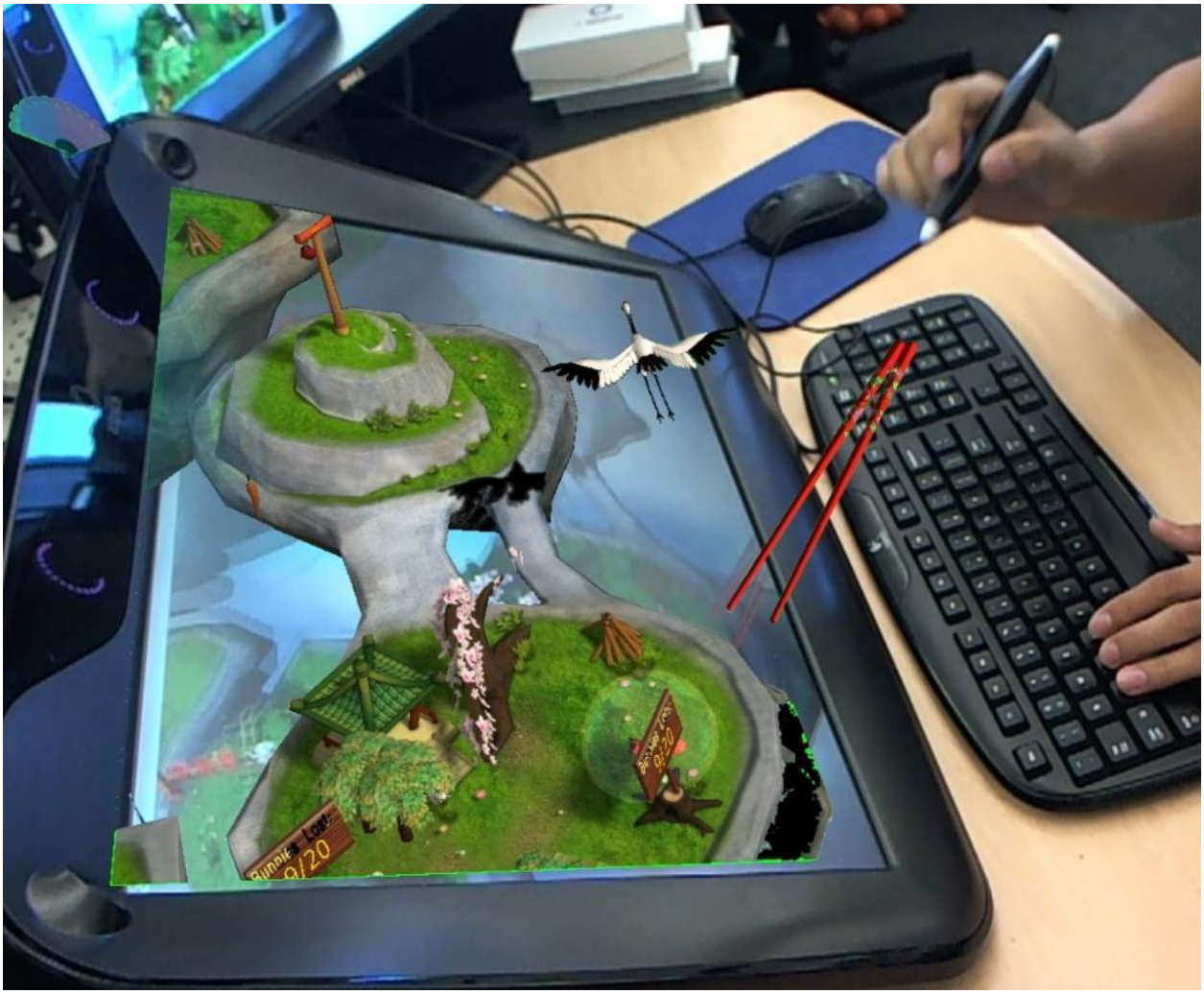
HOP THE FENCE DESIGN DOCUMENT

TEAM ZIMENSION

PURPOSE

This was an academic team project created by 8 graduate students at Carnegie Mellon University. The intent of the project was to create a fun and engaging game that takes full advantage of the zSpace platform.



The project was sponsored by Carnegie Mellon and housed in the Silicon Valley campus at EA Games, but received technical and creative support from the zSpace company.

Developers from zSpace also visited the team to test out the early prototypes and give guidance and feedback. The team followed up by sharing progress with zSpace periodically throughout the semester.

The relationship between the zSpace company and team Zimension proved very useful, as it allowed the team to playtest with experts who knew a lot about the device and were quick to notice problems and give suggestions for fixing them.

zSpace®

Carnegie Mellon University
Entertainment Technology Center

TEAM

Team Zimension is composed of two artists, three programmers, a sound designer, a game designer, and a producer. The advisors of the project are Carl Rosendahl and Jiyoung Lee.

Left to right: Stephanie Yuan, Tia Li, Dorothy Sheng, Megan Johns, Ryan Shen, Sangyun Han, Sim Xing, Victor Qin

PLATFORM

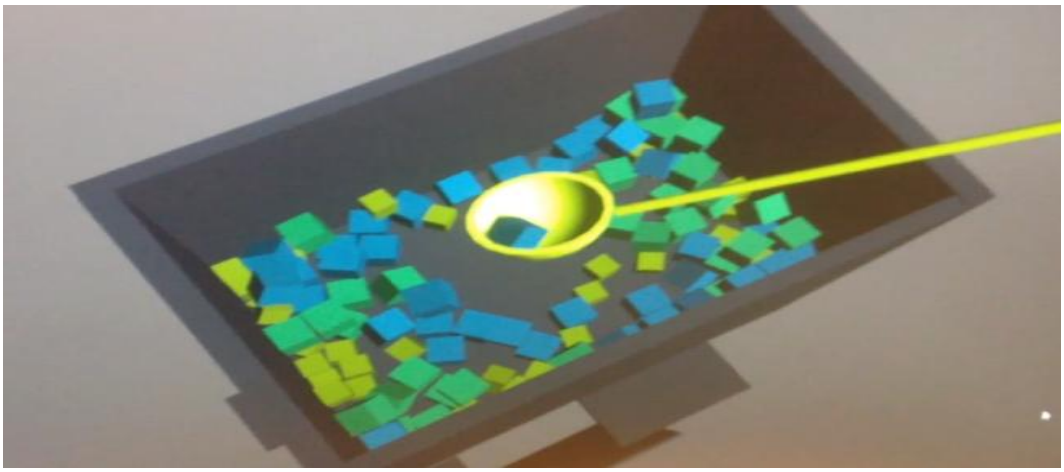
The zSpace platform creates a fully immersive experience through a 3D semi-holographic display, a stylus that tracks in 3D allowing interaction with objects in the world and provides haptic feedback, and 3D glasses equipped with head-tracking to give the user the ability to look around an object.

This project is unique in the fact that it is a game designed completely and solely around the advantages and limitations of the zSpace hardware. It is intended to be something unique that can only be played on this specific device - no other system can fully support all of its features in the way it is intended to be played.

RESEARCH

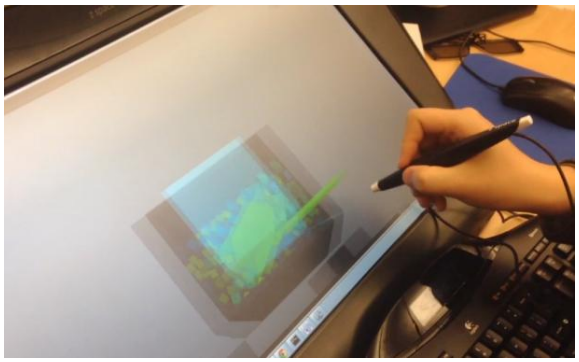
The beginning of the semester was dedicated to brainstorming, researching the platform, prototyping, and exploring possibilities. The focus of this exploration was to test the limits of the device and to see what interactions would create an engaging experience and put the hardware to innovative uses.

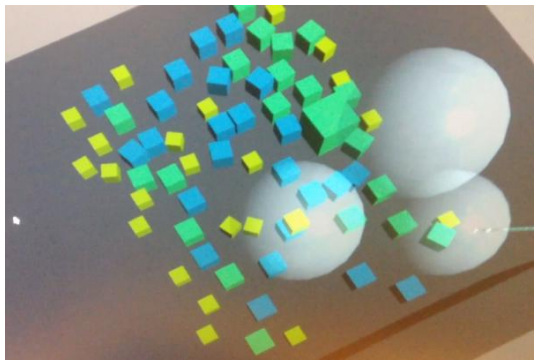
One early demo used the haptic feedback of the stylus:



The stylus is represented in the world by a spoon, and the haptic feedback is turned on when the spoon touches a cube in the box. From this the team learned that haptic feedback can help the player to understand when their stylus is "touching something" in the virtual world. The team also learned about the settings of the haptic feedback and what things can be done to adjust the feeling - changing the duration of a pulse and the time between pulses.

Another demo allowed the user to draw 3D primitives in space:



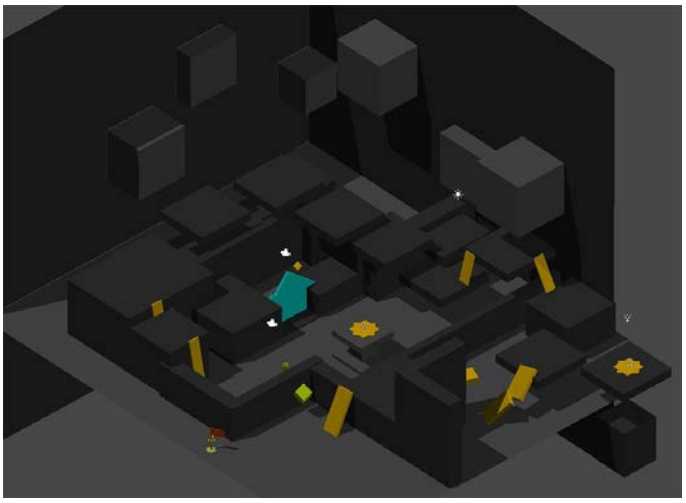
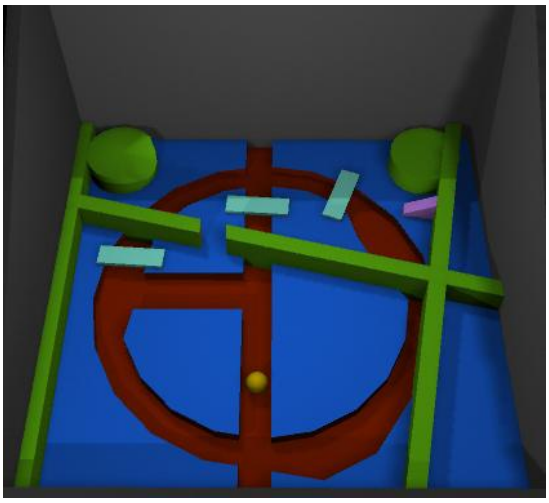


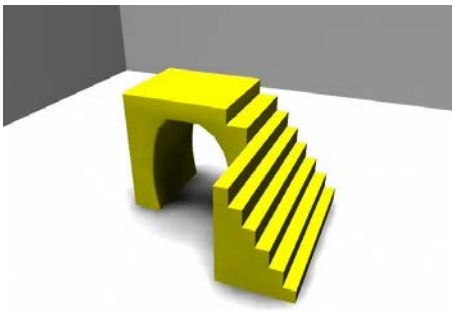
The initial demo used cubes, and the user could determine the length, width, and height of the cube (but not the orientation) based on where they clicked and released the primary button. A modified version of the demo allowed the user to create spheres instead, and this feature made its way in to the final game in the form of drawing bubbles around creatures.

THEMING

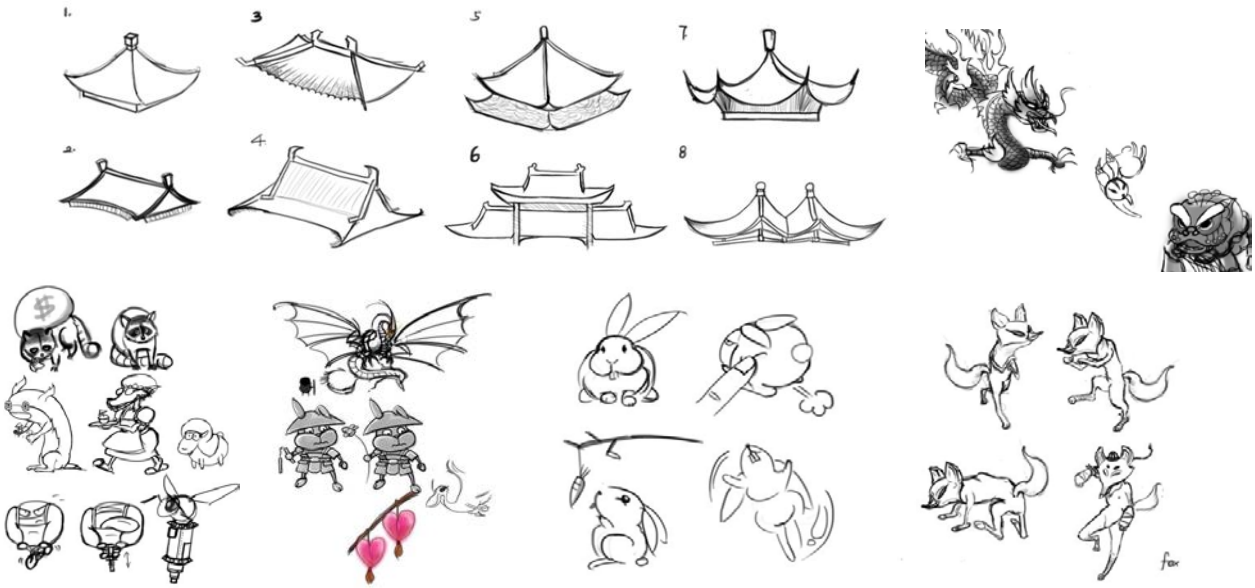
The team also went through several iterations of previsualization to determine the theme, goals, characters, and style of gameplay. Some highlights included mazes, spatial puzzles, and strategy games. Theme exploration ranged widely from pastures, futuristic sci-fi, Chinese buildings, underwater ruins, and floating islands.

PREVISUALIZATION

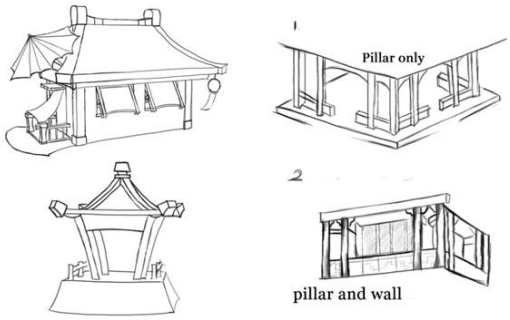



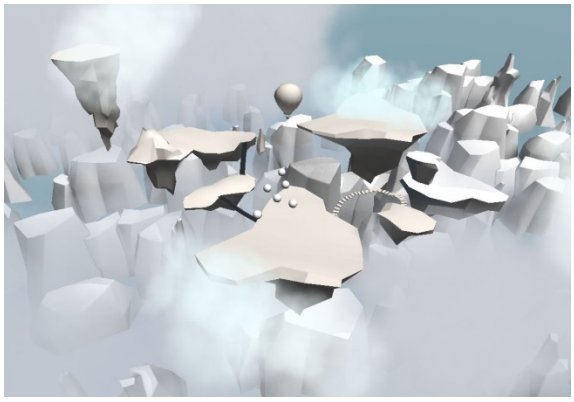



SKETCHING



MOCKUPS AND CONCENPTING

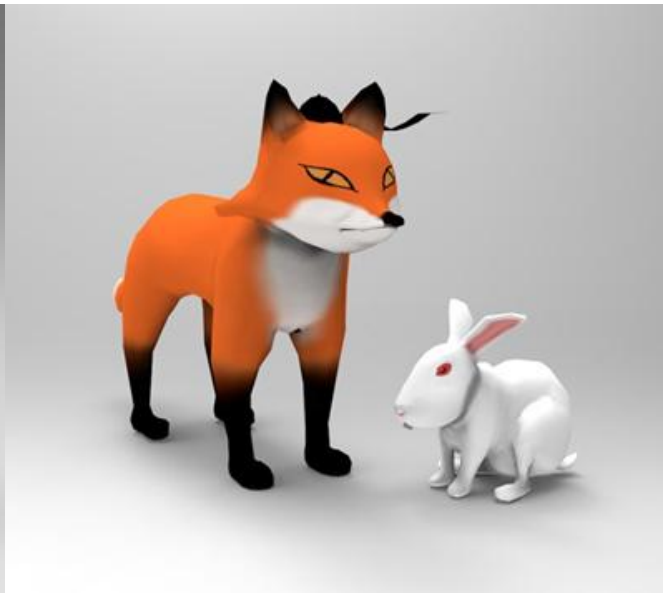




CHARACTERS

Character exploration also led to many brainstorming sessions where discussion involved the necessity for both good and bad characters, and how they would interact. Possible good characters included mushrooms, sheep, birds, and rabbits. Bad characters included wolves, foxes, dragons, evil birds, and raccoons.

These discussions culminated in the conclusion to use very obvious enemies - foxes and rabbits - and to set them in a unique environment of Chinese islands floating in the sky. In later levels a second enemy character is introduced - a bird flying in circles over the islands.



FINAL LOOK

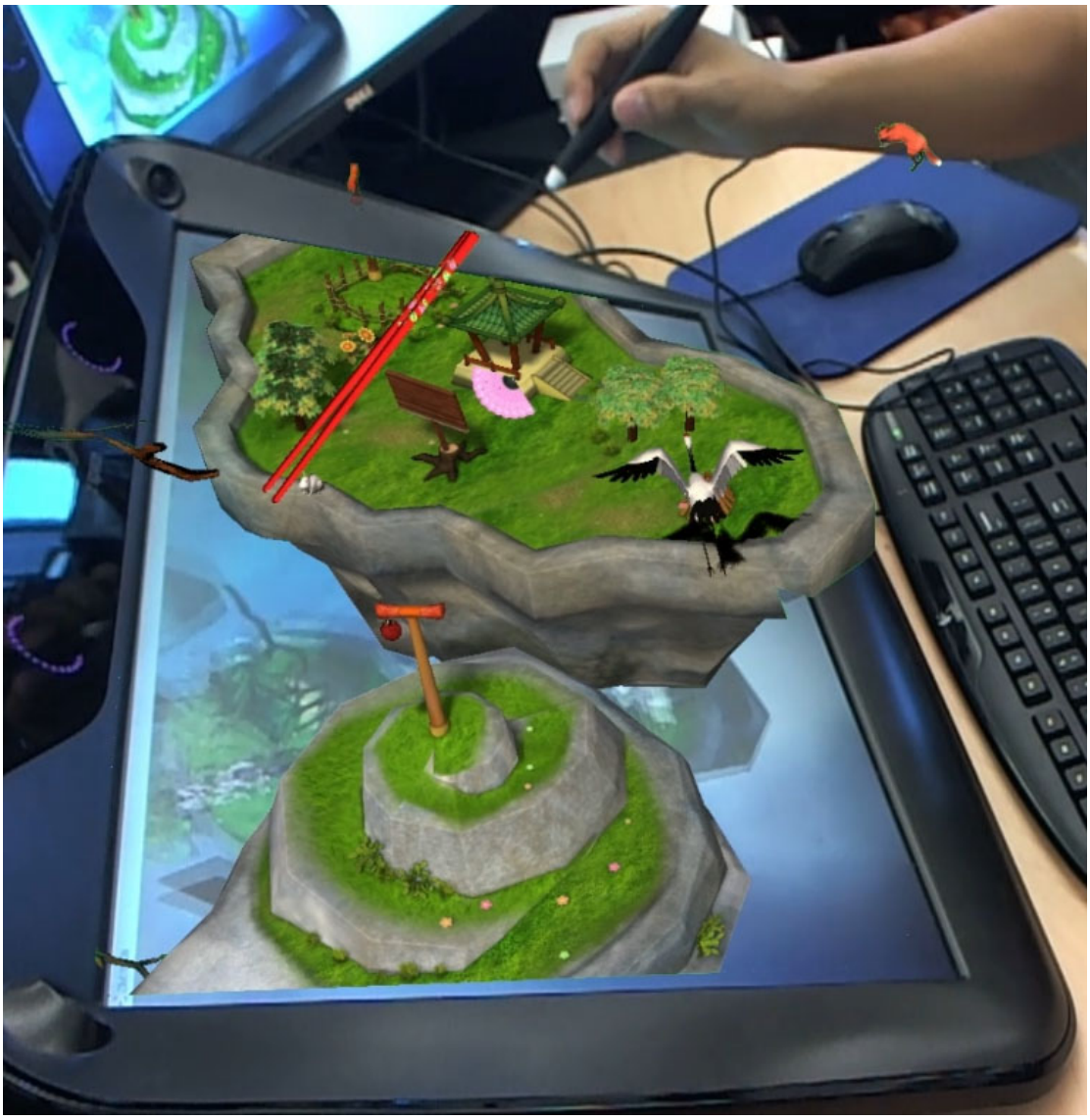
The team decided to use traditional Chinese art style and background music, and to embrace the whimsical nature of a fantasy world of floating islands populated by silly bunnies.

GAMEPLAY

OVERVIEW

A single player sits in front of the zSpace device holding the stylus and wearing the 3D glasses. They are presented with a world of floating islands decorated in a Chinese theme. In this world there are naive rabbits that hop around innocently.

The player's mode of interaction is to use the stylus as a pair of chopsticks in the world. The player can interact with the rabbits by drawing bubbles around them to make them float and by picking up carrots which attract nearby rabbits to follow.



There are also dangers in the world - foxes that come out of holes and chase the bunnies, wind that blows bubbled bunnies toward a tornado, and a bird that flies around and pops bubbles.

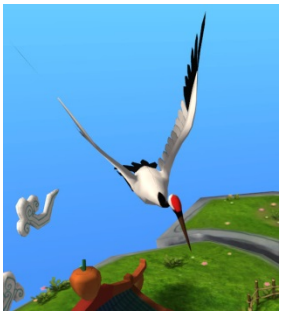
CHARACTER AI

The three types of characters behave as predator and prey. The rabbits are innocent and need to be protected by the player. They emerge from rabbit holes on different islands, and hop around waiting to be guided. Foxes are enemies that come out of fox caves in small waves (usually one or two at a time) and they growl as they enter to let the player know danger has arrived. The foxes are sneaky and like to hide near trees, but sometimes they wander out in the open. When a fox sees a rabbit it will chase and try to catch and eat the rabbit. A rabbit that is being chased may be so frightened that it falls of the edge of the island. The birds are fairly neutral, they have no motive – they simply fly around the islands popping any bubbles they encounter. The 3D sound allows the player to know when a bird is coming and which direction it is coming from.









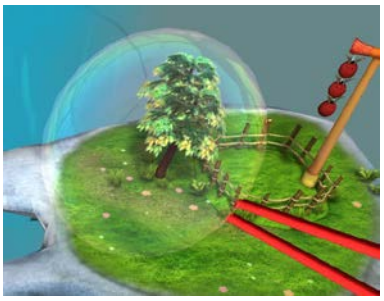

Players can bubble foxes to temporarily strand them in the air. While the fox is suspended the player can use a fan to push the fox off the island. Bunnies can also be put in bubbles to enable them to move between islands, but watch out! Bubbled bunnies may be blown away by the wind.

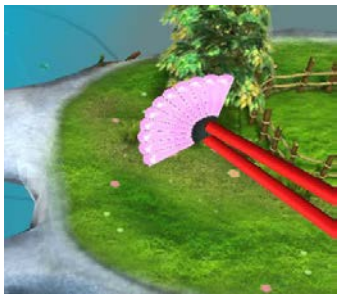
INTERACTIONS

In the original interface, the player had a menu to select different tools, and then the stylus would be replaced with that tool.



After playtesting, the team determined a simpler method would make more sense. Players now have three types of interaction - click and drag to draw bubbles, click on a usable item to pick it up, and lean left and right with head tracking (or use WASD/arrow keys) to move their position around the world and zoom in and out.





Three types of items can be used - sticks which pop bubbles, fans that can push bubbles, and carrots which attract the rabbits. All of the items spawn in a tornado in the center.

GOAL

The goal of the player is to move bunnies in to safe zones. Players are informed of their success by chiming sound effects and lanterns that light up (one for each saved bunny). Each safe zone has a set number of bunnies it can hold, and when one safe zone is filled there are fireworks to show the player that the zone is complete.



WINNING AND LOSING CONDITIONS

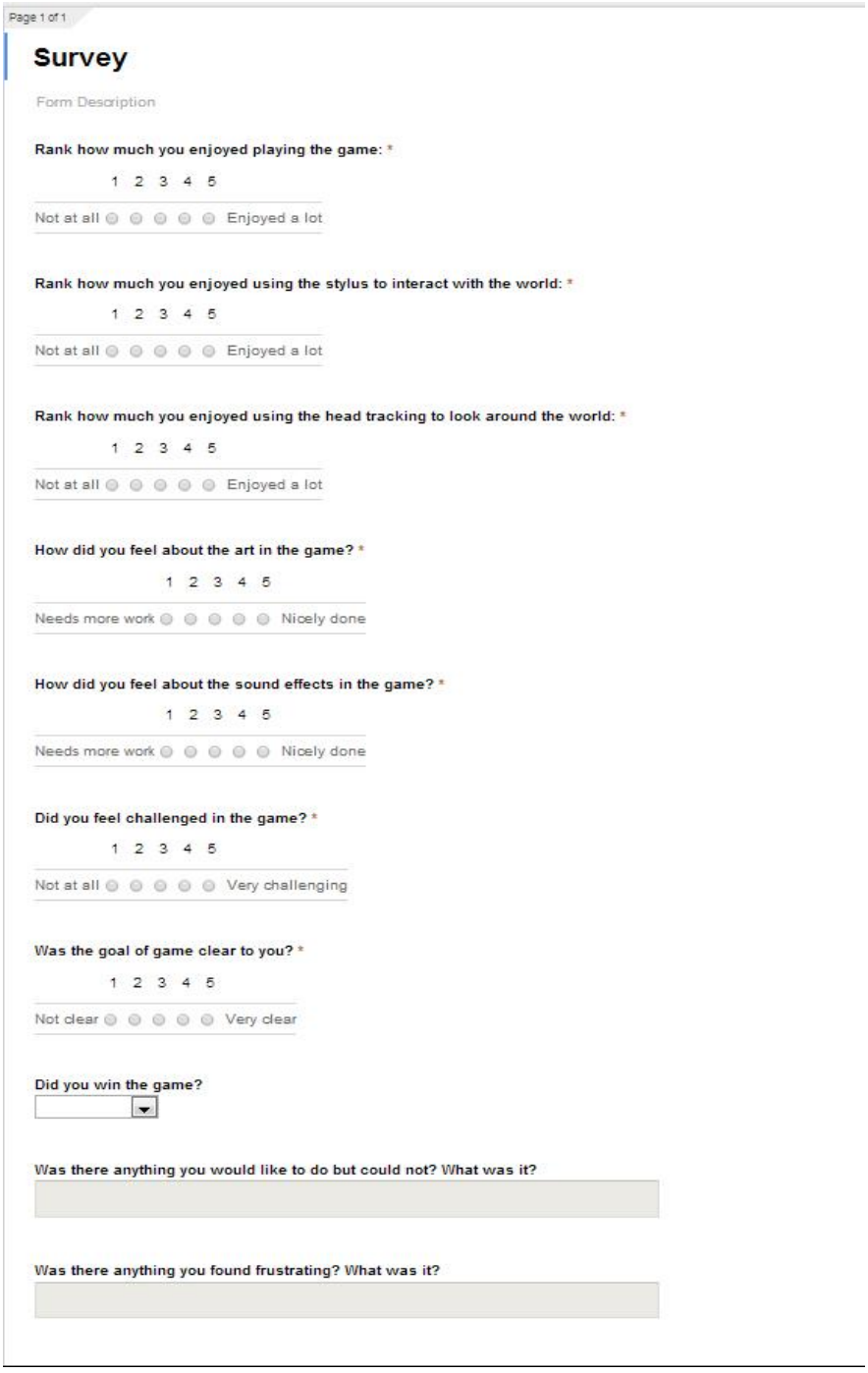
Each level has a number of safe zones, and each safe zone has a number of rabbits it needs. Once all safe zones are full the level is complete, and the player wins the game once they finish all levels.

Each level also has a maximum number of rabbits that can be lost indicated by a sign in the corner. Once the player loses too many rabbits they will lose that level and need to restart.

PLAYTESTS

The team gathered data from multiple playtests. Players were asked to play the game with little instruction, and the team documented problems that were discovered as well as the player's overall feelings. After completing the game the players were asked to fill out a survey, which the team used to assess the quality of the experience and to pinpoint areas that need improvement.

A copy of the survey is included here for reference.



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Survey

Form Description

Rank how much you enjoyed playing the game: *

1 2 3 4 5

Not at all ○ ○ ○ ○ ○ Enjoyed a lot

Rank how much you enjoyed using the stylus to interact with the world: *

1 2 3 4 5

Not at all ○ ○ ○ ○ ○ Enjoyed a lot

Rank how much you enjoyed using the head tracking to look around the world: *

1 2 3 4 5

Not at all ○ ○ ○ ○ ○ Enjoyed a lot

How did you feel about the art in the game? *

1 2 3 4 5

Needs more work ○ ○ ○ ○ ○ Nicely done

How did you feel about the sound effects in the game? *

1 2 3 4 5

Needs more work ○ ○ ○ ○ ○ Nicely done

Did you feel challenged in the game? *

1 2 3 4 5

Not at all ○ ○ ○ ○ ○ Very challenging

Was the goal of game clear to you? *

1 2 3 4 5

Not clear ○ ○ ○ ○ ○ Very clear

Did you win the game?

Was there anything you would like to do but could not? What was it?

Was there anything you found frustrating? What was it?

CONCLUSION AND FUTURE OF THE PROJECT

The completed game will be kept as a demo at the zSpace company and will be available for download on the project website: http://www.etc.cmu.edu/projects/zimension/

The team has also submitted the project for review at several conferences to get more exposure for the game as well as the zSpace device.

Overall the team considers this project a success – not only is it fun to play, but it was also fun to make.