

Design Document: Escape Room VR

1 Executive Summary

One of the more important entertainment developments of the past decade has been the recent growth and popularization of escape rooms. Escape rooms are physical adventure games where teams have to work together to solve a series of puzzles in order to “escape the room”. We are proposing to make an “Escape Room” in VR.

First we will explain why Escape Rooms have mass appeal, and why VR in particular would be a good substitute, and perhaps even an enhancement:

1. **Immersive Environment:** Much of the appeal comes from the experience of being in a completely new, exciting environment where everything is real. Escape Rooms in particular do a good job of placing teams in environments such as prison cells, space stations, and dungeons. With VR, we would not only be able to recreate the environments mentioned above, but we would also be able to create environments that would be impossible to recreate in real life, such as outer space, in a submarine, etc.
2. **Puzzle Solving:** Of course, people love Escape Rooms because it allows them to solve puzzles!

Gameplay: The player will be start off in separate rooms with the objective of escaping a prison. They must explore their environments and solve randomly generated puzzles (using items such as buttons, flashlights, paintings, invisible ink, etc) in order to meet in a central room. Then they must work to escape from the prison as fast as possible, all while avoiding the prison guards who come by to inspect the cell.

Implementation:

1. The game will be created using Unreal Engine.
2. Players will use Vive headsets and touch controllers.

Schedule:

1. **4/06/17 @ 1:30PM:** Alpha Mechanic Demo (game mechanics)
2. **4/13/17 @ 1:30PM:** Beta Mechanic Demo (VR/procedural content)
3. **4/20/17 @ 1:30PM:** Final Playtest (Playtest - aesthetics)
4. **5/2/17 @ 1:30PM:** Final Demo

2 GAME Design - CREATIVE

2.1 High Concept

Players must work to escape from a high-security prison. The player progresses through the game by solving puzzles, which will culminate in a final spectacular escape scene.

2.2 Design Goals

2.2.1 Main Design Features

2.2.1.1 Player goals and objectives.

Main goal - Escape the prison

Secondary goals - Escape the prison as fast as possible. There will also be fellow prisoners who give hints along the way for players who take a while to solve the puzzles.

Type of challenges:

1. Word puzzles - Jeopardy-like puzzles found throughout. The player uses the answer to these puzzles to solve other puzzles.
2. Key-matching puzzles - The player must find items inside the cell and put them together in order to unlock other puzzles.
3. Encryption puzzles - Players are given secret codes to decrypt. These puzzles can be solved by using the answers found in the other word puzzles.

Type of conflicts:

1. The player must avoid suspicious behavior whenever the prison guard walks past.
2. There are also some unfriendly prison-mates who might hurt you during your escape.

Winning condition:

1. Obtain items and find a way to escape the jail cell (multiple ways)

2.2.1.2 Main rules and procedures

Operational rules:

1. The player is placed in a jail cell. The size of the jail cell is the size of the Vive tracking area. This will give our game a very realistic-feeling of being trapped, because the player is literally trapped in the map.

Main game mechanic:

1. The main interaction of our game is between the main character and various objects within the cell. The player progresses by unlocking clues, which will point them to future challenges. We will try to make every single item within the cell interact-able, creating a very realistic

These game mechanics make the game interesting because it makes the game as realistic as possible. Making the cell the same size as the Vive tracking area creates a real sense of being trapped. Having the items all be interact-able makes it have an open-world feel.

2.2.1.3 Player Resources

Our projected list usable items include (but are not limited to):

1. Flashlight (possibly blacklight flashlight for invisible ink)
2. Paintings
3. Wall writing
4. Lights
5. Switches
6. Buttons
7. Keys
8. Panels
9. Toilet

2.2.1.4 Boundaries and Constraints

The game environment limits the player to move only in the space of the jail cell they are confined to. The player will not be allowed to move outside the boundaries of the cell during gameplay. However, the player will be allowed to climb up certain areas of the walls after unlocking suction cups.

2.2.2 Appeal

What is the game genre?

Puzzle/adventure game.

Who is the target audience?

People who enjoy puzzles and escape the room.

What is their age?

0-99+ The colors and gameplay will be simple.

Why is the game fun to play?

Puzzles are fun for humans of any age. We will have random elements so the gameplay is varies each time you play. The game's color will be simple, so people of all ages will enjoy playing the game. The story will be told from another person's perspective, so the user does not need to read instructions. The instruction and goal of the game will become clear as the the game progresses.

2.2.3 Look and Feel

This game will have a similar style of artwork to *Job Simulator*.

2.3 Worlds, Characters and Story (if relevant)

2.3.1 Backstory

You've been in jail for a couple weeks. One day you were roughly interrogated by the guards and sustained a concussion and lost your memories. That day was yesterday. You wake up. The other prisoners will give hints about the backstory through telling your previous "self" and what you had done. The others warn you that your execution date is coming up in a few days.

ESCAPEEEEEEEEEEEEEEEEEEEEEEEEEEE!

2.3.2 Spaces/Worlds

Hallway that the guard walks along and the jail cells, all facing the hallway so you can't see the other jail members. There will be bars along the wall facing the hallway and solid otherwise. You will be able to hear the other jail members and the guard's footsteps as he approaches and walks past your cell.

See attached files for cell layout.

2.3.3 Characters

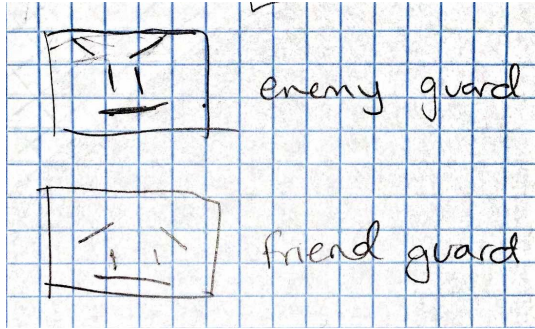
Make sure you include sketches of the characters and brief descriptions of their personalities and capabilities

The user - You are a prisoner, trying to escape the jail

Jail mates - They have known you for some time before you lost your memories. They will not only give you hints and clues, but also tell you pieces of your story. They jail mates are your friends, but will not directly influence the gameplay. They will influence the player through dialogue.

Enemy guards - They have been working in the jail for what seems like their entire lives. They enjoy punishing prisoners and making them suffer. They are merciless and keen to what prisoners do. The enemy guards will occasionally walk around and check if prisoners are performing anything suspicious.

Friendly guard - He is your friend. He is the one who had put items in your cell, so that you can create tools to help you escape from the cell. He will occasionally come by and help the player out.



2.3.4 Levels of Difficulty

How will you vary the level of difficulty

The puzzle itself will have a different level of difficulty depending on which part of the puzzle the player is on.

2.4 Interaction Models

2.4.1 VR Interface - Navigation and Movement/Control

What does the game user interface look like and how does it work

No game interface\Minimal UI. The player will interact with the environment and find tools and equipment to get an idea of how far they are in the game. User interface is usually very awkward in VR, so we will try to eliminate UI as much as possible. Since our movement is confined to a jail cell, the user only can move as much as the HTC Vive can allow them to move to. There will be no awkward movement via teleportation. Every action the player performs in VR has to be physically done in real life.

We will also have various parts of the escape the room puzzle require other types of movements. For example, one clue could be hidden somewhere high or in a ceiling vent, so you'll have to use the vive controllers to climb up. Additionally, if the player escapes in a tunnel, they would use the vive controllers to drag their body through the tunnel.

2.4.2 Game Play Sequence and Levels

See attached file.

2.4.3 User/Environment – Obstacles and Props

Certain interactable objects will spawn that the user will be available to pick up, move, and use on certain other objects in the world to trigger effects. These interactable objects will behave like regular physics objects, and the user will be able to drop or throw them. To indicate that the user can interact with these objects, the objects will be highlighted when they are within interaction range of the controller.

The only non-interactable objects (obstacles) will be the walls of the jail cell, placed at the limits of the Vive tracking zone. This way, the user will not walk outside of the tracking zone, and will not try to interact with stationary objects that do not exist in the real world (e.g. chairs, tables, etc.)

2.4.4 User/Character

How does the user interact with his character and other characters. Be specific.

In singleplayer, the only character the user may be interacting with is the guard. The guard will be an AI that will walk across the jail cells to check if there is anything suspicious going on. The guard makes noises (footsteps, talking) to indicate how far he is from the player. If the guard catches the player doing something suspicious (having unusual items on the floor), the player will lose. Otherwise, the guard will silently pass the player. There will be another “friendly” guard who occasionally passes and helps out the player. However, the player cannot tell the difference between the friendly guard and the enemy guards. In addition, there will be other jail mates who may help out by giving hints and clues. However, the hints and clues are sometimes not exactly clear to the user, so the user has to decipher the messages or items out to find out how to solve the puzzle.

2.4.5 Character/Character

How do characters interact. How will you handle collision detection, AI, physics, etc. Be specific.

Player/Guard: The guard will check on you periodically to make sure you’re not doing anything suspicious. They will also give you food once a day, which you will be able to trade with your cell-mate for another item.

Player/Cellmate: The cell mate gives you hints throughout the game. You will also be able to trade food with your cellmate for another item later in the game.

2.4.6 Motion Tracking

Motion tracking will be used as the primary means of movement in game. The player’s physical position in the VR tracking zone will correspond directly to his perceived location in VR.

2.5 Performance and Scoring

2.5.1 State Variables

The important state variables are the current transforms of all interactable objects as well as whether or not two interactable objects are connected.

2.5.2 Feedback

What are the positive and negative feedback mechanisms you plan to employ and how do they affect the game play.

The positive and negative feedback mechanisms will depend on how the player interprets the items has obtained. The purpose of the game is to solve puzzles so there won't be too much feedback. However, the cell mate is one way that the player will receive feedback. We could also have the player's controller vibrate when they get near the edge of the cell to let the player know that they have reached the level bounds.

2.5.3 Performance and Progress Metrics

How will you monitor player progress. How do you win? How do you lose?

The player will monitor the progress himself. The player has to think about each item and see if they are "usable" or not. The player wins when the jail cell door is unlocked and he escapes.

The player loses when the guard catches the player doing suspicious things.

3 Game Design - Implementation Details

3.1 Design Assumptions

3.1.1 Hardware

We assume a minimum of a VR ready graphics card (Radeon RX 480/GeForce GTX 1060) along with at least an Intel Core i5-4590 equivalent or greater. Also required is at least 8 GB of memory, an HDMI 1.4 or DisplayPort 1.2 display out, and one USB 2.0 or faster. The HTC Vive will be the targeted VR platform.

3.1.2 Software

Windows 7 SP1 will be the minimum required operating system. DirectX11 is minimum version.

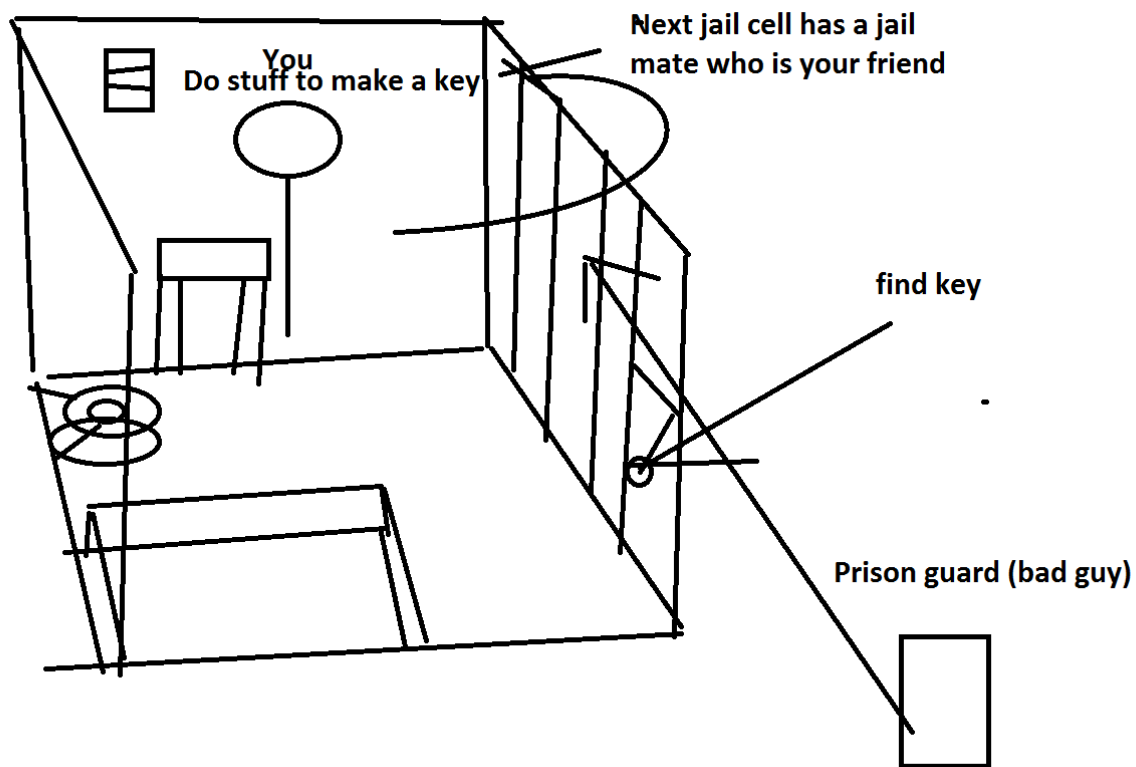
3.1.3 Algorithms and Techniques

What specific algorithms, plug-ins, animation techniques, etc. will you be using to implement your game. Be specific.

We will be using perlin noise to generate the terrain. We will mostly be using simple colors for the game, so nothing will be too difficult. The AI pathing will be using A*. Animation will be done using basic rotations since the AI will just be a shape.

3.2 Storyboards

Show storyboard sketches of your game environment and play sequences here. This should convey the look and feel of the game as well as illustrate the game play.



3.3 Design Logic

3.3.1 FSM - State/Effect

See attached file.

3.3.2 User Solution/Actions

The player wins the game by inserting a key object into the cell door. The key is created through the actions shown in the attached file.

3.4 Software Versions

3.4.1 Alpha Version Features (vertical slice through total experience)

The alpha version(s) represents the first time the game is "playable". List the complete set of features to be included in the alpha version(s).

Most of the items (models) are incorporated into the game.
The item's interaction may work properly if implemented.
The level design is "workable".
The player is able to move freely in the jail cell.

3.4.2 Beta Version Features

List the complete set of features to be included in the beta version
All items are modelled
All items can be combined
Level design is good
Guards and jailmates can speak
There are no errors with hand movement.
Little to no bugs.

4 Work Plan

4.1 Tasks

List ALL the tasks and subtasks necessary to build the game application.

Provide separate descriptions of each task and subtask, which members of the group are assigned to it, and the expected task duration.

Level Design - we need to make sure the jail cell fits well within the confines of the HTC Vive's boundaries and the items are placed properly.

Members: Kelly

Expected duration: week

Modeling - we may need to model some pieces as the game requires specific pieces to fit together to make a new object.

Members: Henry, Kelly

Expected duration: Half a week

Audio - we will need both voice acting for prisoner/guard dialogue as well as audio for object interaction.

Members: Alex, Ed

Expected duration: a week ~ 2 weeks

AI programming - we need to program the guard and the other jail mates to perform specific actions based on the environment.

Members: Henry

Expected duration: A day ~ half a week

Item Interaction programming - The items need to be combined and broken apart properly in order to have the user figure out what item he needs to get to the next step.

Members: Henry, Kelly, Alex

Expected duration: Half a week

Procedural programming - Find how to procedurally generate terrain

Members: Alex, Ed

Expected duration: Day ~ half week

Demo video - Create a good video

Members: Ed

Expected duration: A few days

4.2 Milestones

4.2.1 Minor

Describe the functionality you plan to achieve (and will be able to demonstrate) at the end of each week of development

Week 1 - models, room design, some audio clips of guard/prisoner, some work on combination system, AI guard programming

Week 2 - more models, combination system complete, terrain generation for outside, day/night effect, more dialogue

Week 3 - Integrating clips with AI and integrating user/Ai interaction. FSM of the game is complete. Game should be mostly playable.

Week 4 - bug fixing, testing, game should be complete

4.2.2 Major

Describe the major milestones of the project.

Combination system of items

Procedural terrain

Audio clips and interactions between user and AI

Room level design

Escaping the room

Alpha Version

We plan on being able to interact with objects with each other and with the world in the alpha version. The environment will be basic, and not all objects will have models. This should be playable in VR.

Beta Versions

In the first beta, objects will spawn properly in the environment and the player will be able to fully play through to completion, that is, all puzzles will be implemented.

By the second beta, guard and prisoner AI will be added. All objects will have models and the environment will be properly textured.

4.3 Development Schedule

Organize your work plan tasks in some kind of readable format and attach it to this document.

Sun	Mon	Tues	Wed	Thurs	Fri	Sat
3/26			models, room design	some audio clips of guard/prisoner	some work on combination system	AI guard programming, test VR

4/2	more models, test VR	combination system complete	more dialogue, testing	VR alpha demo	terrain generation for outside	day/night effect
4/9	Begin integrating audio with the characters	More integrating	Testing	VR beta demo	The audio/AI should match the flow/story of the game	
4/16	bug fixing, testing VR	testing, game should be complete		VR Final playtest	Bug fixing	Bug fixing
4/23	bug fixing	Bug fixing	Bug fixing	Bug fixing	Bug fixing	Bug fixing
4/30	make sure it works 100%	VR Final demo				