

The Development of Wuu Shyng

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Abstract — *The game of Wuu Shyng has the player go through 5 biomes that represent the 5 Movements in Chinese culture: Earth, Metal, Water, Wood, and Fire. The biomes consist of mazes where creatures live. These creatures are both innate users of martial arts and forces of nature. The player allies himself with these creatures and engages in battle with other creatures. The ruler of the biome resides at the end of each maze. The goal of the game is the eventual defeat or alliance of all 5 ruler creatures. Knowledge of how each of the five movements interact with each other is foundational to the entire game, especially in the battles. The main inspiration of this game is Pokémon, though elements from other games also appear in Wuu Shyng. The game is written through the LÖVE framework in the Lua language and can be run in many desktop, mobile, and console platforms. Wuu Shyng is free and open source software.*

Key Terms — *Biome, Creature, Movement, Wuu Shyng.*

INTRODUCTION

Wuu Shyng is intended to be a free-and-open-source clone of the *Pokémon* game series. The game series also had a trainer leave his house and travel a world filled with creatures (the titular Pokémon) that have natural and supernatural abilities. Other than collecting Pokémon, the trainer went to towns over his country, defeating Gym Leaders (professional Pokémon trainers) and eventually gaining access to the Pokémon League. The trainer even thoroughly defeated a villainous team along the way. He then fought and defeated the Elite Four and Champion.

The games kept themselves fresh each new game console through the addition of new lands and, therefore, new Pokémon. However, while the

mechanics behind the games have had gotten tweaks and inclusions each generation, the games have been cementing themselves recently into a predictable pattern, alienating some fans of the series. Junichi Masuda, composer and game director of the series, justifies this pattern by comparing *Pokémon* to basketball; both games had their rules tweaked but core mechanics remain the same [1]. However, the games stuck too closely to the pattern set by the games; many 'beats' in the plot remain the same, giving one example. Many fans, therefore, made their own works (stories, art, comic strips and books, and even fangames and modifications of the official games) that had plots that are vastly different from the ones set in the official games. Fangames and modifications are of special note here; they might instead change up the country and Pokémon or simply the mechanics. One extraordinary case was *Pokémon Evoas*, a fangame that, in addition to having an entirely new plot that involves the existing Pokémon characters, remixed the game mechanics into a stronger game that still remained loyal to the core ideas behind the original *Pokémon* games. Unfortunately, despite the heavy fan following, Nintendo's lawyers ordered Mark Radocy, the maker of the fangame, to take down *Pokémon Evoas* due to the infringement of intellectual property that *Pokémon Evoas* had caused. [2]

Wuu Shyng would instead have a free license. More specifically, all assets in the game shall be under either the GNU Public License 3 (GPL3) or a Creative Commons Attribution-Share Alike (CC-BY-SA) license. These permit the users to not only use the game and related assets but also modify, share, and even sell the game and assets. Despite the possible loss of profit from this technique, the wider and stronger fan support of the games would more greatly reward that fans and provide a greater

benefit overall. Another benefit would be that the fans may continue to expand upon *Wuu Shyng* without legal trouble even if official support ceased.

DESIGN

A familiarity with the concept of the Five Movements is necessary behind the understanding of the concepts of the game. The Five Movements are officially called “五行” when using either simplified or traditional Chinese characters, “Wǔ Xíng” when using the Hanyu Pinyin romanization, or “Wuu Shyng” when using the Gwoyeu Romatzyh romanization. The concept of the Five Movements says that “chi” manifests itself in five physical forms: Earth, Metal, Water, Wood, and Fire. [3]



Figure 1
The Five Movements

The more commonly-known Greek Classical Elements, that is, earth, water, wind, fire, and sometime aether, mainly deal with the physical and sometimes alchemical properties of the elements. However, the Chinese Five Movements put a greater emphasis on both the chi behind the movements and the interactions between the movements instead on the material form of the chi. Indeed, one fundamental concept of the Five Movements is the cycles that explain the interactions between each physical form of chi. One of these cycles is the “enhancing cycle” where one movement feeds and therefore enhances another:

Earth enhances Metal which enhances Water which enhances Wood which enhances Fire which enhances Earth. Here, a movement strengthens the chi of another; giving one example: if you water a tree (which is the source of wood), the tree grows strong. [3]

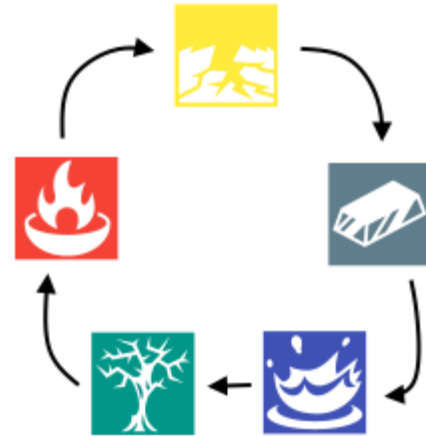


Figure 2
The Enhancing Cycle

Reversing the “enhancing cycle” forms the “weakening cycle”: Earth weakens Fire which weakens Wood which weakens Water which weakens Metal which weakens Earth. In this case, the water would rust the metal. [3]

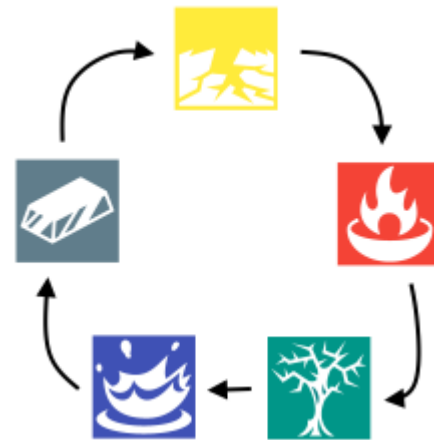


Figure 3
The Weakening Cycle

Another cycle is the “controlling cycle”: Earth weakens Water which weakens Fire which weakens Metal which weakens Wood which weakens Earth. Extending the Water example, water would extinguish a fire.

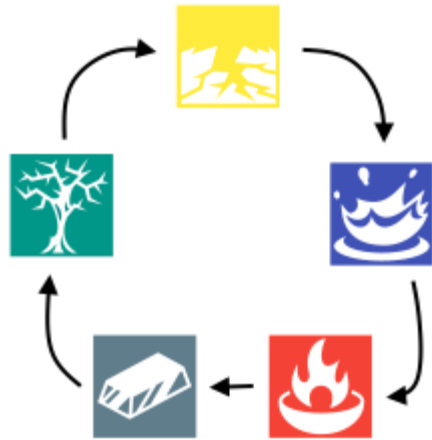


Figure 4
The Controlling Cycle

The Five Movements form a foundational concept of Chinese Culture: the Five Movements are used in all types of areas: from medicine to music. Relevant categorizations include the following:

- Direction [4]
 - **Earth:** Middle
 - **Metal:** Right
 - **Water:** Down
 - **Wood:** Left
 - **Fire:** Up
- Color (used in *Wuu Shyng*) [3]
 - **Earth:** Yellow
 - **Metal:** Silver
 - **Water:** Indigo
 - **Wood:** Teal
 - **Fire:** Red
- Season [5]
 - **Earth:** Transition or Late Summer
 - **Metal:** Autumn
 - **Water:** Winter
 - **Wood:** Spring
 - **Fire:** (Early) Summer
- Weather [5]
 - **Earth:** humid
 - **Metal:** dry
 - **Water:** cold
 - **Wood:** windy
 - **Fire:** hot

- Emotion [5]
 - **Earth:** Meditation
 - **Metal:** Sadness
 - **Water:** Fear
 - **Wood:** Anger
 - **Fire:** Joy
- Motion [3]
 - **Earth:** Attract in
 - **Metal:** Pierce toward
 - **Water:** Run down
 - **Wood:** Grow up
 - **Fire:** Spread out

- Rhythm [3]
 - **Earth:** Stable
 - **Metal:** Pointy
 - **Water:** Liberal
 - **Wood:** Enduring
 - **Fire:** Radiant

- Shapes [3]
 - **Earth:** Square
 - **Metal:** Circle
 - **Water:** Wave
 - **Wood:** Rod
 - **Fire:** Triangle

The TV Tropes page on the film *Inside Out*, inspires the following extrapolations of the above emotions towards respective temperaments: [6]

- **Earth:** Phlegmatic
- **Metal:** Melancholic
- **Water:** Supine
- **Wood:** Choleric
- **Fire:** Sanguine

DEVELOPMENT

The graphics of the game are based on 2D sprites. Idealistically, sprites deliberately run counter to the prevalent attitude in 2016 that games must be "works of art", putting disproportionate emphasis on music and graphics, even making the graphics extremely detailed 3D, at the expense of gameplay or actual content. Meanwhile, the

Pokémon games released on the Game Boy line had 2D graphics and relatively low-quality sound, yet people consider these games classics and play them again even unto this day. Basing the graphics on 2D sprites would make more apparent the increased focus on gameplay and content. Pragmatically, 2D sprites are not only easier and faster to make and edit but also less expensive on computer resources.

The world of Wuu Shyng is separated into 5 biomes that represent each movement. Each biome, in turn, has a town, dome, and keep. The town forms a hub where the player can learn and prepare. The dome forms the main gameplay, being a maze where creatures can approach and fight the player's creatures. At the end of the maze is a keep that houses the ruler of the biome. Defeating or influencing the 5 ruler creatures is the ultimate goal of the game. Each biome is located according to its location: the Earth biome would be in the center, the Metal biome would be at the right, and so on. The biomes themselves are biodomes that have tunnels that not only serve the purpose of town but also connect to the Earth biome in the center. Due to the special position of the Earth Biome, special considerations were made on the design of the biome. The maze of the Earth biome is actually a labyrinth that spirals towards the center, maintaining an effective play time that is similar to the mazes of the other biomes. This type of maze might be boring, hence, in addition to exploring ways of making the labyrinth itself more interesting, the town got a special design, which surrounds the perimeter of the Earth biome. This also works towards the original concept of the Five Movements, the Earth sometimes representing a central or transitional state of whatever subject that is being categorized under the Five Movements. The town of the Earth biome itself surrounds the Each biome has its own special feature: the wood biome has an abundance of fruits and vegetables while the metal biome has gold, instead.

Upon entering the dome maze of a biome, creatures approach the player at half the walking speed of the player. Internally, the game randomly picks an entry from a 10-element array that the

screen has which holds a set of numbers, each entry having a number from 0 to 3. The value of the entry tells how many creatures appear on the screen. This approach lets me adjust the probabilities of how many creatures appear on the overworld; the appearance of a group of 3 creatures on the screen can be made more likely. The creatures that appear are generic; the player does not know which creature would appear until the player touches a creature on the overworld, which leads to a proper battle against the creature. If the player wins in battle, the creature disappears from the overworld. If the player flees from battle, the creature becomes still, flickering, and intangible during a few seconds in the overworld before chasing the player again. Occasionally, there may be screens that deliberately have something other than creatures; these "reprieve" screens may be empty, have a proper rest house, or even have something of service to the player. Alternatively, the trainer can use a form of repellant that can temporarily prevent creatures from appearing in the overworld.

In battle, the player's can not only Fight, but also Relent. More specifically, 'Relent' lets the player run away from the battle, temporarily save the game during the battle, or directly engage with the creature. In this case, engaging would involve, in effect, checking whether the creature would join your party or not depending on the "chi" value the player has. More specifically, in this game, "chi" measures the player's influence. The amount of chi the player has depends on the creatures the player has on queue. Each creature emits chi from its own movement. The opposing creature would join only if the player has enough total chi or the right kinds of chi. Fighting gives access to the 5 moves of the player's creature: a generic, neutral move and up to 4 moves that have a movement. There is an auto-battle option where, by a button press, the creature can automatically battle using the neutral move. Except for the neutral move, all of the creature's moves have points that restrict the number of times the creature can use a move before the creature needs restoration. Lineups, a vital element of battles, check the movement of the active move

against the movement of the defending creature. More specifically, if the active move's movement:

- ...is neutral, then the move deals plain damage.
- ...matches the defending creature's movement, the move heals the defending creature by the same amount of damage that would have otherwise dealt the defending creature.
- ...enhances the defending creature's movement, the move deals 0 damage and the opposing creature gets its statistics raised.
- ...weakens the defending creature's movement, the move deals 1.5 the damage and the opposing creature gets its statistic lowered.
- ...controls the defending creature's movement, the move deals 2 times the damage.
- ...leads the reverse of a control against the defending creature's movement, then the active creature takes the same amount of damage that would have otherwise be dealt to the defending creature.

An example would be using a Water move that normally deals 50 damage. Absent of other factors...

- ...a Water creature would be healed 50 damage.
- ...a Wood creature would take 0 damage and have its statistics raised.
- ...a Metal creature would take 75 damage and have its statistic lowered.
- ...a Fire creature would take 100 damage.
- ...an Earth creature would take 0 damage. Instead, the Water creature would take 50 damage.

The creatures can also inflict status ailments on each other. Each status ailment is also associated with a movement.

- Earth inflicts 'bury' in which the defending creature cannot act but can will into fighting again. More specifically, the creature has fallen into a hole that has its own HP. The creature fights the HOLE instead of the opposing creature. Once the hole runs out of HP, not only is the active creature cured of "bury", but any damage that is left over from the final

attack is also inflicted into the defending creature. (In other words, if a move inflicted 34 damage while the hole had 7 HP, the defending creature would take 27 damage from the same attack that unburied the active creature.)

- Metal inflicts 'off-center' in which defending moves might miss.
- Water inflicts 'freeze' in which the defending creature is temporarily unable to act, the defending creature not being able to will into fighting.
- Wood inflicts 'poison' in which the defending creature loses HP constantly.
- Fire inflicts 'burn' in which the defending creature loses HP progressively.

METHODOLOGY

Reinforcing the goal of making this game entirely free-and-open-source, the programs, development, and assets had free licenses.

The following tools were used in the development of the game:

- Abiword (in writing the design document)
- Aseprite (in drawing the sprites)
- Daedalus (in developing the mazes)
- LibreOffice Calc (in analyzing the database)
- Notepad++ (in writing and running the code)
- MyPaint (in sketching the concepts)

Not every program involved was free or open-source, though. File backups were done through Box while notes were taken in Resoph Notes (in Windows) and SimpleNote (in Android). Given the time taken in actual development against looking for freely-licensed alternatives to these programs, the decision decided towards saving time.

The game was originally meant to directly use the Libretro API, a compatible front-end being able to run these games. Strengths of Libretro include a MIT license, plenty of features that would benefit gamers (savestates, networking, customizable controls, and so on), and a front-end that can be run in many platforms. (At the time of writing, RetroArch, the reference front-end, can run in

Microsoft Windows, Apple OS, Apple OS X, GNU/Linux, Google Android, Blackberry Playbook, Blackberry 10, Haiku, and even Enscripten. Through jailbreaking, RetroArch can also run in Apple iPhone, Nintendo- GameCube, Wii, Nintendo 3DS, Sony PlayStation 3, Sony PlayStation Portable, Sony PlayStation Vita, Microsoft XBOX, and Microsoft XBOX 360.) However, programs written using the Libretro API are normally written in C or C++, a language that is difficult to use. However, Libretro also had Lutro, a program that runs games written in LÖVE, which uses the easier-to-use Lua. LÖVE is also freely-licensed.

The following media sources were involved in the development of the game:

- Kenney’s art assets (temporary art) [7]
- Lorc’s icons (charts of this document) [8] [9]
- The Open Bundle (temporary art) [10]
- Wikimedia Commons (art studies) [11]

The following tutorials went into the art:

- *Art Academy: Lessons for Everyone!* (general art instruction) [12]
- *Create Believable Creatures* (character design) [13]
- *Drawing a Likeness* (art study instruction) [14]
- *How to Draw Cartoon Animals* (specific art instruction) [15]
- *LET’S DRAW MANGA Monsters* (character design) [16]
- *Spriting Guide* (sprites) [17]
- *The Art of Animal Character Design* (character design) [18]

The start of the development process went into research into the LÖVE framework, the YAML format, visual design in games, some elements on the *Pokémon* games and what type of music fit each movement. Around this time, the real-life biomes that would represent each movement in the game were:

- Earth = Tropical Rainforest
- Metal = Subtropical Dry Forest
- Water = Tundra

- Wood = Grassland
- Fire = Dry Desert

The specific ecoregion that was the focus of the Metal biome was the Chhota-Nagpur Dry Forests of India. The first act of actual development was enhancing and modifying the mazes in Daedalus, making sure that the enhanced mazes did not have any dead ends. The first act of actual programming was making a practice stage that dealt with the tile-drawing methods learned from my studying of LÖVE, the methods using tiles from Kenney’s art assets [7]. The practice stage also had a movable character that remained within the bounds of the stage, its sprite being a dragon character from the Open Bundle [10]. Due to a rudimentary knowledge of LÖVE, the code displays each tile individually. The prototype later got some form of collision detection.

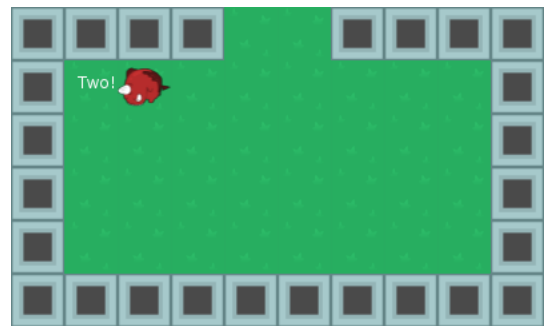


Figure 5
Prototype of Overworld

The next step was drawing dialogue boxes of different sizes. Plans were made of the battle interface. These boxes and planning went into another prototype, this one being on the battle system, the prototype implementing a controllable cursor that selected from the in-battle menu. The prototype also had a rudimentary form of the complete battle system, including variables that held the statistics of both battling characters. More specifically, alongside the usual Hit Points, Attack, Defense, and Speed, the prototype also had a “Technique” variable that would have increased the probability of the occurrence of the secondary effect of any move that did have a secondary effect.

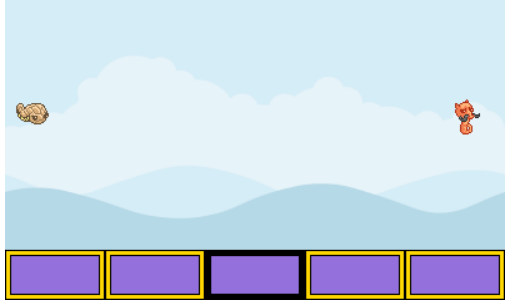


Figure 6
Prototype of Battle System

The focus of the research time went into both the biomes and statistical mechanics that would be present in the game and what features in the later *Pokémon* games can be safely omitted from *Wuu Shyng*. Research led to focus on the Chhota-Nagpur Dry forests that would form the basis of the metal biome in the game [19] [20]. More specifically, reference pictures on the scenery and animals of the forests came up, leading into a few studies on the animals [11]. The research on *Pokémon* designs was deepened. At this point, the mazes of every biome were completed, the Earth maze ending up having two versions. Back to the prototype, the "bump" library resulted into being an essential asset in giving the desired tile-based collision-detection. On the artistic side, some of Lorc's icons were converted into representations of the five movements. A result of this adaptation is a general palette that would guide the coloring of the game; the palette is composed of 5 colors that correspond to the 5 movements, plus 10 colors that are light and dark variants of the 5 main colors. The prototype sprites and dialogue boxes went into a new overworld prototype, which then got collisions that use the bump library. The library also led to a new form of moving the character; this time, the character obeyed the collision physics of the bump library. A template function managed the collisions. A search for ways to improve the user interface of my game led to the Material Design language from Google [21]. The benefits of Material Design included a minimalist yet intuitive and easily-understandable design, precise guidelines, freedom to use, and interoperability between desktop, tablet, and mobile ecosystems.

Taking into account these factors, especially considering the possible platforms on which *Wuu Shyng* would run, the Material Design language became the interface language of the game. The first course of action was the transferring the Material Design palette to both Aseprite and MyPaint, then redo the reference palette to one that used the colors of Material Design. The second course of action was making the icon of the game according to Material Design, the icon being an abstraction of the interconnected domes that form the biomes in *Wuu Shyng*.



Figure 7
Icon of Wuu Shyng

Material Design assets from Google, including fonts, reference grids, interface elements, were added to the available resources of the game. At this point, an unrelated but important discrepancy came up: at the time, the Grasslands real-life biome would have represented the Wood in-game biome, but Grasslands, being so named, barely have any trees! Searching for a better-fitting biome led to the Temperate Coniferous Forests [19]. The actual prototype took a lot of time in the resolution of how the game should handle transitions between two rooms, requiring several days' worth of debugging and problem-solving. Meanwhile, research went into natural disasters, resulting into many ideas of moves in the process. However, the research led to almost no ideas regarding Metal-based moves, hence the research was subsequently refocused on what metals are mined in India, specifically Chhota-Nagpur [22], alongside the uses and effects, both negative and positive, of the metals that India mines [23]. Even deeper research went on what properties distinguish metals from other elements [24]. The need of proper art designs led to the zoo in Mayagüez and studies on some of the animals there. Connecting research and development, lists of animals that appear in specific, local ecoregions of the biomes were extracted. Back to the subject of

programming, the "press Z if you want to interact with something" functionality, which was not working properly in an old prototype, was placed into the prototype that correctly implemented the bump library. The result was the automatic correct-functioning of the interaction code. At this point, the final selection of local ecoregions that represented the biomes were:

- Earth: Northern Indochina Subtropical Forests
- Metal: Chhota-Nagpur Dry Forests
- Water: Taimyr Central Siberian Tundra
- Wood: Northern California Coastal Forests
- Fire: Taklimakan Desert

April 24 was the day when general development focus shifted from designing the entire game to building a small demonstration. Given the imminent exhibition of the game to a public audience, the name of the demonstration the "Space Fiesta Demo". The title referred to both the Nintendo Space World that exhibited a prototype of *Pokémon Gold* and *Pokémon Silver* and the Pokémon Festa that exhibited a prototype of *Pokémon Ruby* and *Pokémon Sapphire*. The original word "Festa" was changed to "Fiesta" because the main languages of Puerto Rico were English and Spanish. First all, a narrower selection of animals that would form the basis of the creatures to be designed was necessary. The emphasis during the narrowing process was on endemic animals and general variety. The result was 3 animals per biome, thus giving some variety while not being overwhelming in development. From Kenney's art assets [7] came a tileset that fit better the idea of the Earth biome in Wu Shyng. After combining and simplifying the notes on character design. the demonstration started to get some actual code. More specifically, the converting the new overworld prototype to an actual release, given that the battle demo was in a far less finished state. Out of organization concerns, some parts of the code went into their own separate module files. Afterward, there was an experiment towards a less hardware-dependent control-scheme, but the new scheme gave too many problems in controlling the

dragon player, requiring the reversal of the experiment. There were troubles when telling the program what screen should be currently active. The bug was due to an error in type functionality; the name of the screens was a combination of a letter and a number, hence those raw values needed to be turned into strings. Debugging was done on the passages that switch screens.



Figure 8
Space Fiesta Demo

Due to the lack of time, only one creature was designed before the Space Fiesta Demo. Personal experience with temperaments led to the decision that the one creature would be a Metal creature, Metal being associated with the feeling of sadness which itself can be associated with a melancholic attitude. The character would also have a movement that pierces forward, a pointy rhythm, and a circular shape. Of the 3 animals associated with metal, the hyena, which, despite biological reality, has the popular depiction of a frequent laughter, would make a great contrast to the emotion of sadness. After doing a study on the real Hyaena Hyaena [11], sketches were done of some concepts of the creature.

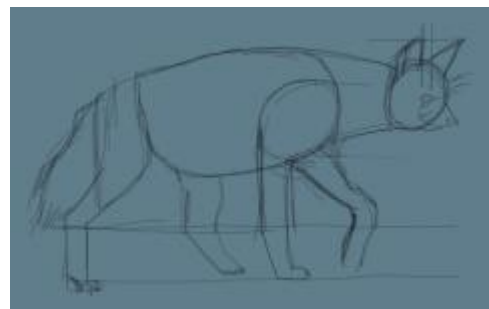


Figure 9
Study of Hyaena Hyaena



Figure 10
Concept Sketches of Metal Character

On April 30, the maze was fully coded. The deadline required a feature freeze on the game itself that day. On the design side, the hyena character went through more sketches before one of these became a sprite. The one deviation from the sketch is the eyes of the hyena; despite the heads being based on the “Toonbox Studio heads” of Paris Christou [15], an experiment went into making the eyes of the sprite have irises, making the sprite more in common with the style of *Ninja Baseball Bat Man* [25], the inspiration of the spriting style in *Wuu Shyng*.



Figure 11
Process of Drawing the Sprite of the Character

On the programming side, debugging was finished. Free time in the schedule and the need of some sort of reward at the end of the maze led to a ship object being placed at the end of the Earth maze. The ship congratulated the player when the dragon character interacted with the ship object.

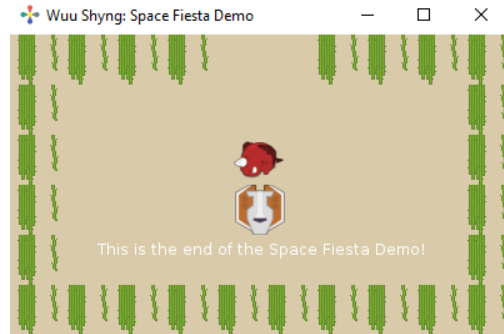


Figure 12
Ship Object at the End of the Maze

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