead change our consumptive behavior in order to create a better future. This web application is designed for teenagers and young adults, ages 15 to 24. By developing an engaging interactive game application, we intended to focus the target audience’s attention on serious environmental topics.

The story begins with the main character, Kevin, who questions the worth of life lived inside the city wall. Inside the wall, the citizens never question where all the manufacture products come from, how things are made or where they go. He decides to go beyond the wall to discover answers. After he makes it outside the wall, he is surrounded by enormous quantities of waste. Then he meets a local citizen and tells him that he needs to travel all the way to the end of the wasteland to discover the best method to clean up this toxic mess.

The project is a combination of storytelling, character design, game environment design, equipment design, user interface design and game development. The final presentation exhibits a playable role-playing HTML5 application that contains an intro motion graphic, 7 combat levels, 1 shelter town and a world map with 1 main character, 4 non-player characters (NPC) and 10 monsters.
INTRODUCTION

After the Industrial Revolution, mass manufacturing production was found to be more beneficial for making profits than for creating sustainable lasting products. It also changed consumer behavior and people began to purchase more and throw things away more easily instead of appreciating them. Landfills now fill up with enormous amounts of waste every year. In 2012, Americans produced about 251 million tons of Municipal Solid Waste (MSW). MSW means everyday items that are thrown away and become garbage. Forty percent of food in the United States today goes uneaten and just 15 percent of wasted food could feed more than 25 million Americans every year.

More then 150 years after the start of the Industrial Revolution, scientists have begun to be aware of the issues of global warming and potential environmental disaster. Much data and information is published for the general public, and even interactive media have been developed to make us aware of the degradation of our environment; however, the idea of making life sustainable seems too abstract for many people.

Stuff: The Abandoned Land is a role-playing game that contains a story to guide the user to understand the facts of environmental destruction. Not only is there a major storyline with the main character having to travel all the way to the end of the wasteland, there are also several mini-quests that non-player character (NPC) requests to collect the waste items by defeating the monsters to receive rewards. It encourages the user to develop recycling behaviors. I used a role-playing game because it can make serious topics more interesting and also users can participate by playing the part of characters during the game. Throughout the game, users can learn about environmental destruction and the importance of recycling. And they can also understand that we are part of the manufacture and consumption circle and that we can change consumptive behavior and decide to make the world more sustainable.


REVIEW OF LITERATURE

The Story of Stuff: The Impact of Overconsumption on the Planet, Our Communities, and Our Health—and How We Can Make It Better


This book, divided into five topics (Extraction, Production, Distribution, Consumption, and Disposal), addresses the hidden costs and environmental destruction caused by the products we use daily, from their production to the end of their life cycle. The authors also point out the importance of what they call “Toxic in, Toxic out,” when production facilities use harmful chemicals in products to reduce the cost of manufacturing. At the end of products’ life cycles many are returned to the Third World countries that helped make them to be decomposed and burned, creating even more harmful chemicals through this process and contaminating the environment even further. This is the foundation of developing the overall world outlook and storyline for this game.

Cradle to Cradle: Remaking the Way We Make Things

William McDonough and Michael Braungart, Cradle to Cradle: Remaking the Way We Make Things. (New York: North Point Press, 2002).

The title, “Cradle to Cradle,” is the central idea of this book. The authors believe that sustainable production and development should be created for biodegradable, long-term usage, and be environmentally friendly. The authors mention that a lot of products are created to be thrown away, which pollutes our environment. These are not designed to be recycled back into our ecosystem. This book develops the game concept of placing the main game stage on a wasteland to show how we fill our environment with toxic waste.
REVIEW OF LITERATURE


This online article published by the United States Environmental Protection Agency provides statistical data to show user that we dump enormous amounts of waste every year. That has influenced me to rethink changing our consumptive behavior in order not to continue producing so much waste.

Wasted: How America Is Losing Up to 40 Percent of Its Food from Farm to Fork to Landfill


This online article is about how America is careless about throwing away so much uneaten foods from production to consumer. Just 15% of this wasted food would be enough to feed 25 million people for a year. Most of the time the foods are over-produced and end up thrown away. Sometimes they are blemished but have the same nutrition as perfect fruits and vegetables. After reading this article I decided to bring this issue into the game to address the idea of changing consumptive behaviors and reducing the waste.

The Minecraft Overviewer - Design Documentation


This is the online game design documentation for The Minecraft Overviewer. It provides a great resource for creating isometric tile designs, including information from the visual tile design to the mathematical grid structural system. This document helps me to build my foundation knowledge of designing an isometric game.
REVIEW OF LITERATURE

New Tile Engine Tutorial Series


This is another online isometric tutorial website that provides information and resources to help me build an isometric tile design. It also shows different types of tile maps, which provides a wide range of map options for me to select from in the beginning of the process. One of the tutorials also addresses the benefit of a staggered isometric grid system.

HTML5 Canvas - Native Interactivity and Animation for the Web

Steve Fulton and Jeff Fulton, HTML5 Canvas—Native Interactivity and Animation for the Web (O’Reilly Media, 2011).

This is a book for learning the foundation of HTML5 Canvas. It provides a great introduction from basic foundation knowledge to advanced interactive HTML5 Canvas application. It has a lot of great tutorials and tips to help me prepare the JavaScript and develop skills for creating the interactive HTML game.

Making Isometric Social Real-Time Games with HTML5, CSS3, and JavaScript

Mario Andres Pagella, Making Isometric Social Real-Time Games with HTML5, CSS3, and JavaScript (O’Reilly Media, 2011).

This tutorial book provides the foundation knowledge and concepts for developing isometric interactive games using HTML5 Canvas. It has improved my knowledge of JavaScript development.
PROCESS / THESIS PROJECT PARAMETERS

Thesis Project Parameters

- HTML5 Canvas interactive game
- JavaScript modular structure
- 7 combat levels and 1 shelter town, a world map, and introduction animation
- Engaging simple visual design with intuitive user interface
- Simple control operation with the hints to guide the user
- Sound effects to enhance the game play

Technical Specs

<table>
<thead>
<tr>
<th>Software</th>
<th>Adobe Photoshop, Illustrator, Audition, AfterEffects, Autodesk Maya, Sublime Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programming Language</td>
<td>HTML5, JavaScript, CSS3</td>
</tr>
<tr>
<td>Open Source Script</td>
<td>RequireJS (<a href="http://requirejs.org/">http://requirejs.org/</a>)</td>
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<td>jQuery (<a href="http://jquery.com/">http://jquery.com/</a>)</td>
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<tr>
<td></td>
<td>A* Search / Pathfinding Algorithm in Javascript by Brian Grinstead (<a href="http://github.com/bgrins/javascript-astar">http://github.com/bgrins/javascript-astar</a>)</td>
</tr>
<tr>
<td></td>
<td>Simple JavaScript Inheritance by John Resig (<a href="http://ejohn.org/">http://ejohn.org/</a>)</td>
</tr>
</tbody>
</table>

Target Audience

<table>
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<th>Age</th>
<th>Teenagers and young adults, 15-24 years old</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male and female</td>
</tr>
</tbody>
</table>
Structure

Before starting the development of this interactive game, it was important for me to study several RPG games and set up a production plan within my ability and the established complexity of game structure. The game has to be challenging and multiplex, offering interesting and varied gameplay experience. The visuals have to be stylish to engage the user. The user interface and navigation have to be simple and organized and easy to operate. The user experience of gameplay should be smooth and self-explanatory. Last but not least, the structure of the code has to be organized and modular and have the ability to be expanded and modified. After the study, I designed the game in the following sections:

Home Menu Screen

The home menu panel contains a start button and a credits button (Fig 1). After the user clicks the start button, it shows a panel that tells the user that they have the ability to load the previous game in progress or start a new game. The credit panel displays all the acknowledgements including my thesis community, friends and other resources.
Intro Animation

The purpose of this game is to introduce awareness of environmental destruction and recycling. In the initial process, the introduction story was part of the introductory conversation with non-player characters (NPC) during the gameplay; however, the conversation was too long and uninteresting so I decided to make a visual interactive typographic introduction using mouse scrolling as the navigation tool to control the story’s progress. I started to work on the storyboard to create a single-shot continuous storyline. I did some experiments developing the high-resolution images with zoom out effects using HTML5 CSS3 3D transform. This caused critical performance issues and limitations of the CSS3 3D transform properties, which in turn caused the browser to use too much CPU calculation to process this effect. Finally, I decided to use AfterEffects to create a motion graphic typographic animation to achieve similar results (Fig 2).

Fig 2
The screenshot images from the intro animation
PROCESS / STRUCTURE

Game Stage

After I completed the game style and development capability research, I chose to work on the isometric angle view with HTML5 2D Canvas. I choose HTML5 2D Canvas because it has more development resources than HTML5 3D Canvas during that period of time. JavaScript is also the new trend for web development after Adobe Flash was taken over by HTML5. The 2.5 dimension isometric view has been widely used in game design, because it is easy to develop into a grid system and also contains a 45-degree object side view (Fig 3).

Fig 3
The combat stage in the 2.5 dimension isometric view

World Map

There are 7 combat levels and 1 shelter town in this game. In order for the user to switch between each stage, the world map (Fig 4) has a great interface for the user to select a previous stage in which to fight with monsters and level up the character. The world map can help the user to understand a brief geography worldview of this game.
After a long period of developing this game, the scope of the story became too large to complete within the time limitation of my graduate study. I decided to have a brief ending of the first part of the story, and then continue developing the remaining story for a longer project. After defeating the final monster, there is a short conversation (Fig 5), then it changes to a full-screen image and leads the story to act two, which takes place in the industrial factory area.
Story

The story begins with the main character, Kevin, who questions the worth of life inside the city wall. Inside the wall, the citizens never question where stuff comes from, how they are made or where they go after they are no longer being used. He decides to go beyond the wall to discover the answers.

After Kevin makes it outside the wall, he is frightened about the truth of the toxic mess that the city produces and discards into the wasteland. While he is wondering, he meets Allen, who starts with a brief introduction about this land. Allen provides Kevin with basic armor and weapons and instructs him to fight the waste monsters in order to survive there. He also mentions there is a scientist who has found the solution to clean up this toxic mass. Allen asks Kevin to defeat the monsters in this location to prove he has the ability to survive in this land and to meet him at the shelter near this location.

After Kevin defeats all the monsters and arrives at the shelter. He speaks with Allen again about the cause of environmental destruction. Allen says that he has to travel all the way to the end of the wasteland where the same scientist who found a solution disappears few years ago. In the meantime, he needs to help other people living in the wasteland to gather food and recyclable resources from the monsters. By recycling the waste, they help to build up the shelter’s economy and also clean up the land.

At the end of journey, Kevin defeats the final monster boss, Giant Waste Titan, and finds out the scientist has already left the wasteland heading toward the next industrial city. Kevin and Allen decide to continue following the path to discover the solution to clean up this environmental destruction.
Typography

In the process of selecting the typefaces for this game, it was a challenge to find a suitable font style that is futuristic, streamlined, simple and legible. During the game production, the typeface selections have changed many times. Some typefaces suit the style of the character and environment design; however, they have poor readability. Other typefaces have great readability, but do not suit the style of the theme. In the end, I found these two typefaces that contain the properties I am looking for.

Exo 2

The typeface Exo 2, which is used in the title caption and button, is a geometric san serif typeface with a futuristic and technological style. It also provides a variety of font weights that can be used for different purposes.

```
18pt ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890!@#$%^&*()
```

```
14pt ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890!@#$%^&*()
```

Maven Pro

The typeface Maven Pro, which is used in the body copy, has a special geometric curvature of stock. Even though it is a unique san serif typeface, it is legible in long paragraphs of text.

```
18pt ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890!@#$%^&*()
```

```
14pt ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890!@#$%^&*()
```
PROCESS / LOGO

Logo

The name of this game is called “Stuff” because I use this word to express a term of unwanted things. It expresses the general term of unsorted garbage that does not sort out into recyclable items. The subtitle, “The Abandoned Land,” gives a brief introduction to the forgotten wasteland, which is the end of all the stuff. I chose to use industrial bronze metal plate as part of the logo design to give an imperfect industrial metal waste style. Adding some waste illustration around the logo solidifies the relationship to the waste topic (Fig 6).

Fig 6
Final logo design

Fig 7
Logo design process
PROCESS / INTRO ANIMATION

Intro Animation

In the process of developing the intro animation, I started with writing the script about the reason why the main character chooses to leave the wealthy city and go outside the huge city wall to discover the end of the stuff. The citizen never questions where stuff comes from, how it is made or where it goes. He decides to go beyond the wall to find answers.

The intro is a single-shot continuous typographic animation. The background music is quiet and intense to express the end of all the unwanted waste. In the animation, the words fade in and slide over with a slow ease, according to the beat of the music. The hue of the scene is less saturated to build the emotion of being serious and dark.

The beginning of the animation starts with an overlapping city buildings scene with a fade-in of text (Fig 8). The city wall appears while the camera continues to zoom out away from the city buildings. Then the camera comes out from the frame of a digital pad that is placed on the conveyer belt (Fig 9). It is surrounded by the waste (Fig 10). At the end of the animation, the conveyer belt fades into a scene of the main character standing outside the city wall in the wasteland (Fig 11).

Fig 8
Intro animation: the city buildings with typographic animation.
Fig 9
Intro animation: the camera comes out from the frame of a digital pad.

Fig 10
Intro animation: the scene is surrounded by the waste.
Fig 11
Intro animation: the main character standing outside the city wall in the wasteland.
PROCESS / USER INTERFACE

User Interface
The visual design style that I chose for the user interface design is flat, simple, organized and recognizable. I get a lot of influence from modern applications that have a simple, clean vector and a flat shape design. Even though the shape is simple and flat, I decided to give some shading either using the saturated solid color or a slightly gradient color to highlight the three-dimensional shape. When there is a button, there is a highlight of cursor hover over status either switching the icon color or changing background gradient color.

Home Menu
The home menu (Fig 12) begins with the main character standing on a wasteland with a huge city wall in the background. Behind the city wall, there are futuristic city buildings radiating with glowing blue light. The foreground is a dark, dirty and muddy environment that creates a huge contrast between the wealthy city and the poor toxic wasteland. The main character wears unarmored clean white clothes that do not fit the dirty environment he stands in. It gives a brief introduction of the story.

In the center of the screen, the logo slides down to show the topic of the game, then the start button and credit button pop up. The start button is the primary navigation element to start the game, and is larger than the credit button to attract the user’s attention. For the style of the buttons I kept the industrial theme of metal border with screw and decorative metal parts. The button name is light gray in color, and then it turns white when the user moves the mouse over the buttons. It attracts the user’s attention to these clickable elements.

After the user clicks the start button, it shows a panel of three clickable buttons to load the previous game in progress or start a new game. A delete button also appears beside the progress button to allow the user to delete the history. (Fig 13)

The user interface of the modal window has a consistent design with the close button in the top right corner so the user performs the same action to close the panel. It also has the same metal decorative corner on the other three corners to maintain a consistent design style throughout the whole game.
**PROCESS / USER INTERFACE**

Fig 12
Home menu panel includes load the previous game, start a new game and display the acknowledgements.

Fig 13
The panel of load the previous game and start a new game.

Fig 14
The credits panel display the acknowledgements.

GAME DESIGN
CHIEN-JU PENG

GAME DEVELOPMENT
CHIEN-JU PENG

THESIS ADVISER
SHAUN FOSTER
CHRIS JACKSON
DANIEL DELUNA
PROCESS / USER INTERFACE

Character Status and Game Control Panel

The character status panel (Fig 15) has the main character’s portrait, which switches different clothes according to the character’s costume. The portrait image is surrounded by a yellow-orange experience bar to identify how far the character has reached toward the level up. On the left and right side of the portrait image, there is a life bar in an orange-red color, and an energy bar in turquoise. When each property value goes down, the bar shows a dark gray color to identify the loss.

![Fig 15](Character status panel)

The game control panel (Fig 16) is a set of buttons to trigger the game activities or open up the panels. The control buttons include the defense, character ability and inventory, skill, attack and move buttons. The skill buttons have included see above heal, pierce and hard smash skill buttons (Fig 17).

![Fig 16](Game control panel: before click the skill button)

![Fig 17](Game control panel: after click the skill button)
In the early stages of development, the character status panel was on the top left corner of the screen, and the game control panel was on the bottom right corner of the screen (Fig 18). The reason these two panels were placed in opposite directions is because there is the potential to convert the web HTML5 game into a tablet application. It is easy for users to control the buttons on the bottom corner without blocking the screen.

Through conducting a usability test with my thesis community members, the character information was determined to be too far from the main character, so the user is not able to catch the changes from the character status panel while focusing on the stage. At the same time, there is a long distance of mouse movement from right bottom corner toward the tiles around the main character when you click the move button and select the destination tile. To improve the user experience, I merged two panels into one group and placed it on the bottom center of the screen, which keeps the eye focused on the center bottom region (Fig 19).
Another issue came up during the usability test. Compared to the previous game control panel design, it has too many reiterative mouse activities. It especially happens when the user wants to move from one tile to another tile, and then the user repeats the same attack action to attack monsters. The reiterative steps are as follows (Fig 20):

1. User clicks move button.
2. User selects the destination tile.
3. User clicks attack button.
4. User selects the target monster.
5. After attacking the monster, user clicks defense button.
6. User selects defense direction.
7. User clicks YES to end this turn.
8. In the next run, repeat step 3-7 until the monster is defeated.

Fig 20
The reiterative mouse activities
PROCESS / USER INTERFACE

After rethinking the whole process of operating the activity of the main character, I rearranged the game control panel and added conditional functions to reduce the operating steps. The improved steps are as follows:

1. System initially activates move feature with yellow boxes on the stage.
2. User selects the destination tile.
3. System detects if there is a monster nearby. If there is none near by, system auto completes the turn, and then user clicks destination tile on next run.
4. If there are monsters, system auto activates attack feature with red box on stage.
5. User can either select different skills or click target monster to attack monster.
6. System auto completes turn.
7. In next run, system repeats step 4-5. Or if user defeats monster on previous run, it automatically goes to step 1.

This significantly improved the user experience and reduced operation time by half. The user does not get tired of operation because of the removal of the monotonous reiterative mouse activities.

Character Ability and Inventory Panel

The character ability and inventory panel (Fig 22) is divided into two parts. On the left side, it contains all the character information. The right side of the panel is an interchangeable panel that can switch between three different panels: skill and ability, inventory and monster profiles.

On the character information panel, the information contains the value of character name, level, experience, health, energy, attack, defense, dodge ability
and walk distance. All information automatically updates when the user changes the value of the character ability or switches to different equipment. The full body character image automatically switches according to the equipment put on the character.

The skill and ability panel is divided into two sections. In the ability section, the user is able to upgrade the value of strength, dexterity, vitality and energy. The skill section contains four skill upgrade buttons: pierce, hard smash, heal and evasion. The pierce skill attacks enemy with multiple rapid strikes. The hard smash skill allows the main character to smash the target to inflict damage. The heal skill restores the character’s HP spell out. The evasion skill increases the character’s dodge ability. It has reset buttons on each section to allow the user to reset the value.

The inventory panel (Fig 23) is divided into two sections: equipped weapon and armor and inventory. The equipped and inventory description boxes are on top of each other to allow the user to compare the item properties. This panel has a feature to equip or unequip the character or use the recovery items.
In the monster panel (Fig 24), each monster profile contains a full body portrait image with the description on the side. It provides a background story about the relevant waste and pollution.
PROCESS / USER INTERFACE

Speech Bubble

The speech bubble (Fig 25) pops up on top of the character’s head with a portrait image on the left side of the box to identify the speaker. I used a tan color to distinguish from the stage environment that is less saturated with color. It also has a black border around the box to increase the separation from the background and has an inner white border to highlight the box. The character name is in a coral color to distinguish from the speech in black. There is a bouncing metal arrow icon in the bottom right corner to attract the user’s attention to the speech bubble.

Fig 25
The speech Bubble

World Map

There are seven combat levels and one shelter town in this game. I designed a full-screen world map (Fig 26) to allow the user to switch between each stage. The color choice of the map is a less saturated brown color to build up a lifeless and polluted environment with added bright line strokes to highlight the shape. The tone of the city and stage buttons is more saturated and brighter to distinguish them from the background image. It highlights the interactive elements that the user can click on.

In the initial stages of the stage buttons, they are in a gray tone, and then they become yellow-orange when the user has permission to access the stage. There is a bouncing effect applied to the newest stage-level button to remind the user what the next step is.
Quest Panel

From the usability test, I learned that some users quickly click over the instructions and story without reading them, then they become confused by following steps. I created a quest to-do panel (Fig 27) in the top left corner to remind the user what they need to accomplish in order to move forward.
PROCESS / USER INTERFACE

UI Tooltip

In the process of designing the iconography, I tended to create a simple, recognizable icon instead of using text. However, it was not always distinctive enough for the user to figure out the property of those symbols and buttons. In order to prevent this, I added a tooltip (Fig 28) onto most of the symbols and buttons to prompt the user with a hint.

![Fig 28](The UI Tooltip)

Equipment Shop

The equipment shop (Fig 29) is operated by non-player character, Allen, in the shelter town. The shop panel is divided into two sections. On the left side is the purchase equipment service panel that offers random equipment. On the right side is the sell equipment service panel where users are able to trade unwanted items for money.

![Fig 29](The Equipment Shop)
Game Character Design

After completed my initial research on game character style, I chose a two-and-a-half heads tall character ratio design that has 1 in head, 1 in body and 0.5 in legs. This childlike character is adorable and attractive and in a style that fits my target audience.

Since this game is in an isometric view using HTML5 Canvas, the character animation sequences layout in a sprite sheet. The character animated sprite sheet needs to have four different directions of front left, front right, back left and back right. To increase the production speed, I decided to create and animate the 3D character model in Autodesk Maya, then render in four different camera views. It also helps to be able to swap the costume very easily by recreating different flattened textures in Adobe Photoshop.

Main Character

After I started experimenting with the first character model in Maya, the initial 3D main character design had some major styling and functional issues. First, the model had the costume as part of the body, which caused the issue of swapping different costumes. Also, the hair wasn’t stylish enough. Third, the texture was too detailed and did not fit the style of the environment. Last, the 3D character was using the Maya HumanIK tool to rig and animate the character; however, it caused some issues when I tried to animate it in Maya 2014.

Fig 30
The first main character 3D model in Maya
PROCESS / GAME CHARACTER DESIGN

After that I decided to return to the drawing board to recreate the new 3D character (Fig 31), and I made the following changes to enhance the new 3D mode. First, the 3D model is capable of recycling that the main body can reuse on other characters! (Fig 32). Second, the new texture style is simple, clean and stylish, which fits with the design of the environment (Fig 33). I used the shape tool in Photoshop to outline the standard shape, then I used the brush tool to add simple shading and shadow to enhance the detail of the flat color. The shadow also helps to differentiate between overlapping body parts. Third, I found an online tutorial, Rigging Game Characters in Maya, in Digital Tutors, to set up a functional game character rig in Maya (Fig 34). The new animation controllers improve the functionality and process of animating game characters.

**Fig 31**
The sketch of new main character design
PROCESS / GAME CHARACTER DESIGN

Fig 32
The enhanced second main character 3D model in Maya

Fig 33
New character texture creates in Photoshop

Fig 34
A functional game character rig with animation controllers in Maya
Armor Design

I have designed five sets of armor (Fig 35) for the main character that the user can earn by defeating the monsters or can purchase from the shop. In the beginning of the game, the main character wears the futuristic white clothes that have fewer defenses and also show a lack of awareness of the dangerous outside the city wall. The strength of armor is based on the materials, which range from leather to plate mail. The design style of the armor follows the simplicity of a flat design with slight touches of shadow to enhance the three-dimensional shading.

Weapon Design

I also designed five melee weapons (Fig 36) for the main character to use. The reason that I chose melee weapons is because the story is taking the place in the wasteland, where there isn’t much technology to develop high-tech weapons, such as a laser gun. The melee weapon is easier for the blacksmith to produce with the inadequate resources of this environment.
PROCESS / GAME CHARACTER DESIGN

Recovering Items

There are two types of recovering items (Fig 37): the food is for recovering health and the juice is for recovering energy. The selection of the foods, fruits and vegetables was based on the food that many kids hate to eat, such as eggplant, broccoli, sprouts and avocados. The reason behind selecting unfavorable health ingredients was because I want teenagers and young adults to start recognizing these foods are good for them since they can cure health and provide energy. The style of illustration is a colorful flat shape with enough details to enhance the visual design.

Recycling Waste Bags

In the game, there are six types of waste bags (Fig 38) that users can collect from monsters. The types of waste include glass, paper, food, plastic, metal and electronic waste. The colors of these waste illustrations are based on the color system of standardized recycling labels designed by Recycle Across America (http://recycleacrossamerica.org/). This creates a relationship between the experiences of the digital world and the real-world standardized system, with this recycling color system helping in this recognition.

Non-player Character (NPC) Design

The NPC 3D models are reused from the main character’s body model to reduce production time. Adding additional decorations and accessories on the body model enhances visual design and also creates different visual identity from the main character. Each NPC has a slightly different body movement animation to make the character come alive and be engaging.
**PROCESS / GAME CHARACTER DESIGN**

**Allen** (Fig 39) is the main story guide NPC to lead the main character throughout the game. He is also an equipment vendor who provides the service of purchasing and selling armor and weapons in the shelter. He wears a red fabric costume with some basic shoulder armor and green goggles.

**Audrey** (Fig 40) is the wasted food collector. She offers the service of trading waste bags with a reward of money and recovery items. After user collects a certain amount of requested waste bags, she gives extra higher recovery items to user as a bonus reward. She wears simple unstylish rugged clothing to present the inadequate resource environment in the wasteland.

**Jim** (Fig 41) is the electric and metal waste collector. He offers the service of trading the waste bags with a reward of money. After user collects a certain amount of requested waste bags, Jim will give a weapon to user as a bounce reward. He wears a black costume with shoulder and elbow protection armor. The black metal hat with gas mask represents the dangers of the wasteland.
**PROCESS / GAME CHARACTER DESIGN**

**Kyle** (Fig 42) is the glass, paper and plastic waste collector. He offers the service of trading the waste bags with a reward of money. After user collects a certain amount of requested waste bags, he will give armor to user as a bounce reward. He wears yellow full-body protection clothes to prevent being exposed to the toxic and dangerous environment.

**Monster Design**

The monsters are made from the waste and pollution. They are the representations of the chaos produced by humans. For example, the blob has a liquefied body shape that is created by waste food. By defeating the monsters, you can gain the correlated wastes, equipment and recovery items. After receiving enough waste, you can trade with NPC in the shelter to earn some awards. This process guides the user to understand the importance of recycling and reducing waste.

**Yellow Blob** (Fig 43) is a liquefied spirit that is full of wasted foods. It looks tiny and harmless, but sometimes it can do unexpectedly large damage.

**Green Blob** (Fig 44) is a liquefied spirit that is full of wasted vegetables. It looks tiny and harmless, but sometimes it does unexpectedly large damage.
PROCESS / GAME CHARACTER DESIGN

**Purple Blob** (Fig 45) is a liquefied spirit that is full of the wasted mixed foods and vegetables. It looks tiny and harmless, but sometimes it does unexpectedly large damage.

![Purple Blob](image)

**Paper Whirlwind** (Fig 46) is made from shattered paper. It can make long distance moves with slashing damage. Watch out for paper cuts!

![Paper Whirlwind](image)

**Plastic Whirlwind** (Fig 47) is made from shattered plastic pieces. It can make long distance moves with colorful slash damage.

![Plastic Whirlwind](image)

**Metal Whirlwind** (Fig 48) is made from shattered metal pieces. It can make long distance moves with serious slash damage.

![Metal Whirlwind](image)
PROCESS / GAME CHARACTER DESIGN

Lump of Paper (Fig 49) is made from massive amounts of paper waste. It is heavy and only able to make small distance moves.

Fig 49
Monster design: Lump of Paper

Lump of Plastic (Fig 50) is made from massive amounts of plastic waste. It has a colorful body that is never degradable.

Fig 50
Monster design: Lump of Plastic

Lump of Metal (Fig 51) is made from massive amounts of metal waste. It is heavy and tough to make a scratch.

Fig 51
Monster design: Lump of Metal

Giant Waste Titan (Fig 52) was once a guardian of the land, but now it is polluted by the waste that humans produce. The pollution has made him very irritated with humans.

Fig 51
Monster design: Giant Waste Titan
**Isometric Grid Design**

The isometric grid system is the foundation of the game. There are two types of isometric tile systems, the traditional grid and the staggered isometric grid (Fig 52). After I completed the research process, I decided to use a staggered isometric grid because the algorithm of the coordinate system prevents the mistake of objects overlapping in the wrong order.

**The Standard of Isometric Tile**

The ratio of isometric tiles is 2:1 with the dimension of 128 pixels × 64 pixels (Fig 53) based on the computer word size of 8, 16, 32, 64, and so on. The frame size of the game space is set to 1024 pixels × 768 pixels, which is the standard ratio for smaller monitors. The tiles can be evenly divided and distributed inside the frame. The height of the tile has the increment of 16 pixels to create various terrains depending on the value of the height.
The Design of Ground Tiles

Each ground tile image (Fig 54) is designed in vector in Adobe Illustrator with the dimension of 128 pixels x 224 pixels. These tiles are laid out in 10 tiles on the horizontal and extended on the vertical on a sprite sheet. Each upper face of the ground tile has a fine border around it to create separation from other tiles. The upper edge of the upper face also extends beyond the frame of tile to have a more organic edge overlap with the other tiles. The design approach is to create a clean simple vector style but contains enough details to create the shade of the objects. For the color choices, I tried to select less saturated color to provide better separation between the characters and the terrains. Last but not least, it is retouched with the cloud texture mask in Adobe Photoshop to have the tiles fade out into background.

The Design of Decorative Tiles

The decorative tiles are placed on top of the ground tiles to enhance the visual design of terrains (Fig 55). I create three types of decorative tiles: ground decorations, small objects and higher objects. The ground decorations (Fig 56) are mostly trash objects that merge on the surface of the ground tile. The purpose of combining two images is to create more variety of ground tiles.
PROCESS / ISOMETRIC GRID DESIGN

within the limited sprite images and to reduce the file size. The small objects (Fig 57) are the block object that has the property of blocking the path and overlaps with character. It includes low walls, large trash objects and other objects. The higher objects (Fig 58) are also block object that is taller objects, such as building walls.

Fig 55
The tile image composing of ground tiles with decorative tiles

Fig 56
The design of decorative tiles: ground decorations

Fig 57
The design of decorative tiles: small objects

Fig 58
The design of decorative tiles: higher objects
PROCESS / ISOMETRIC GRID DESIGN

Fig 59
1-1 The End of Stuff

Fig 60
1-2 Shelter
Fig 61
1-3 The Lost Land

Fig 62
1-4 Silent Valley
**Fig 63**
1-5 Toxic Waterfront

**Fig 64**
1-6 Abandon Ravine
PROCESS / ISOMETRIC GRID DESIGN

Fig 65
1-7 Mountain Trails

Fig 66
1-8 The End of Wasteland
Game Development

After doing initial research on the HTML5 game engine, I determined that there isn’t any pre-developed game engine that suits all the functional requirements to develop a custom isometric game (in 2013). I started learning and experimenting to develop my personal custom HTML5 game engine that has a modular structure and can more easily expand and duplicate the elements. In the following sections, I have listed some of the technical challenges that I encountered while developing this game.

Game Stage

The stage is rendered in HTML5 2D Canvas. The stage contains four layers of overlapping transparent canvas. In the foreground layer, it is the activity canvas that continuously redraws the animated images of characters and overlaps objects. For example, each character or monster has its own idle mode with a slight movement that requires the Canvas to consistently render each new image. This helps to reduce the hardware process usage by eliminating unnecessary elements. The draw image method in 60 frames per second is an expensive process in HTML5 canvas that uses a lot of hardware processing, which it requires to restrict to use when it is necessary.

The second layer is the interactive feedback layer (Fig 67), which shows all the activity tile graphics. It shows the highlight tiles of the character traveling distance ability on top of the ground tile. When mouse moves over these tiles, it proves the feedback of adding a four corners arrow shape to indicate the selecting tile.

Fig 67
The interactive feedback layer with highlight tiles
The third layer is a passive canvas that only renders the new image when the background changes position. For example, the user navigates around the map, which the Canvas requires to render new images. Other than that, it stays in the same image.

The last layer is the background image. In my initial development, I tried to reduce the hardware process by only rendering the image when a user navigates the map. After performing the usability test, there was feedback that I should enrich the visuals by animating the background images. I did some fine-tuning tests for reducing the speed of rendering the moving background image without noticing the delay in order to keep the good hardware performance.

**The Development of Isometric Tiles**

The game is developed using HTML5 Canvas, based on JavaScript. To enhance the ability of reusing and increase the variety of the terrain map, the map is designed in a modular sprite sheet structure that can be easily recreated and modified throughout the code. It is generated in a three-dimensional array of data. The order of the array structure is the row number, the column number and the tile properties. The initial tile properties include height of tile, ground tile sprite image number, ability of passing through and decorative tiles information.

After a long development progress, I encountered a performance issue in regard to redrawing regularly decorative tiles because it increases CPU usage. Then I decided to separate the decorative information from the ground tile array into its own object array. It has properties of column, row, decorative sprite image size, decorative sprite image number and ability of blocking. It helps to merge unnecessary objects into the terrain map image instead of having to redraw too frequently. (Fig 68)

I developed a visual interactive isometric mapmaker in JavaScript with a simple user interface to help me generate visual terrain maps without imagining the array structure (Fig 69). After designing the map, it converts the visual map data into an array code that I can import to the game.

In the initial process, I attempted to sketch out the terrain map on paper; however, the design process of drawing on paper is slow and incoherent due to the transfer from the line drawing to code. Developing a UI for building an isometric level creator allowed me see the terrain design in real time to assist me
to efficiently and rapidly construct multiple levels. It was also helpful to be able
to make a revision of the map layout whenever there was an issue.

The terrain visual design contained the tiles in various heights with overlapped
objects to create variant terrain. The various heights increased the challenge for
users to search the path of defeating all the monsters (Fig 62, 63 and 65). The
overlapped objects developed a sense of depth from the flat tile design. Some
large objects also blocked the walking path, which forced the user to think
about strategies for using the barriers to prevent injury from the monsters. Some
levels had the map in a surrounding shape (Fig 61 and 64), which forced users to
think about strategies to prevent attack from both sides.

Fig 68
The ground tile array in
JavaScript
Off-Screen Canvas Buffering

There was a huge hardware performance issue while I was developing this game. It was consuming too much CPU while rendering the graphics. After doing some research to solve this major performance issue, I created an individual off-screen canvas for each external image and drew the image on it. It helped to create the image buffer in the computer memory to reduce the CPU usage of consistently loading external files. Each off-canvas image gets stored in the array so other functions can recall the image data.

Hit Test on HTML5 Canvas

Unlike Adobe Flash, the foundation of HTML5 Canvas does not come with the object hits test, which is a most important activity for interactive games. After doing extensive research for a solution, I come up with a simple solution for searching coordinate positions using the color map.

It starts with creating an off-screen hit test canvas that redraws the color tiles in the same position as the original image tiles. Each hit test isometric tile fills with a unique RGBA color according the X and Y coordinates. The color Red stands for position X, and the color Green stands for position Y. For example, the color of the hit test tile of position 10:7 is rgba(10, 7, 0, 1). Every time a user clicks on the color canvas, the program looks up the pixel corresponding to the mouse position on the hit test canvas. It reads red and green color to find out the corresponding tile coordinate position.
SUMMARY

Usability Testing

In the initial play testing, the monster was either so weak the user could defeat it with a single hit, or too strong and caused severe damage and killed the user too quickly. The monsters whirlwind (Fig 46–48) possessed a high dodge rate that user had high chance missed the hit. In some levels, the map was too big so that user had to travel a long distance to defeat all the monsters, which decreased the interest of playing. In the users’ experience, the game task was confused and a struggle so the user was able to easily comprehend the next step. Also, the workflow of the control operation had too many steps, which means the user got bored easily after operating steps. Last but not least, a lot of bugs appeared during the usability testing.

There was continuous usability testing from users while I was developing this game. However, there were limited resources for finding the target age group audience. Some of my test users are not in that range, but they provided very valuable comments to improve the game. The improvements I made are as follows:

1. Reduced the control operating steps by rearranging the game control user interface and adding analysis functions to auto complete or reuse previous activities to reduce unnecessary mouse operating.

2. Used Microsoft Excel to create a data sheet to calculate the damage formulas to improve the balance of monster strength. This data sheet helps to visualize a series of value that affects characters’ and monsters’ abilities. (Fig 70)
3. Added sound effects to enhance the auditory experience, which improves the visual impact.

4. To prevent the main character being surround by monsters and attacked from all sides, the monsters’ ability to move was limited to within five steps.

5. Fixed series of bugs that has included: recover health after switching equipment, monster unable to pass over the death location of another monster, unable to purchase any equipment from Allen, and broken functions causing the game to crash.

6. Added the quest todo list panel on the top left corner of the screen to provide a guide for the user.

7. Added hotkey for advance users that can quickly switch between features. (Fig 71)

8. Added a gray pin button for unvisited locations on the world map to show all the oncoming locations.

9. Removed the turn base full-screen message when switching between user and monster to improve the fluency of gameplay.

10. Used TinyPNG (https://tinypng.com/) to reduce the PNG file size, so that all the image files have been reduced to almost 70% of their original file size, which reduces the load time on the browser.
CONCLUSION

Although there are many interactive game applications that approach environmental issues in order to deliver a message of sustainability, only a few of them are successful in developing awareness of environmental destruction and the positive results of recycling. The lack of the identification with the value of changing consumptive behavior and reducing waste causes overconsumption of unnecessary products and unconscious discarding of functional items.

The reason for creating this project is not only to develop an interactive role-playing game application, but also to deliver a caution in relation to environmental issues. By identifying that they are part of the production and consumption cycle, users can participate in events encouraging to change consumptive behavior and selecting eco-friendly biodegradable materials to create a better future.

After usability testing, the users provided great feedback about this game that was successful in my efforts to amend the game to draw users’ attention to the problem of waste and the importance of recycling. Some participants realized the damage to the environment of throwing too many toxic non-degradable wastes into landfills. A few users also pointed out that it was amusing to have unfavorable healthy food as the recovery items to attract the audience to eating healthy. Overall, the characters and environment design are engaging and attract users’ attention.

I believe this is a successful interactive game that communicates a message of achieving a better future by changing our own consumption behavior. This also helps the target audience, teenagers and young adults, to be aware of environmental destruction and the importance of recycling.

Last but not least, I would like to thank Shaun Foster, Chris Jackson and Daniel DeLuna for all their help and support during this process and development.
Interactive Sustainable Role-playing Game

Thesis Proposal for
the Master of Fine Arts Degree

Rochester Institute of Technology
CIAS, School of Design
Computer Graphics Design

Chien-Ju Peng
October 10, 2012
APPENDIX / THESIS PROPOSAL

Thesis Proposal for Master of Fine Arts Degree

Rochester Institute of Technology
College of Imaging Arts and Sciences
School of Design
Computer Graphics Design

Title      Interactive Sustainable Role-playing Game
Submitted by  Chien-Ju Peng
Date      October 10, 2012

Thesis Committee Approval

Shaun Foster, Assistant Professor, Computer Graphics Design

Signature of Committee Chair  Date

Chris Jackson, Associate Professor, Computer Graphics Design

Signature of Committee Member  Date

Daniel DeLuna, Associate Professor, Computer Graphics Design

Signature of Committee Member  Date

Your signature on this page indicates your commitment to working with this student in their effort to complete this thesis project for the time period indicated on the timeline.
Abstract
I will be developing an interactive role-playing game application for teenagers and young adults. Through the gaming experience, the user will be able to learn about environmental destruction and gain the ability to use this knowledge to avoid contributing to its cause by learning how they can create an economically sustainable society and a healthier environment. Developing my project into an interactive game provides more interest for this audience.

Problem Statement
After the Industrial Revolution (1750-1850), the approach to mass manufacturing production was found to be more beneficial for making profits, then for creating sustainable lasting production. Toxic chemicals and materials were easy to make and use in the manufacturing of products, reducing production costs, and, because of this, are still used today. Unfortunately, these toxins also pollute our environment and damage human health as a result. They are in the air we breathe and their byproducts are dumped into landfills when they have reached the end of their life cycle. Years after the start of the Industrial Revolution, scientists have begun to be aware of the issues of global warming and environmental disaster. Much data and information is published for the general public, and even interactive media has been developed to make us aware of the degradation of our environment; however, the idea of making life sustainable seems too abstract for many people.

My interactive role-playing game project will create an environment through which the user is able to navigate in virtual space. This game will use a quest system focused on environmental damage and disaster. The main character, Dante, begins within a wasteland that has been ruined by environmental disaster. This place is representative of our real world and its interrelationship with a developing Third World country. The polluted environment will cause damage to Dante's health and property. It will also cause creatures to transform into monsters because they have absorbed all these toxins. While the user attacks those monsters, the user can retrieve the waste from the monsters and can then return this waste back to its original form and recycle it so that it produces renewable energy. The final quest for Dante is to flight with a colossal toxic monster called Avarice, in order to restore wasteland back to a livable environment. Through playing the game, the user will be able to learn to prevent destruction and how to restore the ecosystem back to an inhabitable environment.
Survey of Literature

Sustainability

The Story of Stuff: How Our Obsession with Stuff is Trashing the Planet, Our Communities, and Our Health—and a Vision for Change


Annie Leonard created a video in 2007 entitled “The Story of Stuff” and published it online to raise awareness of the environmental crisis created from a US consumerism point of view. In 2010, she decided to turn her digital video into a book. This book, divided into five topics: Extraction, Production, Distribution, Consumption, and Disposal, addresses the hidden cost and environmental destruction caused by the products we use daily, from their production continuing through to the end of their life cycle. She also points out the importance of what she calls “Toxic in, Toxic out”; production factories use harmful chemicals in products to reduce their cost of manufacturing. Workers absorb those harmful chemicals during product assembly, and some chemicals are extracted into the environment and pollute our water and land. Those finished products are then purchased by the consumer and taken home for use where their chemicals slowly evaporate into the air around us or are absorbed by touching the product’s surface. At the end of products’ life cycles many are returned to the Third World countries that helped make them to be decomposed and burned, creating even more harmful chemicals through this process and contaminating the environment even further.

Cradle to Cradle: Remaking the Way We Make Things


The title, “Cradle to Cradle”, was the central idea of this book. They believe that sustainable development should be created for biodegradable, long-term usage, and be environmentally friendly. The authors mention that a lot of products were originally created to be thrown away which polluted our environment. These were not designed to be recycled back into our eco-system. The book states that waste could be made to be reused or to biodegrade back into the earth; that power created with renewable energy would create a healthier and cleaner environment; and, that humans should respect our natural environment and create a sustainable coexistent ecosystem.

Sustainable Architecture White Paper


This White Paper is about sustainable architecture from past to present. It focuses on the importance of architects constructing buildings that are harmless to nature. Every element of sustainable architecture is designed to use economically endless natural resources that can be applied to building.
APPENDIX / THESIS PROPOSAL

No Impact Man: The Adventures of a Guilty Liberal Who Attempts to Save the Planet, and the Discoveries He Makes About Himself and Our Way of Life in the Process


Colin Beavan spent a year with his family living an extreme lifestyle that tried minimizing their impact on the environment. During their experiment, they gave up modern utilities and products, such as elevators, washing machines, and toilet paper. In the process of defining the necessity of conveniences, they tried to find a new way of living to reduce their impact on their habitat.

Autodesk Sustainability Workshop


Autodesk operates this website to provide a lot contents about sustainability design strategies. This resource will be helpful in developing the contents of the story for my interactive game.

Okala Ecodesign Guide


The IDSA provides a series of ecological and sustainable guidelines for designers. It will be a source of content for developing my project.

U.S. Green Building Council


The U.S. Green Building Council is a non-profit trade organization that exists to promote sustainable building and design. It also creates Leadership in Energy and Environmental Design (LEED) green building rating certificates. It is a great resource for content for my game story.

Energy Star


The Energy Star program was created by the U.S. Environmental Protection Agency and the U.S. Department of Energy to give certificates toward energy efficient product sand practices. This web site contains many resources on energy saving and developing sustainable environments. I is another good resource for developing my game content.
Interactive Game

The Planet Zero


Nissan created this Flash interactive website to promote their new eco-friendly vehicle. Inside this web site, the user was able to experience and navigate in a 3D virtual environment to learn about a zero-emission society. It had successfully designed 3D cartoonish characters to represent real world objects. For example, a giraffe fan represented a wind power generator. The site included a creative storyline with interactive 3D Flash games for each sustainable power generator. The user was able to understand and obtain information about each generator throughout their gaming experience.

The Vynil Game


This is a game with a 2D simulation of the European PVC Industry where users need to make the industry profitable and sustainable at the same time. It teaches users about production, the processes and applications of PVC, and how these can become more sustainable by making the right decisions on how they are manufactured.

Energyville


This is a 2D simulation educational game on energy control where the user is able to place and control power plants and try to meet the challenge of keeping economic, environmental, and security impacts low.

ElectroCity


This interactive online game was created to increase public awareness of sustainability. The user is able to build different public services to expand the city. At the same time, the user has to build power plants to support the city, while keeping their environmental impact low.

Graphic User Interface & Game Design

Don’t Make Me Think!


This book focuses on developing a user-friendly interface website. It breaks down content layout into blocks and organizes them in a way that improves usability and accessibility.
APPENDIX / THESIS PROPOSAL

The Practical Guide to Information Design

This book is about how to design an organized information layout by using color, type, and image. The book demonstrates that by creating a clear and organized layout, one is able to improve the user experience when the user is looking for information. The book also discusses the way people navigate for information on a page.

Pause & Effect: The Art of Interactive Narrative

This book discusses visual media in interactive narrative, storytelling, and interaction; and, provides examples from different time periods. It separates 2D and 3D interactive media into sections and gives case studies on art, games, the Internet, and theater.

Smashing Magazine

This editorial website provides a great quantity of the newest updated articles and tutorials related to web development, including coding development, visual design, web & mobile design, and user experience design.

Technical


This book provides solid foundation for JavaScript knowledge that will help me increase my knowledge in developing my HTML5 game.

HTML5 Canvas

This book covers foundational HTML5 Canvas coding for game framework development using Canvas and will be used in helping me to develop my skills in developing my HTML5 Canvas game.

Making Isometric Social Real-Time Games with HTML5, CSS3, and JavaScript

This book provides information and tutorials for HTML5 sprite animation and isometric grid patterns to help me to develop an isometric map for the game.
Design Ideation

The main character, Dante, lives in a futuristic affluent indoor environment. Dante believes that everything in his world is both disposable and plentiful. In his home he eats only a small amount from a pile of food on his table. He then asks a machine to clean up the remaining food. He asks that same machine to throw away only slightly used electronic products he no longer wants. He walks into his hallway and sees an odd creature. The creature runs away quickly, dropping an unknown item (Nadia’s Trigger) on the floor. Dante picks up the Trigger and follows after the creature. After following it to the end of hallway, Dante accidentally falls into a dumping pipe, where the creature has also fallen.

At the end of the long pipe, Dante lands on a landfill piled with waste, in the middle of a planet that is unknown to him (in reality it is the outside world of his own world that has been destroyed by toxins and pollution and turned into wasteland). As he explores this new environment he becomes engaged in his first battle with monsters that inhabit this unknown land. An image of an unknown man is projected to provide the user with the basic battling tutorial. After Dante’s battle, the projective man introduces himself as a scientist named Ken. Ken gives Dante directions to a shelter isolated from pollution.

When Dante enters the shelter, a citizen suggests that he visit the laboratory in the middle of town where he can get information about where he has landed. Entering the lab he meets Ken’s creation, Nadia, a computer that explains to Dante that the object in his hands is called Nadia’s Trigger. The Trigger protects him from pollution (the user will find out later that it is also a gate key to open the factory door where the monster, Avarice, resides). Nadia asks Dante to fight the monsters in the landfill to collect the waste objects they are made of and bring them to her to be converted to green energy and other sustainable materials.

At this stage, Dante’s mission is to:

1. Fight the monsters in the landfill to collect their waste objects
2. Bring the waste objects to Nadia to be converted to green energy and other sustainable materials

When enough waste has been converted to green energy and other sustainable materials, Nadia upgrades the Nadia Trigger so that it can open the factory door where the monster, Avarice, resides. Dante is then told that, in order to restore peace and the environment, he must have his final battle with Avarice.
Story support content

Ken's Journal
Ken keeps a daily record, a journal, of his world and shares it with the user as they play the game. It provides the game player with a brief background about the planet. At the same time, it highlights important information for the user. Ken's journal entries are placed in specific locations to help the user navigate the game's story.

Ken's Journal Entry 1
Another city was buried by massive toxic waste. The civilians were evacuated because it was no longer safe. There's hardly a clean place left to live on this planet. After the Industrial Revolution, the factories produced massive low cost products. They seemed to be well received by the people. However, the prosperity did not last long. The waste was not biodegradable and started to pile up. At same time these wastes produced toxic liquids and gasses. The condition only became worse.

Ken's Journal Entry 2
The pollution literally grew into monster forms. The worst monster of all is Avarice who is the outcome of human greed and squandering; a colossal toxic monster in the wasteland. Avarice gains its power from the pollution and waste. Many soldiers and civilians have been killed from its toxins. Creatures polluted by Avarice were also transformed into monsters. Avarice seems to be an unstoppable monster that continues to grow in strength.

Ken's Journal Entry 3
The Sky City is almost completed. Two-thirds of the population has already moved into the upper city. After the appearance of Avarice, the counties were united into one nation and began to build another city on top of the wasteland. Has this ground gone beyond saving? I am building a machine called Nadia that can separate wastes back to their original material and produce renewable energy. But the support and resources are so tight that progress is slow and might take years to complete. A recovery of the ecosystem and sustainable natural environment will not happen until that day.

Ken's Journal Entry 4
I accidentally encountered Avarice. We fought but I was able to trap Avarice inside a factory and seal him behind a heavy metal door. The door won't be able to hold him for too long though. My body has been greatly poisoned by the pollution…I won't be alive for much longer. The Nadia's Trigger is able to open the door. But the Trigger is sealed and that seal can only be broken when we are able to fill the Trigger with enough natural energy. I sincerely hope someone can complete this task and recover our environment in soon.
Concept Sketch

Main Character
Dante

Final Monster
Avarice

Monster Design
The monsters visual styles and characteristics are based on real world waste and toxic chemicals. Since this planet has been polluted, the creatures have been contaminated, have transformed into the waste and toxic chemicals they have come in contact with, and have become monsters.
User Interface

This is the visual environment. Dante and the user are able to navigate around the space and interactive with other non-player characters.
Methodological Design

This interactive role-playing game has two aspects: game design and user interface design.

Game Design

My thesis project is primarily focused on game design, including visual storytelling, scriptwriting, character design, and environment design. The graphical element will be a 2D illustrated graphic and texture. The user can use either their mouse or keyboard to navigate through the virtual environment and control the directions Dante moves in.

User Interface Design

My primary goals are to maximize a distinct graphical interface that is very user friendly. I will do so by designing clear iconic graphics focused on fluency of interactive user interface navigation to enhance the user experience.

Target Audience

My target audience is teenagers and young adults, 15-24. I decided to focus on this age range is because it is a period this demographic is forming habits. Through the game's progress, they are able to understand environmental destruction and gain knowledge to help them avoid the same problems in our real world. My goal is to make them more aware of the issue of toxic pollution and provide them with information so that they can contribute to the solutions for our society and might feel compelled to help the environment become more sustainable and green.

Target Audience #1

- 22 years old
- Only child
- University Student
- Accounting major
- Has a girl friend who also from same university
- Spend most of his time working in front of his computer
- Also play StarCraft II and other online game
- Strong love in frozen food
- Indoor person
- Love to buy new electronic product online

Target Audience #2

- 16 years old
- 1 brother, 2 sisters
- Junior high school student
- Take bus to school
- Love Math and Music
- Play drum in school band
- Hates history teacher who always gives too much homework
To promote my thesis project, I will purchase domain hosting with an exclusive domain name. The web link address will be posted on Facebook, Twitter, and other popular social media websites. At the end of my process, I will submit my project to the following competitions:

- Adobe Design Achievement Award
- HOW Interactive Design Awards
- American Design Award: Student Annual Design Contest
- Computer Arts Interactive Competition

Visual graphic images will be used in the user interface and character designs. In order to develop fluency within the environmental navigation controls, I must optimize the image file size, but it should still maintain sharp, stylish image quality. HTML5 Canvas will be at the core of producing this interactive web game. The user friendly interactive interface will enhance the quality of the user experience both visually and in the user orientation.

To review and test the interactive application, I will purchase domain hosting with an exclusive domain name. The web link address will be posted on Facebook, Twitter, and other popular social media websites. At the end of my process, I will submit my project to the following competitions:

- Adobe Design Achievement Award
- HOW Interactive Design Awards
- American Design Award: Student Annual Design Contest
- Computer Arts Interactive Competition

The interactive application will be reviewed and tested by RIT students and people outside RIT. During the evaluation, the tester will be asked to write a survey. Additional modifications to the interface will be based on user feedback and data recorded from the testers. The results will also help me to know about users’ preferences for sustainability. Throughout the process, I will discover if this application really helps users understand the importance of sustainability from user feedback.

Purchasing Web Hosting Service & Domain $ 62
Printing Cost for Documentation Book $ 50

Total $112
### Thesis Timeline 2011-2013

<table>
<thead>
<tr>
<th>MONTHS</th>
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<th>Interactive Sustainable Role-playing Game</th>
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<tbody>
<tr>
<td>October</td>
<td>9-15</td>
<td>Research, Document Proposal</td>
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<td>November</td>
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<td>December</td>
<td>30-6</td>
<td>Final Proposal, HTML5 Coding Development</td>
</tr>
<tr>
<td>January</td>
<td>7-12</td>
<td>Main Character developed, 1st committee meeting</td>
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<tr>
<td>February</td>
<td>13-19</td>
<td>Content finalized</td>
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<tr>
<td>March</td>
<td>20-26</td>
<td>2nd committee meeting</td>
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<tr>
<td>April</td>
<td>27-3</td>
<td>Main Character finalized, 2nd committee meeting</td>
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<tr>
<td>May</td>
<td>4-10</td>
<td>3rd committee meeting</td>
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<tr>
<td>June</td>
<td>11-17</td>
<td>Beta prototype done, 3rd committee meeting</td>
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<tr>
<td>July</td>
<td>18-24</td>
<td>Monster finalized, 4th committee meeting</td>
</tr>
<tr>
<td>August</td>
<td>25-31</td>
<td>Project completed, final project started</td>
</tr>
</tbody>
</table>

### Milestones
- Proposal accepted
- Flow chart finished
- Web site started
- 1st committee meeting
- Content finalized
- 2nd committee meeting
- Main Character finalized
- 1st prototype done
- 3rd committee meeting
- Beta prototype done
- Monster finalized
- 4th committee meeting
- Complete final project
- Last committee meeting
- Pass thesis defense
- Thesis show
- Thesis report online
- Publish thesis report
- Graduation

### Thesis Timeline 2011-2013

<table>
<thead>
<tr>
<th>Thesis Timeline 2011-2013</th>
<th>Interactive Sustainable Role-playing Game</th>
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<td>Literature Review</td>
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<td>Research Content</td>
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<td>Final Proposal, HTML5 Coding Development</td>
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<td>Main Character developed, 1st committee meeting</td>
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<td>Thesis Timeline 2011-2013</td>
<td>3rd committee meeting</td>
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<tr>
<td>Thesis Timeline 2011-2013</td>
<td>Beta prototype done, 3rd committee meeting</td>
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<td>Thesis Timeline 2011-2013</td>
<td>Monster finalized, 4th committee meeting</td>
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<tr>
<td>Thesis Timeline 2011-2013</td>
<td>Project completed, final project started</td>
</tr>
</tbody>
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**Thesis Timeline 2011-2013**

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