Project Number: DMO-4333

Mini-Games for Tencent Boston

Prototyping two mini-games for Tencent Boston's upcoming MMO

A Major Qualifying Project Report
submitted to the faculty of
WORCESTER POLYTECHNIC INSTITUTE
In partial fulfillment of the requirements for the
Degree of Bachelor of Science

By
Elliot Brodzki
Gage Fleischer
Sam Rogers
Ashley McGuane

Sponsored by
Tencent Boston

Advised by
Professor Dean O'Donnell
Professor Robert W. Lindeman

Abstract

This report is an Interactive Media and Game Development/Computer Science Major Qualifying Project detailing the design and creation of two mini-games produced by our team over fourteen weeks. The mini-games were made in collaboration with Tencent Boston, a game company in Concord, Massachusetts, which is developing an upcoming fantasy massively multiplayer online role-playing game. Our team used Tencent's guidelines to create Mallet Kombat, a fighting game, and The Element Trail, a procedural platformer on rails using the Unity3D game engine.

Acknowledgements

Our team would like to extend special thanks to Jeff Goodsill for organizing the project and to Justin Webb for contributing to our progress and providing professional insight throughout the fourteen weeks of our project. We would also like to thank Professors O'Donnell and Lindeman for advising this project and helping us bring our games to fruition. Finally, we would like to thank the employees of Tencent Boston that donated their time and advice when play testing our games.

Table of Contents

List of Figures

List of Tables

1. Introduction

Our team consists of four Interactive Media and Game Development students: two majoring in a technical track and two majoring in an artistic track. For our project, we had the privilege of collaborating with the Tencent Boston development team creating mini-games for their upcoming fantasy-based massively multiplayer online (MMO) game. Our team and advisors met twice weekly for progress reports and feedback on our work: once at WPI, and once at Tencent with their employees. The purpose of our project was to create prototypes of mini-games that could be incorporated with Tencent's MMO as a way to give players a change of pace from traditional MMO gaming.

1.1 Tencent

Tencent, Inc. is the third leading internet company in the world, surpassed only by Google and Amazon (Lacy, 2010). Founded in November of 1998, Tencent has since become "…the largest online game community in China" (Tencent Boston). Tencent Boston, a branch of Tencent, located in Concord, Massachusetts consented to working alongside students on their upcoming game. Their game features natural element themes associated with the five Chinese elements (as shown in Figure 1): fire, earth, metal, water, and wood.

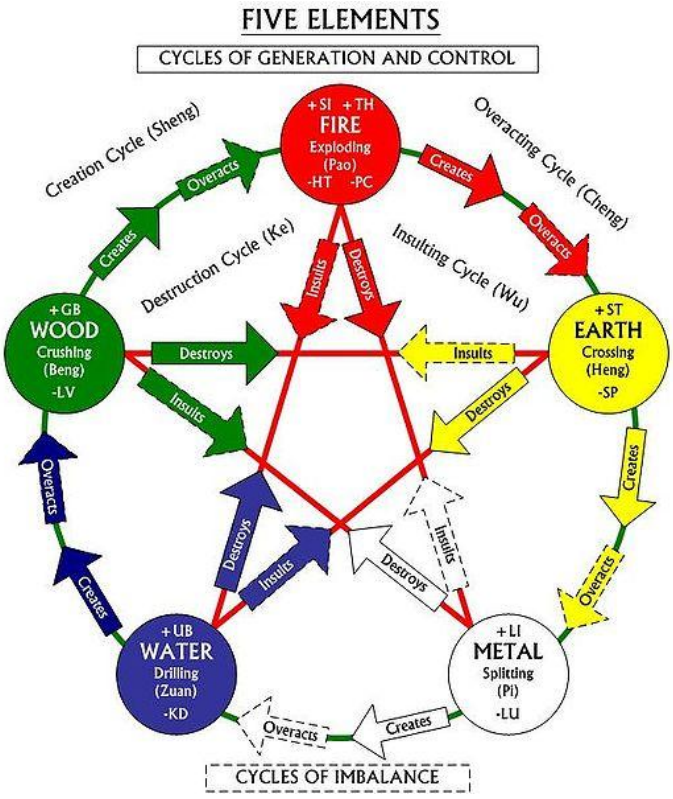


Figure 1: Chinese Element Chart

Following the chart in Figure 1, each element has a specific relationship with the elements connected to it. The star-shaped pattern corresponds to the Destruction and Insulting Cycles, which are prominent in our games. With these relationships, it is easy to distinguish the strengths and weaknesses of each element with respect to each other. Each element also has specific motifs associated with it (Table 1) which played an important role in the artistic design of our games.

Table 1: Element Motifs

Element	Color	Animal
Fire	Red	Phoenix
Earth	Yellow	Yellow Dragon
Metal	White	Tiger
Water	Blue	Turtle
Wood	Green	Green Dragon

One aspect of Tencent's design is the inclusion of a pet for the player. As the player roams through the world, the pet would accompany them as a companion with the ability to execute activities. We felt that expanding on the interaction between a player and their pet with pet themed mini-games would strengthen both the player's immersion within the game world as well as provide the player's companions with an added level of realism.

In addition to the idea of making pet mini-games, Tencent had given us the option to tie in their "brags" system, which works similarly to achievements, except that the player can then use the "brag" for crafting powerful items. We were only able to come up with one idea for the brags which was a card game like war, but with special powers based on the element that the brag was tied to. We decided against this idea because of the constant balancing issues that would have arisen if and when new brags were made.

The first thing we did in the project after learning about the game was to come up with pitches for mini-games that could tie into the MMO. One pitch was an RTS/Sim City style game where the pet is taking care of a garden or island. The island would come under attack after a set amount of time and the player would need to build defensive structures in order to win. Another game idea was to have the pets mine for treasure in a persistent cave that they would tunnel through over time. We also had the idea of making a few multiplayer games like capture the flag, tag and a go-cart racing game. We decided against multiplayer in the end however, since it would have been more difficult to complete in the timeframe.

2. Design

This chapter discusses design processes of both Mallet Kombat and The Element Trail. The technical design explains the different programming alterations we went through during our project. The artistic design covers the different artistic concepts.

2.1 Technical Vision

We decided early on to make the games in Unity3D, since most of our team had experience with it in the past. Unity provided the team with a familiar art pipeline while prototyping the games with programmer stand-in art. It also enabled us to easily build executables for demo purposes every week as well as a fairly simple integration process at the end of the project to combine the two games into one.

2.1.1 Mallet Kombat

In Mallet Kombat the player takes direct control of the pet in order to collect items that are useful in some way in the MMO. In order to do this the player must hit AI-controlled mini-elementals with a mallet and eventually knock them off of a pentagonal platform in order to win. Before starting the game the player must choose a starting mallet type, each of which has its own advantages and disadvantages compared to the others. Each mallet has a special effect when either swung or pounded; this is in addition to knocking the elementals around. The platform consists of five elementally themed areas, each with its own hazards that could knock the players around/off the platform.

The player can perform four actions besides movement: a direct swing attack, a ground pound attack, a block and a jump. When a player blocks, swing attacks are negated and when a player jumps, ground pounds become ineffective. Blocking and jumping however did not make it into the final game. In order to create a re-playable experience the AI needed to respond differently to the player depending on what was going on. And since there were to be at least five of these AI at the start of each game, they all needed to behave uniquely enough to provide enough of a challenge to the player.

Once the game was fun and playable there were design issues that became apparent. There was a conflict between winning and finishing the match. The conflict being that the player is trying to collect elemental orbs by hitting the elementals, but if they wanted to gather a lot of a single type they would try to hit that one more, but that would mean knocking it off thus eliminating the ability to gain more elements of that type. To help resolve the issue the strength modifiers were replaced with giving more or less elements based on elemental type vs. hammer type. This helped the glaring issue with the game, but the game still felt really short if the player was good at knocking the elementals off. Adding multiple rounds to the game helped with that issue. The system allowed the player to play for as long as they wanted, as long as they could survive the ever increasingly strong elementals.

2.1.2 Element Trail

As with Mallet Kombat, the main objective of The Element Trail is to provide a fun alternative play experience for collecting valuables that will be useful in Tencent's MMO. We wanted to make games that were fun, replay-able, easy to play and yet challenging. We wanted a game that had plenty of action so you could never take your hands off of the game controls.

Procedural generation of levels lets us create lots of gameplay that can be easily tailored to find a good level of difficulty for players. Procedural generation of levels is a backbone technical feature of The Element Trail. The idea was to have lots of variability within each difficulty level so that it would not be repetitive every time it was played. With procedural generation we are able to keep the game interesting for much longer when compared to a conventionally designed game that has a set number of levels.

The controls are designed to be simple because game is a platformer on rails. By putting the game on rails we only need to control the up, down, left and right movements of the cart, since it is always moving forward. With these features in mind the player only needs to think in two dimensions when it comes to controlling the cart. With only a few game relevant buttons, understanding how to play the game can be quite easy.

2.2 Artistic Vision

The primary objective in both games involves collecting as many element orbs as possible. These orbs were created early in development and were designed as floating spheres textured to represent one of the five elements. The orbs were also made to glow and display particle effects similar to those assigned to the mallets of Mallet Kombat.

Figure 2: Element Orbs

2.2.1 Character Design

Concept art for the pets was provided by Tencent (Figure 3). If the mini games were ever to be used in the MMO, any of the pets would be playable in the mini games, as the player would be controlling his or her own pet. However, modeling each pet for the prototypes would have been unnecessary for demonstrating how the games work, so one pet was chosen to serve as the playable character for both mini games.

Figure 3: Pet Concept from Tencent

2.2.1.1 Hammer Cat

Given that one of the games was played with hammers, the Hammer Cat concept seemed like the most fitting. The modeling was done in ZBrush. The main focus in modeling the Hammer Cat was adapting the concept art from Tencent faithfully in 3D. A challenge in doing so was imagining what such an abstract cartoon character would look like from the side, as only a front view was provided in the concept art. Deviations from the concept art in the model consisted of the addition of a tail and pupils. The pupils were added to reduce the doll-like appearance of the initial model.

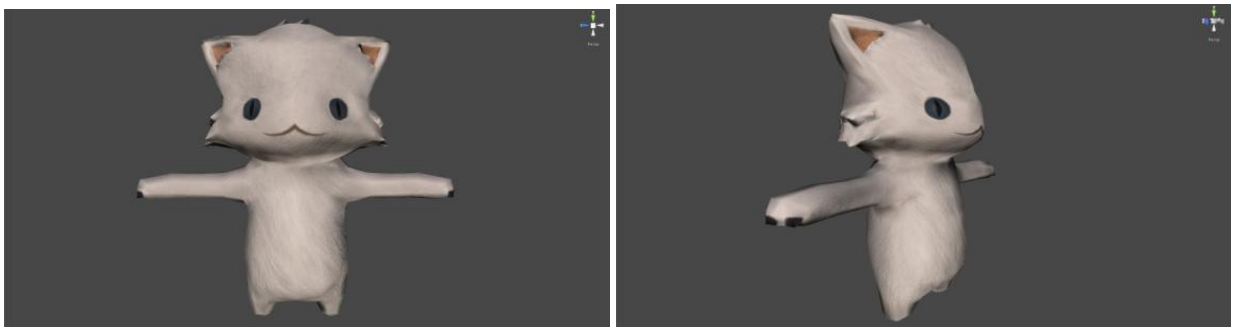


Figure 4: Hammer Cat in Unity

Since hammers play an essential role in Mallet Kombat, a hammer was created for the combatants to wield. However, this hammer would not be the hammer of Hammer Cat as seen in the concept art, as it was meant to be used by all pets and originally the elementals as well. A new mallet was designed and modeled in ZBrush and given different colored textures and particle effects to represent each element. The high-poly ZBrush model shown in Figure 5 was later modified with a longer and thinner handle, so that the short-armed pets would look more natural wielding it.

Figure 5: High-poly Fire Mallet in ZBrush

2.2.1.2 Elementals

Figure 6: Element Concepts from Tencent

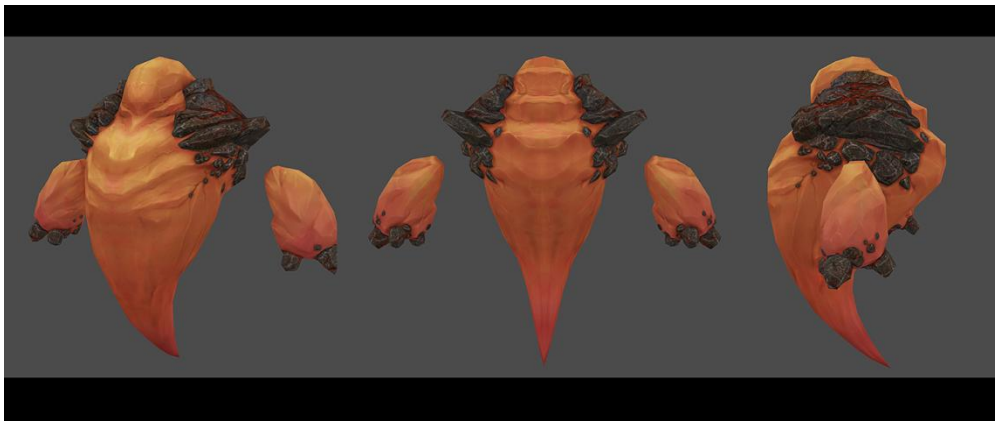


Figure 7: Fire Elemental Renders from Tencent

Concept art and renders of a model were provided for the elementals by Tencent (Figures 6 and 7). The elemental model created for Mallet Kombat was based off of the renders of the elemental and modeled in ZBrush (Figures 8 and 9). Each elemental type was given a different color texture and particle effects.

Figure 8: Mallet Kombat High-poly Elemental in ZBrush in Front of Reference Images from Tencent

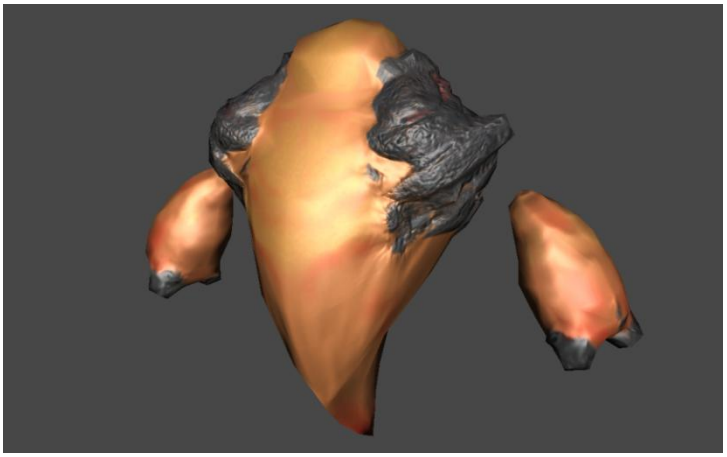


Figure 9: Mallet Kombat Low-poly Elemental in Unity

2.2.2 GUI

The Graphic User Interface (GUI) is an important factor in every game and must incorporate art and functionality. The first concepts, seen below in Figure 10, were the first concepts designed for our games. The pictures on the left side represent the layout of the GUI, and the pictures on the right depict the different interactive buttons during static, mouse-over, and active conditions, respectively.

Figure 10: Early Concept GUI

After reviewing these designs, we decided they were not up to the standard we wanted for our game. The colors were not complementary to our style, and we were discouraged from using default fonts. With this in mind, we designed a completely new layout more contoured to the look and feel of our games. Upon suggestion, we used 1001Fonts.com, a free online resource of unique and interesting fonts posted by its members. With this new tool, we were able to make a new design that was both clear and creative.

Figure 11: Mallet Kombat and Element Trail GUI

(Note: Grey background is not included in game)

Both games share a font for the titles, 'choose' menus, 'fight,' and 'begin' buttons. This font was made with swirling designs that related the games to their fantasy parent. The backgrounds for the GUI's are unique and specific to each game, therefore unifying the games with a font was necessary. Heavy drop shadows were applied to all of the fonts to ensure the visibility and readability of the words against busy backgrounds.

2.2.3 Mallet Kombat

The art for Mallet Kombat strove for a fairly realistically textured aesthetic achieved through a combination of high quality photo textures and normal-mapping. For character modeling and texturing, ZBrush's modeling, poly-painting, and normal-mapping capabilities were used in conjunction with texturing in Photoshop and normal-mapping in Crazy Bump. For environment art, modeling was done in Autodesk Maya and normal-mapping was done in Crazy Bump. Since character concept art was provided by Tencent, and the environment art was conceived of and modeled by the same person, creating concept art did not play a very big role in the Mallet Kombat art workflow.

2.2.3.1 Platform + Pieces

The original idea for the Mallet Kombat arena platform was to have a different environment for each element. Figures 11 and 12 are photo-collage concepts for the wood and water arenas. It was later decided that a better and more time efficient plan would be to integrate all the elements into one arena.

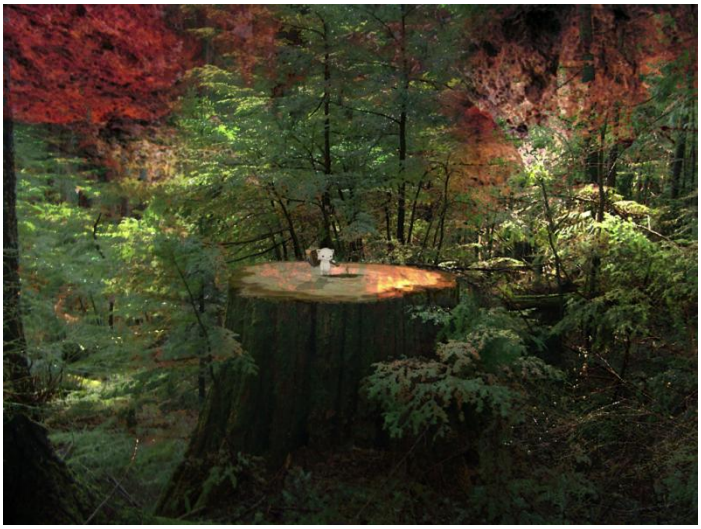


Figure 12: Photo-collage Concept for Wood Arena

Figure 13: Photo-collage Concept for Water Arena

Figure 13 shows the arrangement of elemental areas in a pentagram pattern on top of a pentagonal arena. The pattern is based on the Cycles of Generation and Control in Chinese culture.

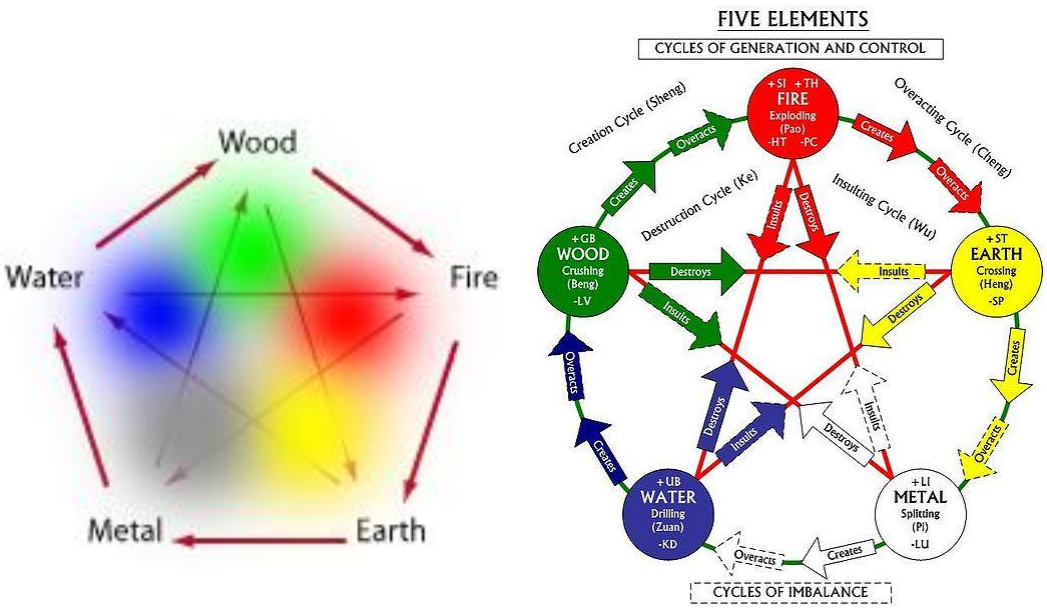


Figure 14: Arena Layout Diagram (on left) and Cycles of Generation and Control Diagram (on right)

The pentagonal platform would be made of stone, but each elemental area would consist of its own miniature landscape. The metal area would consist of metal grating over clockwork. The water area would be a pool of water. The wood area would consist of some wood planks over grassy ground with roots. The fire area would be a grill over a pit of flames. The earth area would consist of dirt and rocks. Surrounding the platform was to be underground scenery.

2.2.3.2 Hazards

Each elementally themed area of the arena has its own hazard that knocks the player away sometimes. This feature was implemented to help balance the gameplay as well as to add some more life into the environment. At first we wanted to have animated meshes that would knock the player around, however, adding colliders to a mesh that is constantly deforming is not currently possible in Unity. This meant our design of the hazards had to change slightly. We ended up with the following four hazards each which use simplified colliders that the player cannot see that are represented by the moving objects that they can see. The metal area has a large spinning gear that emerges and pushes players towards the edge of the arena. The water area has a wave that pushes the players around. The wood area has bramble bushes that sprout from the ground, and push players away from them. In the fire area, the flames rise to knock the player back. We had plans to make a hazard for the earth environment that would be some sort of sand storm that would travel around in a circle. This did not make it into the game however due to time constraints.

2.2.4 The Element Trail

The Element Trail went through many artistic changes during the design phase of our project. Initially, our group considered creating three different variations of a platformer type

game that would have similar, if not identical, controls and features. As the pet, the player would travel down a trail themed to a specific element and be transported in vehicles suited to each environment. In our early designs, these trails would be themed to fire, water, and earth.

Figure 15: Early Fire and Water Environment Concepts

(Note: No 'Earth' game world concept was created in this stage of development)

Our team quickly realized, however, that this plan would be too ambitious to complete in the fourteen weeks of our project. We therefore scaled down our idea into a single game including all five elements. Though the game's scale changed, the basic idea remained the same. The game would continue to be a procedural platformer, but rather than having multiple game worlds, it was condensed to only one. With this in mind, we altered the in-game vehicle to be a more traditional mine cart that would follow tracks through elementally themed tunnels.

2.2.4.1 Core Assets

The mine cart itself was created early in development and underwent few changes. Inspiration for this piece was derived from a posting on an online forum of a site known as Game-Artist.net. The design of the cart was made to be heavy and durable, as it is meant to be exposed to the elements. The cart was given a wooden texture with metal frames along its sides.

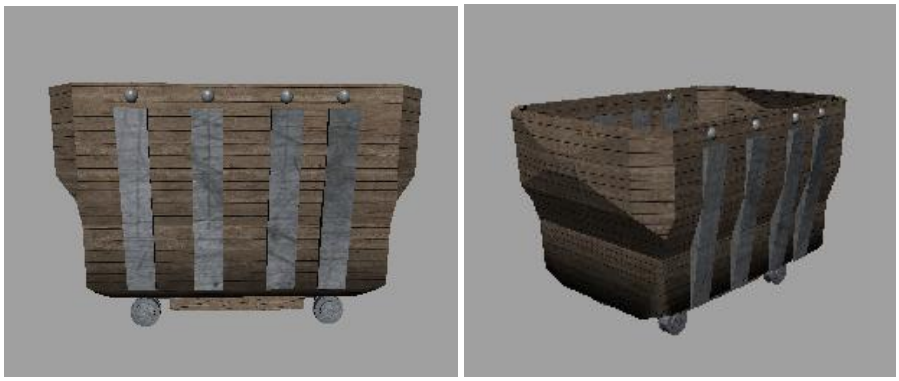


Figure 16: Mine Cart

With a mine cart as the game vehicle, it was clear that we would need tracks for the cart to navigate. The tracks themselves were modeled to represent train tracks. To increase the energy of the experience, we chose to include tracks that could change height during the game. The supports were therefore constructed to replicate old-fashioned wooden roller coaster rides. A roller coaster feel would amplify the experience of riding through the tunnels in the cart as well as provide independent support for each track.

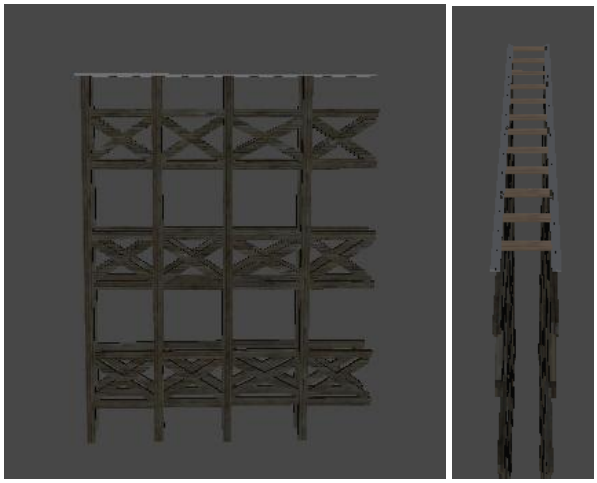


Figure 17: Straight Track with Supports

(Note: Only the straight track is pictured)

For our purposes, we required five kinds of tracks: straight, left curve, right curve, up, and down, as well as appropriate supports for each. Curved tracks were more difficult than originally expected. Creating a curve that could uniformly fit each other track type (including other curves) posed problems: either the track would fit with straight pieces and not other curves, or the opposite. Both the up and down tracks required alterations as well. After the first design was complete, our team felt that the rising and falling during game play was too dramatic and distracting from the game. To address this issue, the change in height of the tracks was reduced to half of the original concept.

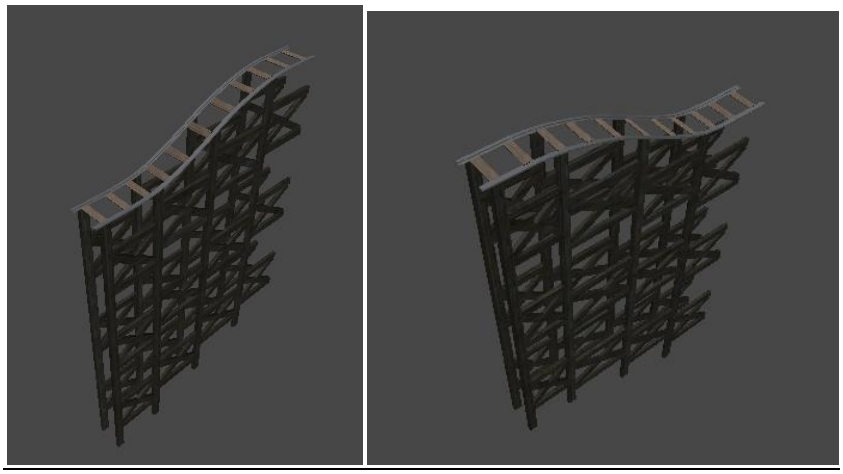
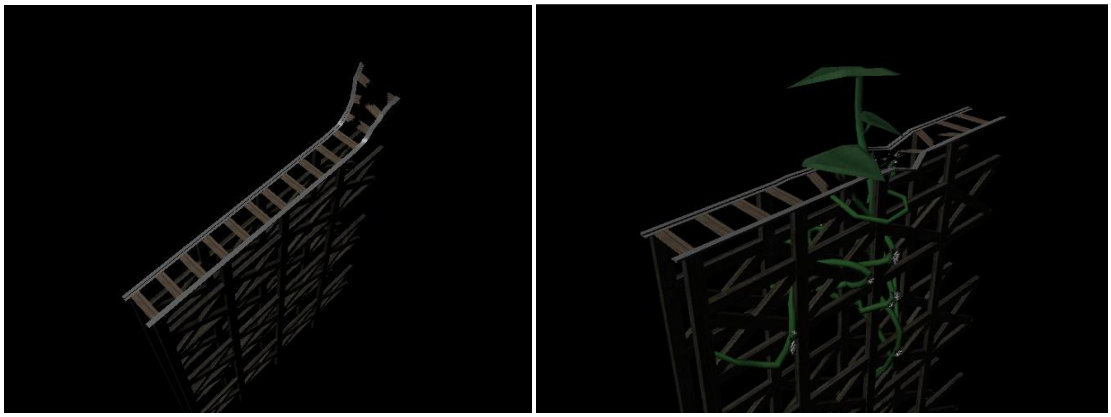


Figure 18: Up and Down Tracks (respectively)

To make the game more difficult, obstacles were created for players to avoid during gameplay. These obstacles were created to be both standalone pieces to be placed on top of tracks as well as completely redesigned track pieces mangled and destroyed by the elements.



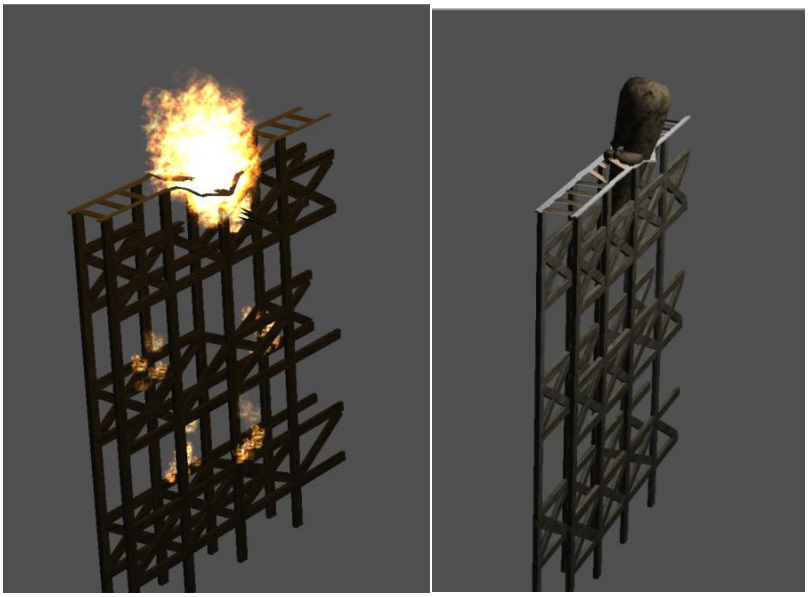


Figure 19: Track Obstacles

2.2.4.2 Environment

In the early versions of our games, we used a generic pipe piece as the sections of tunnel until the finished environment pieces could be completed. Because we chose to procedurally generate the tracks, it was important that each track piece was the same size, which was decidedly the size of one unit of track.

The inspiration for the final Element Trail environments was derived from Tencent's vision of an ancient civilization's ruins. For the purposes of this mini-game, multiple tunnels were created: one thematically designed for each of the five Chinese elements.

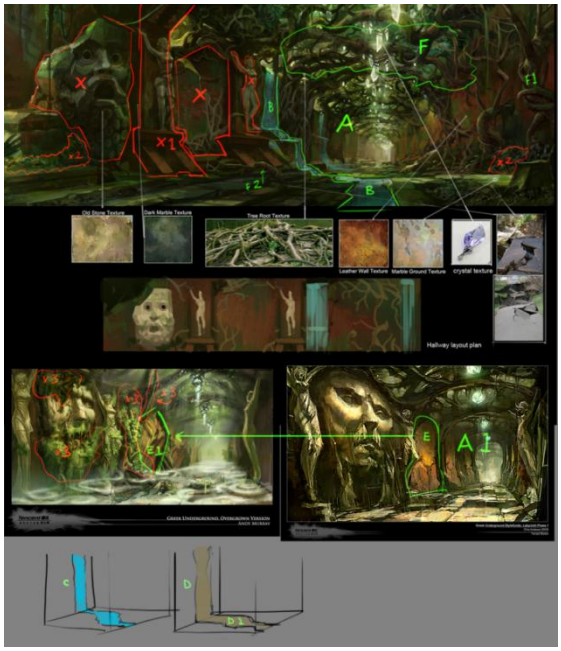


Figure 20: Tencent Underground Concept

Fire tunnels were chosen to feature a phoenix, the animal associated with the element of fire as described in Chapter 1. Early concepts featured large statuesque birds; however, they were altered to account for space within the tunnel.

Figure 21: Early Fire Tunnel Concept

The concept was adapted to a golden phoenix plate stationed in the center of a bowl of fire. This asset was initially positioned to hang from the ceiling of the tunnel. However, after seeing the asset in the game, it was redesigned on top of a pillar because the camera angle of the game obscured it from view.

Figure 22: Phoenix Ceiling Concept

Volcanoes were also added to the tunnel to amplify the fire element theme. To add some visual interest, volcanoes alter from emitting red and black smoke to completely erupting. Smoke, lava, and fire effects were created using Unity particle effects.

For the earth themed areas, we wanted to present a more traditional cave motif with stalactites and stalagmites. Though traditional, the simplicity provided a calm pallet in comparison to the other environmental pieces.

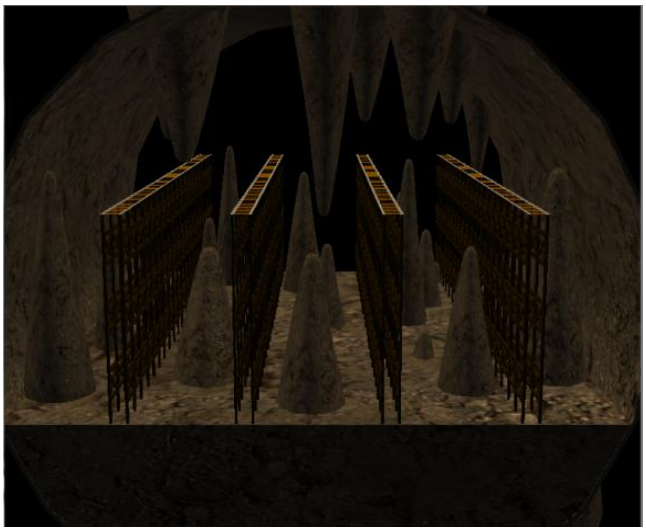


Figure 23: Earth Environment

Creating the metal environment was more complicated than the other areas. The early concept included dozens of metal spikes stabbing through the walls of the tunnel, some surrounded by electricity created with Unity particle effects.

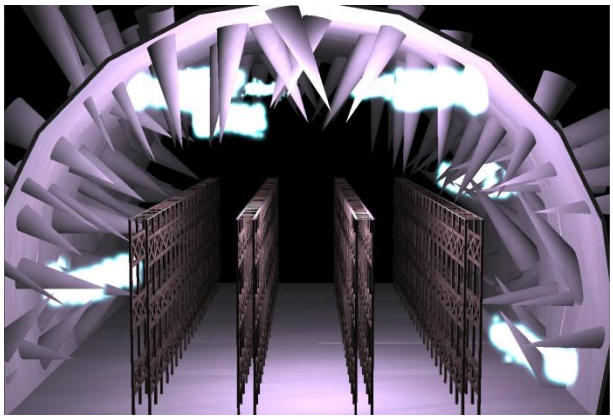


Figure 24: Early Concept Metal Environment

Though conceptually interesting, the lightning effect was not clearly translated to the model and needed to be altered. The metallic texture used also appeared too flat and grey, and was replaced with one that appeared more "shiny" to resemble actual metal. The conical spikes translated more to icicles than sharp metal and were therefore redesigned as lightning rods.

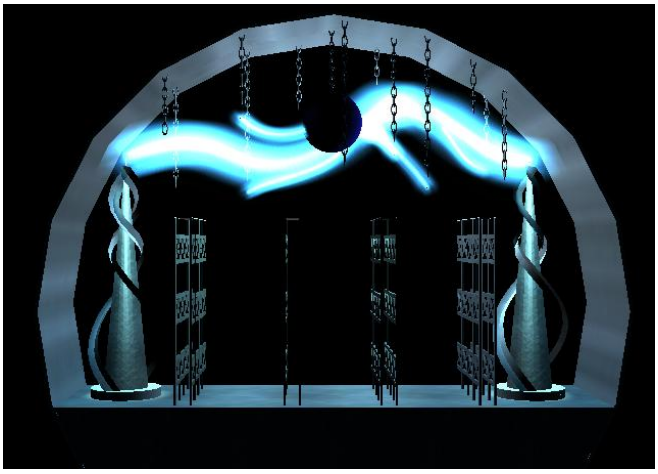


Figure 25: Metal Environment with Lightning

The following progress on the metal environment was partially inspired by the Boston Museum of Science's lightning show. Though the new lightning effect, made possible by a free Unity download, was clearly superior to the first metal environment, the particle systems creating the streams of electricity were too complicated and would cause the game to slow down considerably. Because of this effect on the game, the lightning was removed from the tunnel. Chains were added to the ceiling of the tunnel as an additional metallic accent.

Similar to the fire concept, water tunnels were designed to include the element animal: a turtle. Early concepts arranged a series of pipes along the wall of the tunnel that were shaped like turtles.

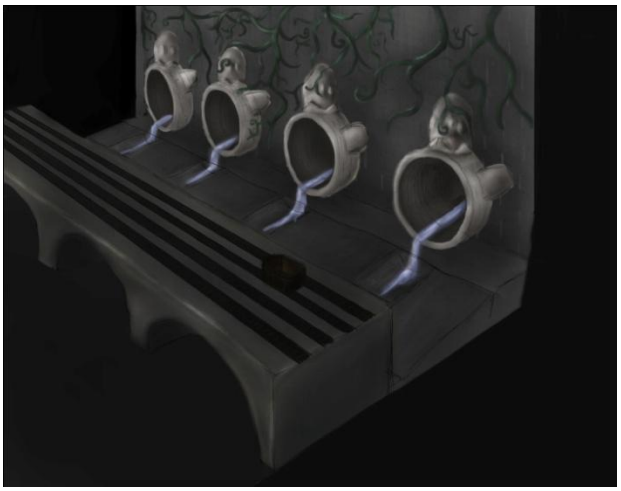


Figure 26: Early Concept Water Environment

Upon review, the design translated too heavily into a sewer scene rather than a water environment. To rectify this, the pipes were modified to be statuesque fountains. To make the fountains more visible, they were placed on pillars to raise them from the floor. Finally, particle effects were created in Unity to simulate water.

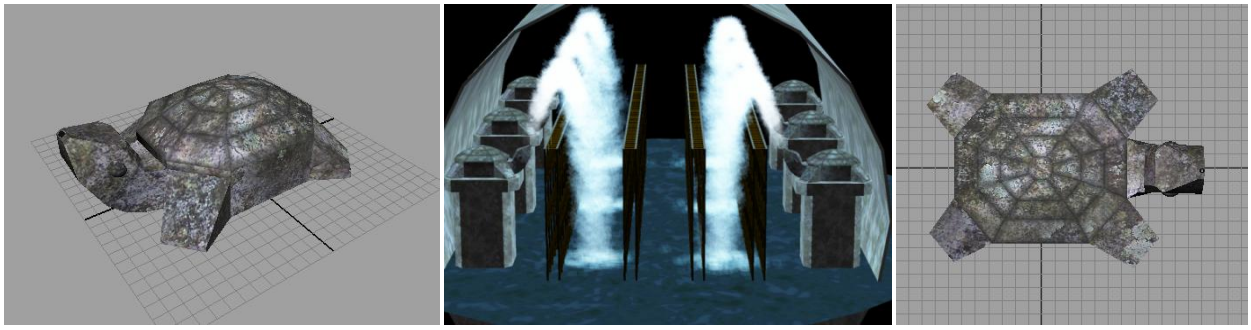


Figure 27: Turtle Fountains

Wood Tunnel

The wood themed environment was not considerably altered from its original concept. Even in early stages, this environment was intended to be filled with tree roots and foliage

Figure 28: Early Concept and Wood Environment

During development, it was clearly noticeable in the game when the tunnel pieces would change from one element to another due to stark seams. To rectify this, ten transition pieces were created to blend the different wall and floor textures of the pipe pieces together more appealingly.

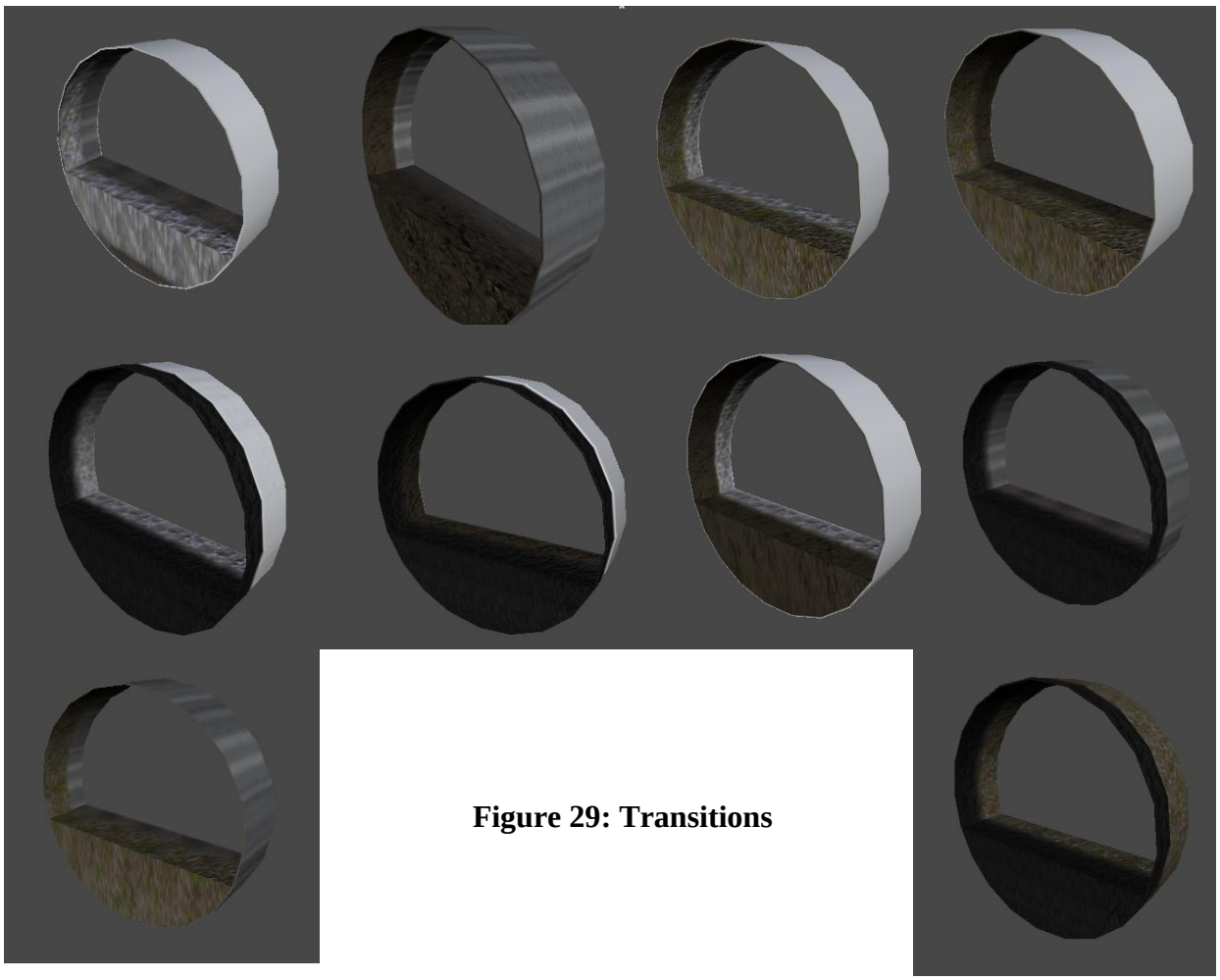


Figure 29: Transitions

3. End Product

After fourteen weeks working on these two games, we were able to reach our end product. This section discusses the gameplay and environments of each game upon completion.

3.1 Mallet Kombat Gameplay

Mallet Kombat is a 3rd person fully 3D round based fighting game. The player competes against AI controlled elementals on a pentagonal platform using an elementally themed mallet of their choosing. The elementals were originally also going to use the different mallets and when they were defeated the player would have a choice to use the new one. However, the team felt that the elementals should attack with their arms/bodies to give them a more natural feel. This change meant that the player only gets to choose their mallet at the start of each match.

A match consists of as many rounds as the player is able to win. In the beginning the player chooses the mallet they want to use. This determines how many elements the elementals will release when hit, in accordance with Table 2 shown below. Each round consists of the player fighting five elementals that increase in strength as the round goes on. Once the player knocks all of the elementals off of the platform, a dialogue is displayed asking if the player wants to keep fighting for more elements or escape with what they have already collected. If they choose to continue then another round begins, but the elementals start out stronger. If they choose to not continue then they can leave the mini-game with all of the elements that were collected. But, if the player loses at any point then they lose half of all the elements they collected throughout the rounds.

Table 2: Elemental Orb Drop Rates

Mallet Type – Elemental Relation	Orbs/Ground Pound	Orbs/Swing
Strong against elemental	3	5
Neutral against elemental	1	2

With the scope of this game it was not necessary to build the combat system or AI outside of Unity. The entire game is scripted in a combination of Unity's C# script and Javascript. The AIs have a simple finite state machine that controls what they do. The AI first needs to choose its target. It will do this every 3-5 seconds. It first checks to see if the player and its enemy elemental are dead. It also at this point chooses whether or not it is going to flee based on its distance to the player and a random number that is generated with Unity's Random.Range() function. The AI has a 30% chance to flee if their distance to the player is less than 15meters away. The AI then chooses its target, it will not choose a target that is dead nor further away from a closer target.

During its update, the AI will move towards its chosen target and check its distances from the targets and the edge of the platform. It will avoid the edge while trying to swing or ground pound when it is close to a target. Every time the AI attacks it must choose what type of attack to use, there is a 70% chance the AI will use a normal swing and a 30% chance that it will ground pound. The AI also has an attack cool-down timer, like the player, which is set to 2 seconds. All of these values were tweaked throughout development in order to fine tune them to be strong, but not too strong and smart, but not brilliant.

The combat system uses a combination of Unity's colliders and distance tracking in order to determine when to knock something back. The player can move around in eight directions and can attack when not knocked down/cooling down from attacking previously. The players attack cool-down timer is one second long, which makes the player feel more powerful than the elementals, since they can only attack half as often. When the player is hit, control is taken away and a force is added relative to the position of the attacker. An animation plays when the player is knocked down, and the animation system is used to trigger other events such as sounds. Once the knocked-down animation completes, the character stops sliding and starts getting back up. When the player is completely up, they regain full control.

3.2 Mallet Combat Environment

The pentagonal stone arena ended up mostly as it was planned. The Earth area is a desert landscape. The metal area is spinning gears under metal grating. The water area is a pool of water resting on wet sand. The wood area is a stump with exposed roots and some ferns in a grassy area instead of wooden planks. The fire area is a grill over a pit of fire. The stone platform was made first. It was modeled with slots in it, into which the individual environmental areas were later placed as they were completed. Since the camera angle for the game ended up looking downwards, the surrounding scenery for the environment was deemed unnecessary as it would not be seen.

3.3 Element Trail Gameplay

The Original concept of the element trail was very close to the game that eventually came to fruition. Like Mallet Kombat, you control a pet for an adventuring hero from Tencent's upcoming MMO. The pet is driving a mine cart as it moves down rails through a procedurally generated tunnel. You control the mine cart with the pet in it and maneuver between the tracks in the tunnel, all while collecting elements and avoiding obstacles in an attempt to reach the end.

The minecart can be made to lean left or right on two wheels. The player can also have the mincart jump into the air. When leaning the player can pickup elemental orbs that would otherwise be out of reach. When the cart is leaning on two wheels the player can make the cart jump, then the cart will leap over to an adjacent track.

The minecart does not actually interact with the visible track. The minecart follows along a path, or spline, determined by a large set of nodes placed during the creation of the course. The

minecart moves from node to node making movements that will match up with the visible track placed below it.

The tunnel is comprised of many sections that are created procedurally and then placed one after another to make up the tunnel that the player rides down. Throughout the tunnel there are four tracks that the player can jump between. At each section of the tunnel, obstacles and elemental orbs are placed along the track and in the environment. When there is a turn in the tunnel all the tracks turn in the same direction.

An entirely new tunnel is generated every time the player picks a difficulty and starts the game. First, the pieces that make up each track are determined. For each section of the tunnel, for each track, the next piece for that track is chosen as either slope up, slope down, or straight. Turns are the least likely to occur piece, next to least likely are ups and downs and finally straight pieces are the most likely to occur. The tracks can curve up and down independently of one another, but they will all turn together. If the tunnel is turning then the next piece for each track will be a turn piece, all in the same direction.

Once each piece of each track has been decided, the placing of the paths that the cart travels along for each track is completed. There are five invisible nodes which determine the course of the minecart for each track piece type. Depending on the track piece type the five nodes are placed at different positions leading towards the end of the tunnel. One way to think of it is as a necklace of beads, one end of the necklace is the beginning of a track in the tunnel and the other end of the necklace is the end of the track. There are many beads (nodes) on the string (course) of the necklace (track). All the beads of our necklace are placed first, in three-dimensional space at each tunnel section, and then a string, or the course the minecart follows, is threaded through all the beads, or nodes, to make up one of four tracks. So when the cart switches tracks, it just switches which string it is following along.

Once all the nodes for each piece in a section have been placed the physical track the player can see is placed. Each piece of physical track spans the distance of the five nodes that were placed before it. Obstacles and elements are placed after the physical track is placed. At every tunnel section for every track piece there is a chance for an obstacle or a string of elements to be placed. The chance of an obstacle being placed on a track is dependent on the chosen difficulty and how far along it is in generating the track. Obstacles exist as either obstacles placed directly on the track or parts of the tunnel environment that are hazardous, such as volcanoes and stalagmites. Placed obstacles are only on straight pieces of track. Having obstacles on turns and ups and downs made the game too difficult for an average player to spot and avoid. Elemental orb placement works the same way as obstacle placement except orbs can also be placed on up and down track pieces as well as straight. There is also chance for a string of one elemental orb type to be placed instead of a single elemental orb. This orb-combo chance is based on the chosen difficulty.

When a player picks a difficulty they are changing the values of nine variables used for the procedural generation. Most of these values increase the harder a difficulty is chosen.

Track Length:	How long the level is.
Starting difficulty:	How difficult the course starts out as.
Difficulty scaling:	How quickly the difficulty increases over the course of the level.
Obstacle starting frequency:	The chance of an obstacle being placed when difficulty is 0.
Obstacle ending frequency:	The chance of an obstacle being placed when difficulty is 100.
Element starting frequency:	The chance of an element being placed when difficulty is 0.
Element ending frequency:	The chance of an element being placed when difficulty is 100.
Element combo frequency:	The chance a group of elements is placed instead of just one.
Max element combo size:	The maximum size of an element combo.

Over the course of the track length the difficulty increases based on the difficulty scaling. The difficulty starts with the starting difficulty value at the beginning of generation and as pieces are placed it increases to 100. The speed at which the difficulty reaches a value of 100 is based on the difficulty scaling value. As the difficulty increases to 100 the obstacle and element frequency go from their starting frequencies to their ending frequencies.

3.4 Element Trail Game Environment

Each environment set piece was created independently of each other and arranged within the game world using procedural generation. Each tunnel piece was purposefully created with assets, lighting, and particle effects that amplify the thematic design. As the mine cart ride comes to an end, the player arrives at an underground train station. This station was created to enforce the concept that though the game is exciting and new for players, it is merely a part of ‘everyday life’ for the player’s pets.

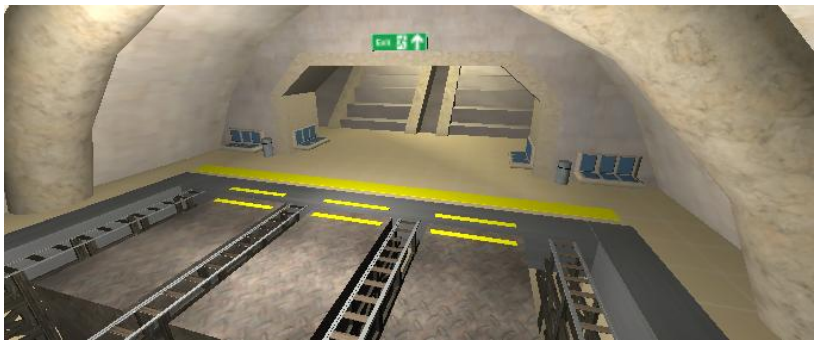


Figure 30: End Game Train Station

4. Postmortem

4.1 What Went Well

Overall, the project was very successful. Our team worked well together despite being divided into two smaller teams, and we were able to accomplish two fun and interesting games that included many of our design plans. We were also very fortunate to have professional game designers evaluate our progress and test our game. Not only did it provide valuable feedback, but it was also excellent exposure to the professional game industry.

4.2 What Went Wrong

In Mallet Kombat, too much priority was given to the creation of environmental areas of the arena, causing animations to be saved for later in the development process. This led to a feeling that the game was not going to be completed and in the game industry, may have been cut from production.

Jumping, blocking, and special attack effects for each mallet did not make it into Mallet Kombat from the original design. Originally elementals were also supposed to use mallets, but when it came time to animate the elementals it was clear that the mallet was designed more for the cat. So we went with a more natural feeling solution, which was to use the elemental's arms to attack and not have changing of mallets mid-game.

The Element Trail was able to have the majority of the planned features from the design. With procedural generation we thought making the art would be much easier as the artists only needed to make a few pieces that we would use over and over again. This turned out to be quite a challenge as art pieces that would otherwise be fantastic looked a little off because of how often they were generated one right after another.

The procedural generation was also not fully completed. We had plans for the tunnel to split in two and then rejoin later down the line giving the player a choice of going right or left. We had also planned for predefined sets of pieces that created interesting level sections to be placed along with individual tunnel pieces. These features of the procedural generations did not make it into the final version. We were however able to implement the procedural generation to an extent that satisfied our goals for a fun game.

Making universal turns that could connect to any other type of track was an unexpected problem in the artistic design of The Element Trail. Despite multiple iterations, getting different track turns that lined up when procedurally placed, took far too long to complete.

4.3 What We Would Do Differently

Even though we brought our games to a completely playable state there could still have been more features implemented and more polish done on both of the projects.

Time constraints prevented the completion of additional assets. Had the project been allotted more time, additional assets, such as ice obstacles as well as cosmetic ice for the water fountains, would have made the games more visually interesting. A less complicated lightning effect may also have been developed, making it possible to successfully include it in the metal environment. However, the time restriction also provided our team with a better understanding of the importance of time management to make deadlines in a professional environment.

4.4 Conclusions

Since we split into two separate groups fairly early on everyone was able to work independently. The split between the two teams enabled features and art to be completed quickly, since one game did not rely on the other. However, this did lead to a lack of documentation and formatting when coding. None of the code needed to be shared between the two games until the very end when we integrated the two games into a single executable. This meant that much of the code was not very extensible and eventually required much refactoring. It also meant that not much art was shared between the two games and that meant more art needed to be produced as a whole, which put a lot of strain on the artists.

The organization and timeframe of this project made it different than any group projects we had worked on in the past. We had, in essence, two groups making two games that are tied together by their themes and a bit of art. In the end, we were able to complete two full 3D game prototypes and put them together into a single product. All of this was completed in fourteen weeks, with four people working on the games with three advisors guiding us along the way.

Appendix A: Design Document

Mini-Game Ideas

Introduction

This document includes a pair of mini-game ideas for Tencent Boston's upcoming MMO created by students attending Worcester Polytechnic Institute.

Revision History

VERSION	DATE	CHANGE
v.1	9/6/2010	Document Created
v.2	9/9/2010	Update Mallet Combat
v.3	9/10/2010	Update Mine Cart Mini-Game
v.4	9/12/2010	Update Procedural Platformer,
v.5	9/16/2010	Update text/bullet balance in Mine Cart section
v.6	9/19/2010	Update Mallet Combat

Overview

Our team has envisioned two mini-games that will allow players to assume control of their pets and engage in fun and interesting challenges. All of these mini-games are intended to feature the player's pet, not the players themselves. Successful attempts at these challenges will yield certain rewards for the player, which could include elements or other in-game facilitators. For our purposes, our team has chosen to create two mini games with different mechanics, which can be adapted and expanded to provide multiple entertaining experiences.

Procedural Platformer on Rails

The platformer puts the pet into the "driver's seat" of a mine cart set on tracks that weave their way through a series of tunnels and environments. The tracks will be procedurally generated to give unique experiences each time the game is played. Track pieces or interesting and challenging sets of pieces will be continually added on to track the player is currently riding. On and around the track will be elements that the pet will be able to collect and upon completing a track, the pet will obtain a treasure. Throughout the course there will be splits in the track where the player can adjust the difficulty of the ride by traversing down different tunnels. This section explains the setting, gameplay, and art developments of this mini game.

2.1 The Environment

The pets will seek out elements and treasure underneath the Immortal City in the constantly shifting passageways. As they travel on, the tracks they will pass through regions touched by the five elements. In these regions elemental pieces will hang from the ceiling, spew from jets of steam or lava, or fly out in sparks from turning gears. Environmental specifications for each element are shown below:

- **Fire Locations**
    - Lava
    - Foundries
    - Boiler Room
- **Earth Locations**
    - Bedrock tunnels
    - Falling dirt
- **Metal Locations**
    - Machinery (grinding gears)
    - Pneumatic pistons
- **Water Locations**
    - Underground Rivers
    - Steam Tunnels
    - Boiler Room
- **Wood Locations**
    - Overgrown Ruins
    - Roots Systems hanging from the ceiling

2.2 The Gameplay

The pet's vehicle traverses down one of four parallel tracks . The player can hop between tracks by leaning and jumping to avoid obstacles and obtain collectables that are floating in the air, are on the tracks, or eject fromjets of steam, crumbling rock, etc. The tracks may sometimes split apart down different tunnels: one towards a tunnel of harder difficulty and one easier. Tunnels of harder difficulty will have the vehicle moving faster and be littered with

more obstacles and collectables. After awhile (TIME HAS YET TO BE DETERMINED) the pets ride will come to an end and they will obtain a larger reward.

2.2.3 Controls

This mini game utilizes a simple and effective control scheme that provides players with a longer range of motion to collect elements and avoid obstacles:

- Leaning
  - The player can lean left and right while in the cart. This will cause the cart to lean on way or the other and will put the cart on either the left or right two wheels.
- Jumping
  - The player can cause the vehicle to jump into the air
- Track switching
  - If the player jumps while leaning left or right the cart will hop over to a track that is adjacent to the track they are currently on.

2.2.4 Rewards

After completing a specific track, the pet will earn additional rewards. These rewards can include any of the following:

- Crafting materials
- Money
- Pet Accessories (hats or hat components)
  - A ribbon, 10 gallon jug, a baby cow -> Ten gallon hat
  - A (lead,copper,silver,gold,jade) Fez
- Consumables

- Potions
- Food/Cookies
- Arrows/Bullets/Knives

2.2.5 Collectables

During the game, there will be certain ‘collectables’ that are the main facet of this activity. As the player traverses the tracks, they will encounter these collectables and obtain them simply by colliding with them. There are three main gathering methods depending on where the collectables is positioned: objects in the center of a track can simply be collided with, objects above a track require the player to jump, and objects to the side of the two outside tracks can be reached by leaning. Though the primary collectable of this game is element pieces (as listed below), other collectables could also include:

- Elemental pieces
- Cart Accessories
  - Sweet Rims
  - A flag sticking out the back
  - Exhaust Pipes
  - Cool paint job
- Money

2.2.6 Obstacles

There are obstacles littering the mine track throughout the game. The player can avoid these by either jumping over them or taking a separate track around it (depending on the obstacle). Obstacles could include any of the following:

- Broken Track
- Rubble on the track
- Dead Ends
- Elementals crossing the track
- Overgrown Sections
- Lava/Steam jets
- Low Ceiling
- Ceiling and Wall Fans

2.2.7 Player driven difficulty

Aside from picking a track difficulty before the player begins their ride, they may also chose to go down more difficult sets of track in order to reap more rewards in the form of collectables.

Mallet Combat

Mallet Combat is a 3D mini-game where the player controls a pet competing for elements by knocking AI-controlled mini-elementals off of a pentagonal platform. In a game there are five elementals of each type with matching elemental themed mallets. At the beginning of each round the player is presented with the five elemental mallets each resting on a different section of the platform. The player clicks on a section/mallet to choose a starting area/mallet. The pet and the elementals all try to knock each other off of the platform. If the pet is the last one on the platform, the player wins.

When knocked off, each elemental gives off its elemental hammer as an optional pickup the player can pick up by walking into it. Each elemental also gives the player an element of its own type as well as any elements it has picked up from the arena. The mallet the player is carrying gives a bonus cluster of its own element for each opponent knocked off.

3.1 Controls and Camera

The camera is fixed on the arena at roughly a 45 degree angle. The followers follow the movement of the curser to walk around. The swing attack is left click, the pound attack is right click, and two keys that are commonly used in the main game are block and jump.

3.2 Weapons and Attacks

The mallets have two attacks: a direct swing at an opponent or a ground pound attack. The swing must hit an opponent directly, but will send the opponent flying a greater distance. The ground pound attack knocks back opponents a distance that is proportional to the distance from where the mallet strikes the ground (i.e. the closer an opponent is to a ground pound attack, the farther they will be pushed back). Blocking a swinging attack negates its effect. When knocked off, each elemental gives off its elemental hammer as an optional pickup the player can pick up by walking into it. Each elemental mallet has its own advantages, and is extra powerful against one particular element in accordance with "the controling (destructing) cycle (剋,克; kè)." A strategic player would pick up the hammer that is strong against whatever enemy he or she plans to attack next, or would base the choice off of what element he or she wants most, as the bonus from the hammer will provide an abundance of that element. The mallets are described below:

- **Wood**

  Every ground pound attack causes a sapling to spring from the ground with great force at an arbitrary point within the attack radius. This sapling will knock enemies a great distance if they are standing where it sprouts. Every hit causes a

splintering effect. All attacks against an opponent with an earth hammer knock that opponent extra far.

- **Fire**

  Swinging hits cause an additional area explosion that sends nearby enemies flying in addition to the opponent that gets hit directly. Ground pound attacks have increased power. Every hit causes an explosion effect. All attacks against an opponent with a metal hammer knock that opponent extra far.

- **Earth**

  Ground pound attacks cause a small temporary dirt sinkhole to form in the arena that enemies can fall into for five seconds. Every hit causes a flying dirt effect. All attacks against an opponent with a water hammer knock that opponent extra far.

- **Metal**

  If an opponent blocks a swinging attack, the opponent will be disarmed for five seconds, as their mallet is broken. Every hit has a 1/3 chance to stun an enemy for three seconds. Every hit causes a spark effect. All attacks against an opponent with a wood hammer knock that opponent extra far.

- **Water**

  Attacks cannot be blocked. Ground pound attacks cause a tsunami that extends to a radius greater than a normal ground pound attack. The wave carries opponents outward from the center. Every hit causes a splash effect. All attacks against an opponent with a fire hammer knock that opponent extra far.

Mallet Stats Table

Mallet	Swing Strength	Swing Special	Pound Strength	Pound Radius	Pound Special	Strength Vs. Hated Element	Hated Element
Wood	100%	n/a	100%	100%	Sprout Tree	150%	Earth
Fire	100%	Small area effect	120%	100%	n/a	150%	Metal
Earth	100%	n/a	100%	100%	Makes Sinkhole	150%	Water
Metal	100%	Disarms Blockers, 30% chance to stun	100%	100%	n/a	150%	Wood
Water	100%	Unblockable	100%	120%	Tsunami	150%	Fire

3.3 The Environment

The arena is pentagonal with a pentagram on its surface. The triangular points of the pentagram each represent a different element. Elements drop onto these triangular areas accordingly as pickups, and the player and the elementals try to get these. Each one of these elemental areas also has a themed hazard that will occasionally try to harm the competitors. Each one of these hazard has warning signs allowing the player to get out of the way in time. These hazards are outlined below:

- Wood
    - Hazard: A forest sprouts from the area, knocking competitors away.
    - Hazard warning: Rustling noise, bulging of the ground
- Fire
    - Hazard: Flames flare up, knocking competitors away.
    - Hazard warning: Glowing, fiery roaring and crackling
- Earth
    - Hazard: An earthquake knocks competitors away.

    - Hazard warning: Rumbling and shaking of the area

- Metal
    - Hazard: The entire segment mechanically jolts upward, knocking competitors away.
    - Hazard warning: Ticking, metallic clanging, and vibration of the area
- Water
    - Hazard: A wave washes across the area, knocking competitors away.
    - Hazard warning: The sound of waves breaking, and the water receding

Appendix B: Tech Document

Mallet Kombat!

Place Arena
Place player on chosen element point
Spawn waves of elementals
- Frequency based on time played
- Number spawned based on difficulty

Enemy AI
- Seek player
- Attack
- Move/Dodge left and right
- Block
- Only so many can seek the player at once?

On enemy death
- Spawn collectable elements at point where elemental leaves arena
- Spawn elemental hammer at point where elemental leaves arena

Collectable Elements
- If they roll off stage, they are moved to the middle of the arena
- Seek player when player is close

Finishing Screen
- Same as Mine Cart finish but pet is holding mallet

Sound – Mallet Combat
- SFX
    - Hammer swing
    - Ground pound
    - Knocked back
    - Fall off platform
    - Explode into skittles (elementals)
- Hazard Sounds
    - Fire
        - Roaring and crackling
        - Flare up
    - Wood
        - Rustling
        - Forest sprouting up?
    - Earth
        - Low rumble
        - Cracking of ground
    - Metal

        - Ticking and clanging
        - Swoosh upward
    - Water
        - Waves breaking
        - Large wave crash

The Element Trail (mine cart game)

Seed Random Number Generator
Algorithmic Generation

- Select Difficulty
- Determine subset of pieces and assembled sets based on difficulty to make up the course
- Generate track from random selection of subset
- As track length increase difficult pieces have a higher chance to be chosen

Generate Splines: The paths the mine cart will move on
Placement of physical track
Placement of Environment

- The tunnel
- Scenery
- Background elements and effects

Piece of Track

- Any number from 1 to 4 tracks
- All move in the same direction and turn at the same time
    - They can go up or down at different times individually but not turn in that fashion
- Unless it is a split piece where the tracks diverge (6)
    - 1 left, 1 right
    - 1 left, 2 right
    - 1 left, 3 right
    - 2 left, 2 right
    - 2 left, 1 right
    - 3 left, 1 right

Types of Track (9)

- Flat-Straight/Turn Left/Turn Right
- Incline-Straight/Turn Left/Turn Right
- Decline-Straight/Turn Left/Turn Right

Assembled Sets

- Instead of placing an individual piece we will also place sets of pieces in order to create interesting obstacles
- In this way we can have parts of a course that players are familiar with so every course is not just a completely random sequence

Collision

- The Player(mine cart) has sphere or box collider

- All the obstacles will also have sphere or box colliders
- On collision player will be placed back on the track several pieces behind where they hit the obstacle
- The collectable elements can also be collided with and will be removed

Finish Screen

- Camera moves to new scene with pet outside of the cart
- Camera slowly rotates around the happy pet
- Pet is surrounded my 5 piles of elements, one pile for every type
- Piles are relative in size to the number they collected
- Finish dialogue is printed on screen displaying stats of the cart run
    - Elements collected, obstacles hit, time, etc.

Leaning

- The player can lean the cart left or right
- The model turns so that the cart is riding on two wheels
- While leaning the player can collect elements on tracks adjacent to the one they are riding on or elements not on a track to the far right or left

Jumping

- The player can make the cart jump
- When the player is leaning and they try to jump the cart will hop over to a track to the left or right depending on which way they were leaning
- The player can collect elements while jumping

Control Limitations

- You can only jump from one track to another when both tracks are at the same height level
- You will not switch tracks when you are on a track all the way to the left or right and are leaning and jumping left or right respectively.

Sound

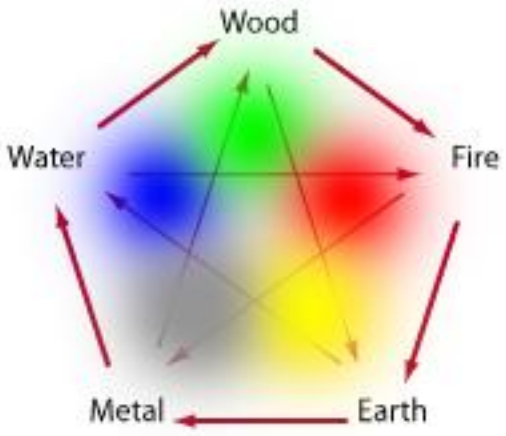
- SFX
    - Travelling down track
    - Leaning (grinding on 2 wheels)
    - Jumping from track to track
    - Collecting elements
    - Jumping to avoid obstacles
    - Falling/Landing
    - Turning (similar grinding to leaning)
- Ambient
    - Water Drops
    - Steam pipes rattling
    - Steam flowing out of broken pipes
    - Animals?
    - Fire crackling
    - Low rumbling
- Other
    - Victory
    - Failure

Appendix C: Art Document

Mallet Combat Art Assets

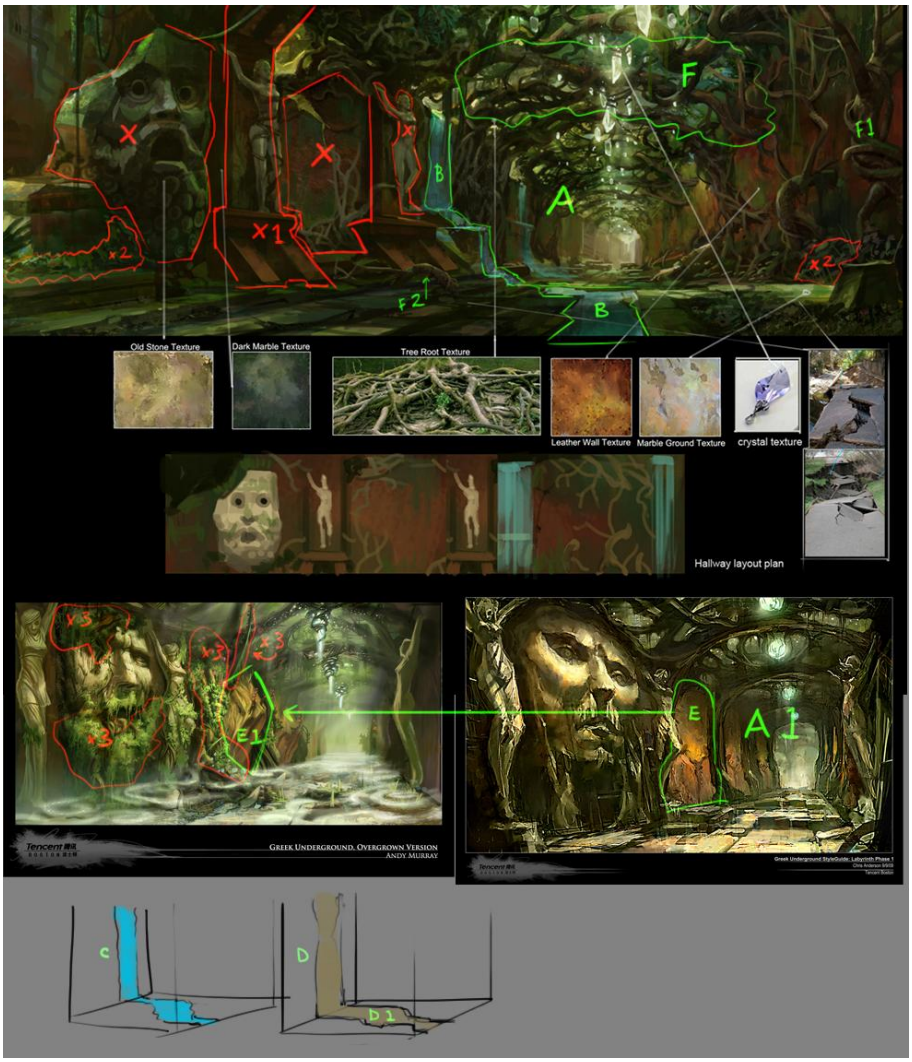
- CORE (HAS to be)
    - MODELS
        - Environment
            - Arena

              A raised stone pentagonal column with the pentagram of the elements engraved into it. The triangular areas on the pentagram are each made up of and representative of one of the elements.



                - Wood area – some wood planks over grassy ground with roots
                - Fire area – a grill over a pit of flames
                - Earth area – dirt, rocks
                - Metal area – metal grating over clockwork
                - Water area – pool of water
            - Surroundings

This would be a large pentagonal chamber housing the arena, styled similarly to the concept seen below in that it is wild, overgrown, and features the elemental motifs (it may have less old statues due to time constraints):



- Mallets

  The oversized mallets are roughly half the size of the pets, and there is one themed for each element. Each mallet will differ in its texture.

- Pet

  A model of "Hammer Cat" as seen in this concept will be used as the player for the prototype:

- Mini elementals

  Models would be a little larger than pets. There would be a different texture for each element.

- ANIMATIONS
  - Pet
    - Idle
    - Walk
    - Swing
    - Pound
    - Knocked back (flailing)
    - Getting back up
  - Elemental
    - Hover
    - Swing

- Pound
- Knocked back (flailing)
- Getting back up

- REQUIRED (SHOULD be)
    - MODELS
        - Models for mallet animations
            - Wood
                - Splinter particles
                - Tree
            - Fire
                - Fire particles
                - Wave of fire
            - Earth
                - Dirt clump particles
                - Sinkhole
            - Metal
                - Spark particles
                - Stunned halo of stars
            - Water
                - Water droplet particles
                - Tsunami
    - ANIMATIONS
        - Mallet
            - Hit effects
                - Wood – splintering

        - Fire – explosion
        - Earth – dirt
        - Metal – spark
        - Water – splash
    - Swing specials
        - Fire – larger explosion
        - Metal – disarm
        - Metal – stun
            - Pet
            - Elemental
    - Pound specials
        - Wood – sprout tree
        - Wood – make sinkhole
        - Water – make tsunami
- Environment
    - Wood
        - Hazard – A forest sprouts from the area, knocking competitors away.
        - Hazard warning – Rustling noise, bulging of the ground
    - Fire
        - Hazard – Flames flare up, knocking competitors away.
        - Hazard warning – Glowing, fiery roaring and crackling
    - Earth
        - Hazard – An earthquake knocks competitors away.
        - Hazard warning – Rumbling and shaking of the area

- Metal
    - Hazard – The entire segment mechanically jolts upward, knocking competitors away.
    - Hazard warning – Ticking, metallic clanging, and vibration of the area
- Water
    - Hazard – A wave washes across the area, knocking competitors away.
    - Hazard warning – The sound of waves breaking, and the water receding

- IF THERE'S TIME (COULD for added effect)
    - MODELS
        - Statues for background as seen in the surroundings concept on page 2.
    - ANIMATIONS
        - Victory dance
    - OTHER
        - Framing image for website.

Element Trail Art Assets

- CORE (HAS to be)
    - MODELS
        - Mine Cart

        - Tracks
            - Straight

            - Downward/upward
            - Left curve/right curve

            - Split track (2 go left, 2 go right)
            - Tunnel

- Collectables: Element Orbs

  SCALE:

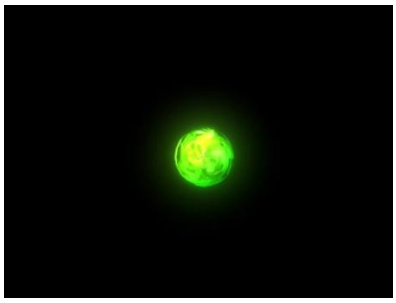
  - Fire

  - Earth

  - Metal

- Water

- Wood



- Obstacles
  - Rock
  - Track end/hole

- ANIMATIONS
  - Forward rattle
  - Element bob

        - Element collection

- REQUIRED (SHOULD be)
    - Environmental adds
        - Fire
            - Lava
            - Foundries
        - Earth
            - Falling rocks/dirt
        - Metal
            - Gears
            - Pistons
        - Water
            - Underground rivers
            - Steam vents
        - Wood
            - Roots
            - Knotted trees
            - Undergrowth
- IF THERE'S TIME (COULD for added effect)
    - Element animal heads as tunnel entrances
    - Customizable features (rims, paint jobs, exhausts, etc.)
    - Pet accessories (hats, sunglasses, etc.)
    - Browser Design
    - Pet victory dance

Appendix D: Art Asset Lists

Mallet Kombat:

Models

Name	Filename	Model %	UV Mapping	Textures	Normal Mapping	Exported	Total % Complete	Owner
Core								
Hammer Cat	catV3.unitypack	100	100	100	100	100	100%	Sam
Mallets	MC_Hammer.ur	100	100	100	100	100	100	Sam
Neutral	NA	NA	NA	NA	NA	NA	NA	NA
Fire	MC_Hammer.ur	100	100	100	100	100	100	Sam
Water	MC_Hammer.ur	100	100	100	100	100	100	Sam
Metal	MC_Hammer.ur	100	100	100	100	100	100	Sam
Wood	MC_Hammer.ur	100	100	100%	100	100	100%	Sam
Earth	MC_Hammer.ur	100	100	100	100	100	100	Sam
Elemental	elementalNoFX	100	100	100	100	100	100	Sam
Water	elementalNoFX	100	100	100	100	100	100	Sam
Fire	elementalNoFX	100	100	100	100	100	100	Sam
Earth	elementalNoFX	100	100	100	100	100	100	Sam
Wood	elementalNoFX	100	100	100	100	100	100	Sam
Metal	elementalNoFX	100	100	100	100	100	100	Sam

Effects

Name	Files	Textures	Integrated	Total % Complete	Owner
Required					
Leaf Particles		100	100	100	Sam/Elliot
Brambles	brambleAnimat	100	100	100	Sam
Fire Particles		100	100	100	Sam/Elliot
Fire Mesh	firePyramid.uni	100	100	100	Sam
Sand Particles	sandParticle.pn	100		50	Sam
Sinkhole	NA	NA	NA	NA	NA
Spark Particles		100	100	100	Elliot
Stuned Halo of Stars	NA	NA	NA	NA	NA
Water Droplet Particles		100	100	100	Sam/Elliot
Tsunami	waveAnimatior	100	100	100	Sam

Environments

Name	Filename	Concepts	UV Mapping	Diffuse Map	Normal Map	Exported	Total % Complete	Owner
Core								
Arena								
Wood Area	woodArea.unitypackage		100	100	100	100	100	Sam
Fire Area	fireAreaV3.unitypackage		100	100	100	100	100	Sam
Earth Area	earthArea.unitypackage		100	100	100	100	100	Sam
Metal Area	metalArea.unitypackage		100	100	100	100	100	Sam
Water Area	waterArea.unitypackage		100	100	100	100	100	Sam
Neutral Area	neutralArena.unitypackage		100	100	100	100	100	Sam
Required								
Wood								
Hazard	brambleAnimation.unitypackage					100	100	Sam
Hazard Warning	NA	NA	NA	NA	NA	NA	NA	NA
Fire								
Hazard	firePyramid.unitypackage					**100**	100	Sam
Hazard Warning	NA	NA	NA	NA	NA	**NA**	NA	**NA**
Earth								
Hazard								
Hazard Warning	NA	NA	NA	NA	NA	**NA**	NA	NA
Metal								
Hazard							100	Elliot
Hazard Warning	NA	NA	NA	NA	NA	**NA**	NA	NA
Water								
Hazard	waveToBePlayedReverse.unitypackage					**100**	100	**Sam**
Hazard Warning	NA	NA	NA	NA	NA	NA	NA	NA

Animations

Name	Filename	Rigged	Imported	Total % Complete	Owner
Core					
Pet					
Idle	allCatAnimatio	100	100	100	Sam
Walk	allCatAnimatio	100	100	100	Sam
Swing	allCatAnimatio	100	100	100	Sam
Pound	allCatAnimatio	100	100	100	Sam
Knocked Back (in air)	NA	NA	NA	NA	NA
Knocked Down (on ground)	allCatAnimatio	100	100	100	Sam
Getting Back up	allCatAnimatio	100	100	100	Sam
Elemental					
Hover	AllElementalAni	100	100	100	Sam
Swing	AllElementalAni	100	100	100	Sam
Pound	AllElementalAni	100	100	100	Sam
Knocked Back (in air)	NA	NA	NA	NA	NA
Knocked Down (on ground)	AllElementalAni	100	100	100	Sam
Getting Back up	AllElementalAni	100	100	100	Sam

Element Trail:

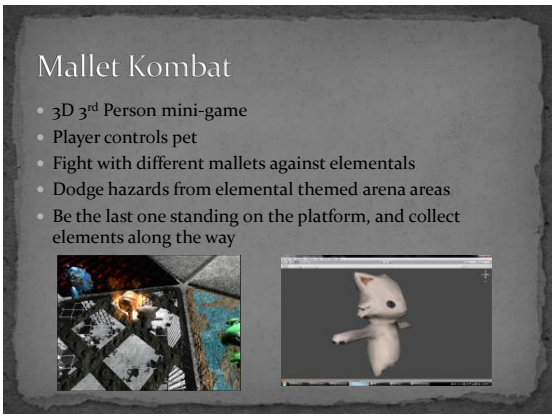
Models								
Name	**Filename**	**Model %**	**UV Mapping**	**Textures**	**Normal Mapping**	**Exported**	**Total % Complete**	**Owner**
Core								
Mine Cart	minecart_10-5-10.unitypackage	**100%**	100%	100%	100%	100%	100%	Ashley
Tracks with Supports	--	**--**	--	--	--	--	--	--
Straight Track	track_straightANDsupport_11-9-10.unitypackage	**100%**	100%	100%	100%	100%	100%	Ashley
Track Curve 1 (inside)	track_curve1+supports_12-9-10.unitypackage	**100%**	100%	100%	100%	100%	100%	Ashley
Track Curve 2	track_curve2+supports_12-9-10.unitypackage	**100%**	100%	100%	100%	100%	100%	Ashley
Track Curve 3	track_curve3+supports_12-9-10.unitypackage	**100%**	100%	100%	100%	100%	100%	Ashley
Track Curve 4 (outside)	track_curve4+supports_12-9-10.unitypackage	**100%**	100%	100%	100%	100%	100%	Ashley
Track1/2 Up	track_half_upANDsupport_11-15-10.unitypackage	**100%**	100%	100%	100%	100%	100%	Ashley
Track 1/2 Down	track_half_downANDsupport_11-15-10.unitypackage	**100%**	100%	100%	100%	100%	100%	Ashley
Element Orbs	--	**--**	--	--	--	--	--	--
Earth	element_earth.unitypackage	**100%**	100%	100%	100%	100%	100%	Ashley
Fire	element_fire.unitypackage	**100%**	100%	100%	100%	100%	100%	Ashley
Metal	element_metal.unitypackage	**100%**	100%	100%	100%	100%	100%	Ashley
Water	element_water.unitypackage	**100%**	100%	100%	100%	100%	100%	Ashley
Wood	element_wood.unitypackage	**100%**	100%	100%	100%	100%	100%	Ashley
Obstacles	--	**--**	--	--	--	--	--	--
Track Hole/End	obs_trackhole1_long_11-22-10.unitypackage	**100%**	100%	100%	100%	100%	100%	Ashley
Earth Track	obs_earth+track_11-20-10.unitypackage	**100%**	100%	100%	100%	100%	100%	Ashley
Earth Standalone	obs_earth+standalone_11-20-10.unitypackage	**100%**	100%	100%	100%	100%	100%	Ashley
Fire Track	obs_fire+track_11-22-10.unitypackage	**100%**	100%	100%	100%	100%	100%	Ashley
Wood Track	obs_wood+track_11-22-10	**100%**	100%	100%	100%	100%	100%	Ashley
Generic Pipe	pipe_straight+floor_10-12-10	**100%**	100%	100%	100%	100%	100%	Ashley
Pipe Curve	pipe_curve_11-22-10.unitypackage	**100%**	100%	100%	100%	100%	100%	Ashley

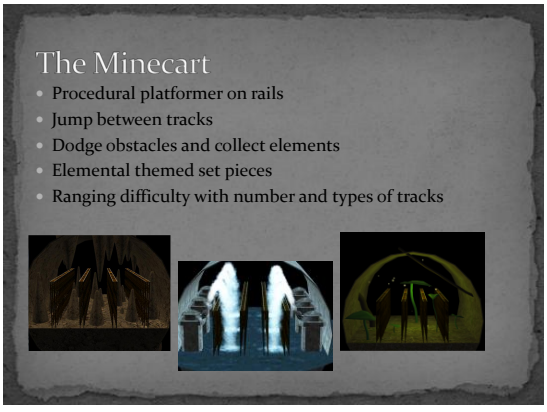
Environments								
Name	**Filenames**	**Concepts/Model**	**UV Mapping**	**Textures**	**Normal Mappings**	**Exported**	**Total % Complete**	**Owner**
Core								
Water	env_water1_11-9-10.unitypackage	--	--	--	--	--	--	--
Pipe Piece	pipe_water_11-8-10.fbx	**100%**	100%	100%	100%	100%	100%	Ashley
Turtle Fountain	env_water_turtlefountain.mb	**100%**	100%	100%	100%	100%	100%	Ashley
Water	env_water1_11-9-10.unitypackage	**100%**	100%	100%	100%	100%	100%	Ashley
Fountain (part.effect)	env_water1_11-9-10.unitypackage	**100%**	*N/A*	*N/A*	*N/A*	100%	100%	Ashley
Splash (part Effect)	env_water1_11-9-10.unitypackage	**100%**	*N/A*	*N/A*	*N/A*	100%	100%	Ashley
Wood	env_wood_11-29-10.unitypackage	--	--	--	--	--	--	--
Pipe Piece	pipe_wood_12-4-10.fbx	**100%**	100%	100%	100%	100%	100%	Ashley
Roots	pipe_wood_12-4-10.fbx	**100%**	100%	100%	100%	100%	100%	Ashley
Leaf Plant	pipe_wood_12-4-10.fbx	**100%**	100%	100%	100%	100%	100%	Ashley
Flower	pipe_wood_12-4-10.fbx	**100%**	100%	100%	100%	100%	100%	Ashley
Fireflies (part. Effect)	env_wood_11-29-10.unitypackage	**100%**	*N/A*	*N/A*	*N/A*	100%	100%	Ashley
Fire	env_fire1_11-16-10.unitypackage	--	--	--	--	--	--	--
Pipe Piece	pipe_fire_11-11-10.fbx	**100%**	100%	100%	100%	100%	100%	Ashley
Volcano	env_fire_volcano.mb	**100%**	100%	100%	100%	100%	100%	Ashley
Phoenix Cauldron	**??????.FBX**	**100%**	100%	100%	100%	100%	100%	Ashley
Volcano Smoke (part.effect)	env_fire1_11-16-10.unitypackage	**100%**	100%	100%	100%	100%	100%	Ashley
Volcano Errupt (part. Effect)	env_fire1_11-16-10.unitypackage	**100%**	100%	100%	100%	100%	100%	Ashley
Fire (part. Effect)	env_fire1_11-16-10.unitypackage	**100%**	100%	100%	100%	100%	100%	Ashley
Earth	env_earth_pipe1_11-7-10.unitypackage	--	--	--	--	--	--	--
Pipe Piece	pipe_earth_11-27-10.unitypackage	**100%**	100%	100%	100%	100%	100%	Ashley
Stalagtite/stalamite	env_earth_11-7-10.unitypackage	**100%**	100%	100%	100%	100%	100%	Ashley
Metal	env_metal_pipe1_11-22-10.unitypackage	--	--	--	--	--	--	--
Pipe Piece	pipe_metal_12-3-10.unitypackage	**100%**	100%	100%	100%	100%	100%	Ashley
Metal Spires	env_metal_pipe1_11-22-10.unitypackage	**100%**	100%	100%	100%	100%	100%	Ashley
Chains	env_metal_pipe1_11-22-10.unitypackage	**100%**	100%	100%	100%	100%	100%	Ashley
End Train Station	env_game-end_12-13-10	**100%**	100%	100%	100%	100%	100%	Ashley
Transitions	--	--	--	--	--	--	--	--
Earth+Fire	trans_earth+fire_11-27-10.unitypackage	**100%**	100%	100%	100%	100%	100%	Ashley
Earth+Metal	trans_earth+metal_11-28-10.unitypackage	**100%**	100%	100%	100%	100%	100%	Ashley
Earth+Water	trans_earth+water_11-29-10.unitypackage	**100%**	100%	100%	100%	100%	100%	Ashley
Earth+Wood	trans_earth+wood_11-28-10.unitypackage	**100%**	100%	100%	100%	100%	100%	Ashley
Fire+Metal	trans_fire+metal_11-27-10.unitypackage	**100%**	100%	100%	100%	100%	100%	Ashley
Fire+Water	trans_fire+water_11-27-10.unitypackage	**100%**	100%	100%	100%	100%	100%	Ashley
Metal+Water	trans_metal+water_11-28-10.unitypackage	**100%**	100%	100%	100%	100%	100%	Ashley
Metal+Wood	trans_metal+wood_11-29-10.unitypackage	**100%**	100%	100%	100%	100%	100%	Ashley
Water+Wood	trans_water+wood_11-28-10.unitypackage	**100%**	100%	100%	100%	100%	100%	Ashley
Wood+Fire	trans_wood+fire_11-27-10.unitypackage	**100%**	100%	100%	100%	100%	100%	Ashley

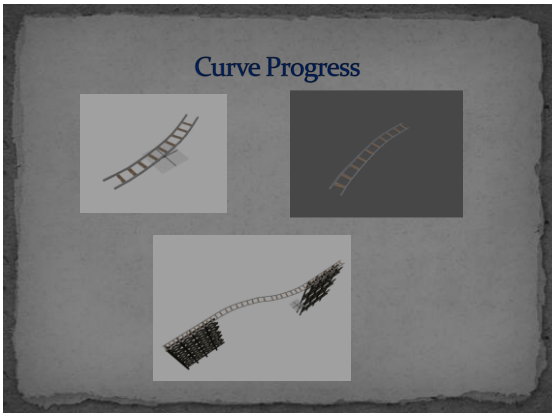
Other			
Name	**Filenames**	**Total % Complete**	**Owner**
Core			
Animations	--	**--**	--
Idol	catAnim_idol_11-26-10.unitypackage	**100%**	Ashley
Lean Left	catAnim_leanLeft_11-26-10.unitypackage	**100%**	Ashley
Lean Right	catAnim_leanRight_11-26-10.unitypackage	**100%**	Ashley
Crash 'OK'	catAnim_crashOK_11-26-10	**100%**	Ashley
GUI: Mallet Kombat	--	**--**	--
Title	MK_UI2_title.tiff	**100%**	Ashley
Choose Mallet	MK_UI2_choosemallet.tiff	**100%**	Ashley
Fire (static)	MK_UI2_fire.tiff	**100%**	Ashley
Fire (mouseover)	MK_UI2_fire_mouseover.tiff	**100%**	Ashley
Fire (clicked)	MK_UI2_fire_clicked.tiff	**100%**	Ashley
Earth (static)	MK_UI2_earth.tiff	**100%**	Ashley
Earth (mouseover)	MK_UI2_earth_mouseover.tiff	**100%**	Ashley
Earth (clicked)	MK_UI2_earth_clicked.tiff	**100%**	Ashley
Metal (static)	MK_UI2_metal.tiff	**100%**	Ashley
Metal (mouseover)	MK_UI2_metal_mouseover.tiff	**100%**	Ashley
Metal (clicked)	MK_UI2_metal_clicked.tiff	**100%**	Ashley
Water (static)	MK_UI2_water.tiff	**100%**	Ashley
Water (mouseover)	MK_UI2_water_mouseover.tiff	**100%**	Ashley
Water (clicked)	MK_UI2_water_clicked.tiff	**100%**	Ashley
Wood (static)	MK_UI2_wood.tiff	**100%**	Ashley
Wood (mouseover)	MK_UI2_wood_mouseover.tiff	**100%**	Ashley
Wood (clicked)	MK_UI2_wood_clicked.tiff	**100%**	Ashley
Fight! (static)	MK_UI2_fight.tiff	**100%**	Ashley
Fight! (mouseover)	MK_UI2_fight_mouseover.tiff	**100%**	Ashley
Fight! (clicked)	MK_UI2_fight_clicked.tiff	**100%**	Ashley
You Fell	YouFell.tiff	**100%**	Ashley
GUI: Element Trail	--	**--**	--
Title	ET_UI2_title.tiff	**100%**	Ashley
Choose Difficulty	ET_UI2_chooseDifficulty.tiff	**100%**	Ashley
Very Easy (static)	ET_UI2_veryEasy.tiff	**100%**	Ashley
Very Easy (mouseover)	ET_UI2_veryEasy_mouseover	**100%**	Ashley
Very Easy (clicked)	ET_UI2_veryEasy_clicked.tiff	**100%**	Ashley
Easy (static)	ET_UI2_easy.tiff	**100%**	Ashley
Easy (mouseover)	ET_UI2_easy_mouseover.tiff	**100%**	Ashley
Easy (clicked)	ET_UI2_easy_clicked.tiff	**100%**	Ashley
Normal (static)	ET_UI2_normal.tiff	**100%**	Ashley
Normal (mouseover)	ET_UI2_normal_mouseover.tiff	**100%**	Ashley
Normal (clicked)	ET_UI2_normal_clicked.tiff	**100%**	Ashley
Hard (static)	ET_UI2_hard.tiff	**100%**	Ashley
Hard (mouseover)	ET_UI2_hard_mousevoer.tiff	**100%**	Ashley
Hard (clicked)	ET_UI2_hard_clicked.tiff	**100%**	Ashley
Very Hard (static)	ET_UI2_veryHard.tiff	**100%**	Ashley
Very Hard (mouseover)	ET_UI2_veryHard_mouseover.tiff	**100%**	Ashley
Very Hard (clicked)	ET_UI2_veryHard_clicked_tiff	**100%**	Ashley
Begin! (static)	ET_UI2_begin.tiff	**100%**	Ashley
Begin! (mouseover)	ET_UI2_begin_mouseover.tiff	**100%**	Ashley
Begin! (clicked)	ET_UI2_begin_clicked.tiff	**100%**	Ashley
You Crashed	YouCrash.tiff	**100%**	Ashley

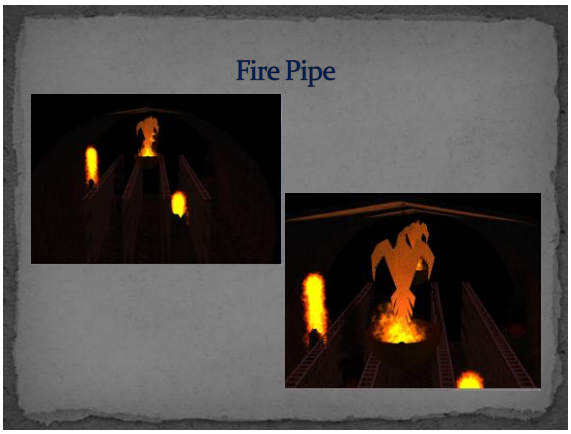
Appendix E: Progress Report Presentations

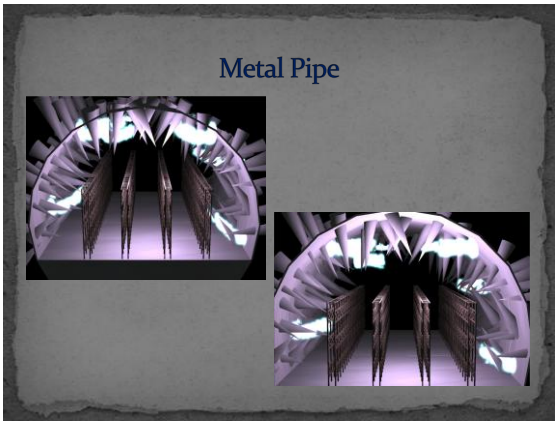
November 16, 2010



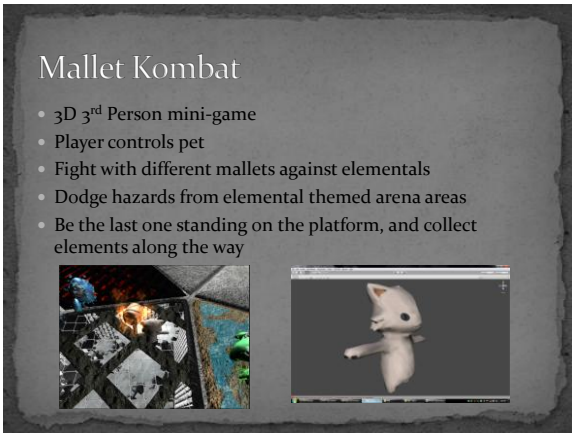








November 24, 2010



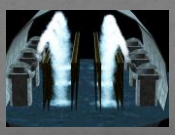
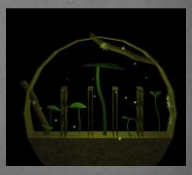
Mallet Kombat: New This Week (11/23/10)

Cat Animations

- Swing
- Ground pound
- Walk
- Idle

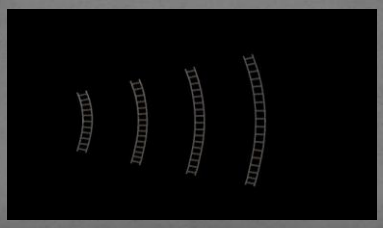
The Minecart

- Procedural platformer on rails
- Jump between tracks
- Dodge obstacles and collect elements
- Elemental themed set pieces
- Ranging difficulty with number and types of tracks

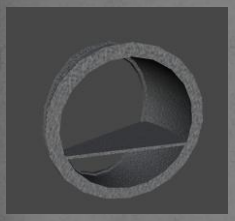
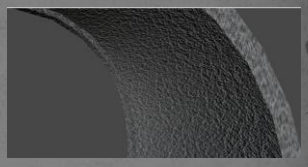




The Minecart: New This Week (11/23/10)

Curves

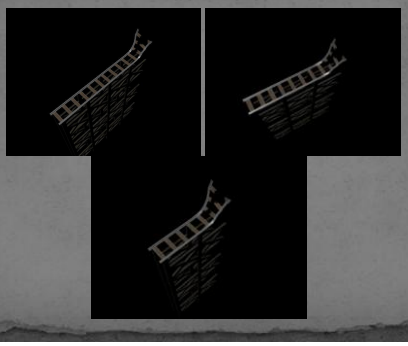


Curved Pipe

Obstacles

Track Holes

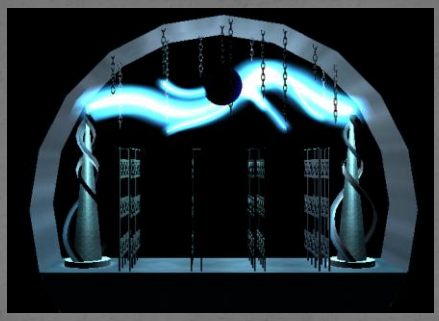


Track Obstructions




Fire Environment

Metal Environment



November 30, 2010

Mallet Kombat & The Minecart

Week 10 Progress Report
Tech : Elliot Brodzki and Gage Fleischer
Art : Ashley McGuane and Sam Rogers
Advisors: Dean O'Donnell and Robert Lindeman

Mallet Kombat

- 3D 3rd Person mini-game
- Player controls pet
- Fight with different mallets against elementals
- Dodge hazards from elemental themed arena areas
- Be the last one standing on the platform, and collect elements along the way

Mallet Kombat: New This Week (12/1/10)

New and Improved Animations!

Elemental
- Hover
- Swing
- Pound
- Knocked-Down
- Get-Up

Cat
- New Swing
- New Pound
- New Walk
- Knocked-Down
- Get-Up

Mallet Kombat: New This Week (12/1/10)

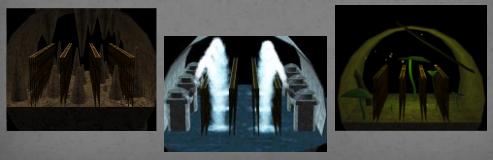
Hazards

- Fire Grate
- Water Wave
- Growing Brambles
- Giant Rotating Gear

Unity Pro Integration!

The Minecart

- Procedural platformer on rails
- Jump between tracks
- Dodge obstacles and collect elements
- Elemental themed set pieces
- Ranging difficulty with number and types of tracks

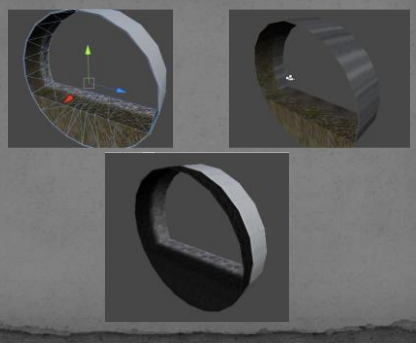


The Minecart: New This Week (12/1/10)

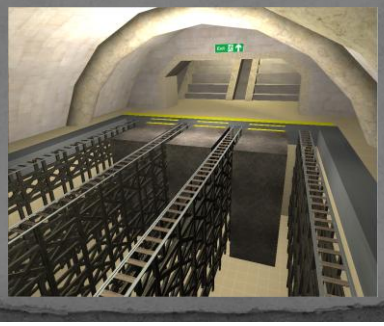
Cat Animations

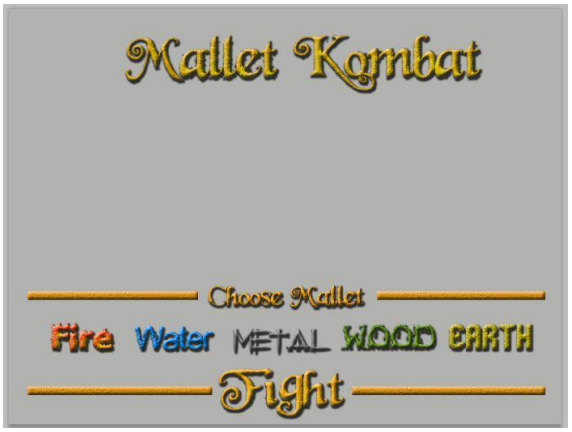
- Idle
- Lean Left
- Lean Right
- Crash 'OK'

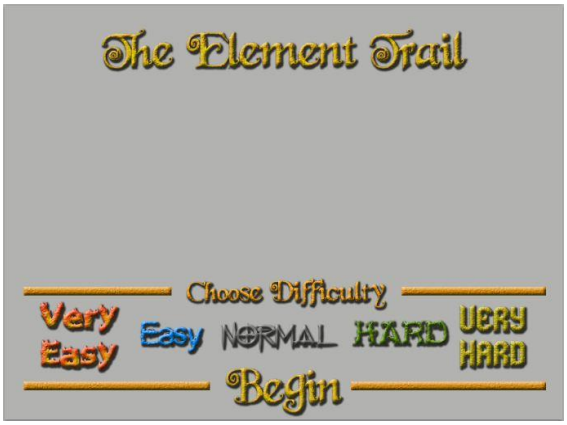
Transitions



Track End Station







December 7, 2010

Mallet Kombat: New This Week (12/7/10)

Reworked Hazards

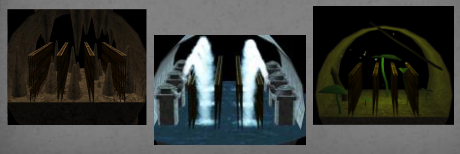
•Fire
•Water Wave

Changes in Round Design

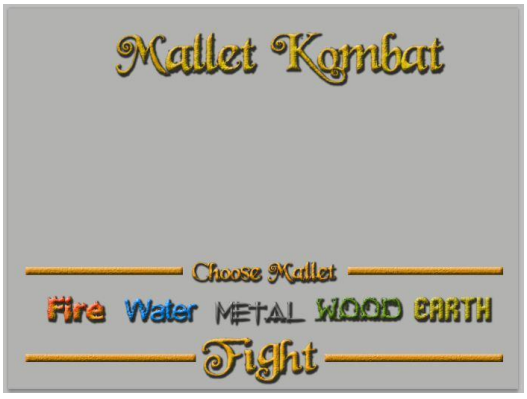
•Advance against harder Elementals or leave with currently gathered orbs

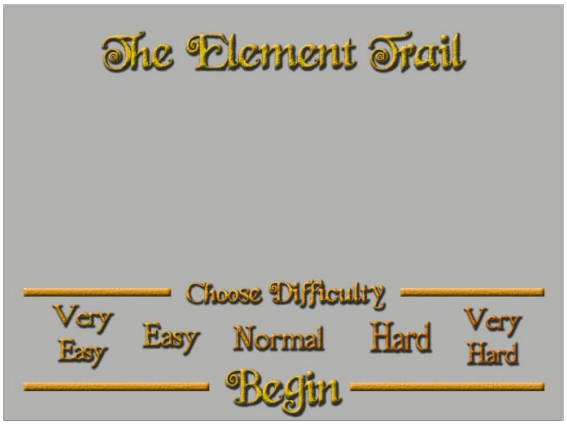
The Minecart

- Procedural platformer on rails
- Jump between tracks
- Dodge obstacles and collect elements
- Elemental themed set pieces
- Ranging difficulty with number and types of tracks



The Minecart: New This Week (11/29/10)






Very Easy
Easy
Normal
Hard
Very Hard
Very Easy
Easy
Normal
Hard
Very Hard
Very Easy
Easy
Normal
Hard
Very Hard
Begin
Begin
Begin


You Win!
Press ENTER to Return to Main Menu
You Fell
Half of your orbs were lost!
Press ENTER to Return to Main Menu
You Crashed!
Press ENTER to Return to Main Menu

Appendix F: References

Lacy, Sarah. "What Valley Companies Should Know about Tencent." *TechCrunch*. Web. 07 Jan. 2011. <http://techcrunch.com/2010/06/20/what-valley-companies-should-know-about-tencent/>.

www.unity3d.com – Unity's site that contains reference material for everything unity can do

www.unifycommunity.com – technical reference unity scripts

www.freesounds.org –free sounds and music were used from the site and used in both games

1001Fonts.com – Fonts used for GUI

Title/Menu Font: Beyond Wonderland

General Text: Vtks Deja Vu

Water: Wasser

Fire: Firestarter2

Wood: Swamp Funk

Earth: Mummification