Player (Subject)

Overview

Name	Design Status
Player General	READY
Movement - Headset	READY
Controls	READY
Positioning	READY

Player General

The player will be immersed in a virtual reality experience via HTC Vive.

Click here for more details

Player

- The game is a virtual reality experience
- The player sees the game world from a first person, virtual reality point of view
- The player uses both the headset and the controllers for the game
- The hands of the player are shown in the world

HTC Vive

- Resolution: 2160 x 1200
- Refresh Rate: 90 Hz
- Field of View: 110 degrees

Head and body (Headset)

- Free rotational movement to every angle
    - Rotation has the same acceleration as the player's rotation
    - Natural rotation feeling
- The player will have limited transnational movement

See more details about the headset below

Hands (Controllers)

- Player interaction with the game world will be possible via controllers
- The player will use the
    - analogue motion reading for positioning
    - digital buttons for interaction

See more details about controller below

Click here for references

HTC Vive user manual: http://www.htc.com/managed-assets/shared/desktop/vive/Vive_PRE_User_Guide.pdf

Dev course on developing to HTC Vive in Unity : http://learn.vrdev.school/courses/enrolled/vive-developer-mini

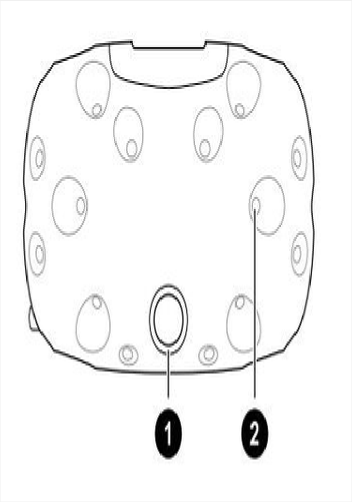
Unity VR Overview: https://docs.unity3d.com/Manual/VROverview.html

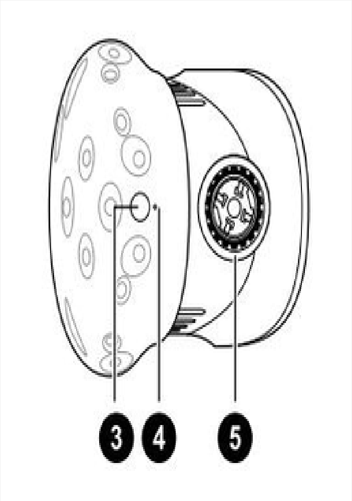
Body controls - Headset

The player will have free rotational movement in all directions.
Click here for more details

Headset

- The player will use analogue input via the motion sensors in the headset
  - Gyroscope
  - Accelerometer
- The player will have 360 degrees free rotational movement
- The player will have limited transnational movement
  - Limit will be defined by the *SteamVR Room Setup* to create a safe bounded environment





#	Name	Note
1	Camera lens	Used as a pass through camera - Can be activated when player reaches playable bounds. (Can be utilised in HTC Vive API)
2	Tracking sensor	Used for motion tracking
3	Headset button	Unused
4	Status Light	Used for status indication
5	Lens distance knob	Used for adjusting distance between each lenses

Lighthouse system

- Light house system will be created to enable safe environment via virtual grid boundaries in the game world

> **Tech info**
> *Lighthouse is a laser-based inside-out positional tracking system developed by Valve for SteamVR and HTC Vive. It accurately tracks the position and orientation of the user's head-mounted Display and controllers in real time. Lighthouse enables the users to move anywhere and re-orient themselves in any position within the range of the SteamVR Base Stations. It is a key technology that enables SteamVR to create the first holodeck or full-room experience in Virtual Reality.*

Movement states

There will be 2 movement states:

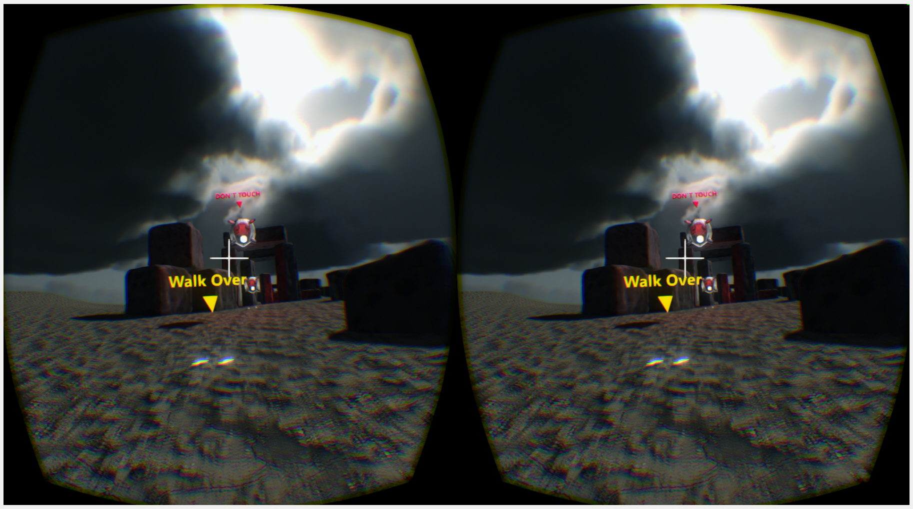
- **State 1 : Moving**
  - The state when the player moves
    - looking around or even simple idle
    - translating
  - There most likely always be some sort of movement by the player as they won't stay still
  - The movement will most likely be in movement state throughout the game
- **State 2 : Still**
  - The state when the player is not moving at all
    - This probably wont happen, unless we freeze movements on menu use
  - Still nice to have the option but probably won't be used

Camera

- The 3D experience of the VR is enabled by the dual camera set-up in Unity
- The main cameras will be directly connected to the player's movement via the headset
  - The camera will face the direction of the headset, always
    - This is static
  - As the player turns his head, the camera turns with it
    - Smooth and perfectly movement is needed for

Tech info
Inside your VR accessory you'll find a pair of Biconvex lenses, which is what takes the images on the display and warps them to fill your field of view. Your eyes perceive these individual images as a single image, which creates the illusion of depth through stereoscopy.

Click here for references



Previous design versions and changes

Version 1

- Absolutely no transnational movement via headset.
  - Player is restricted to move anywhere in the room
  - Rotation only

Changes and decisions
Movement!

- Restricting translational movement in VR can cause serious motion sickness due to the unnatural feeling.
  - To ensure motion sickness is limited to the minimum, we must provide a natural feeling to the movement via the headset
  - The player must feel like he sees sees the environment correctly relative to his movement

Safety!

- Due to allowing translational movement, we have to make sure that we create boundaries for safety
  - Bumping into furniture and other objects is a huge safety right for the player
  - The VR Room Setup enables to create a grid-like boundary system which appears inside the virtual world if the player gets too close to the boundaries.

Hand controls - Controller

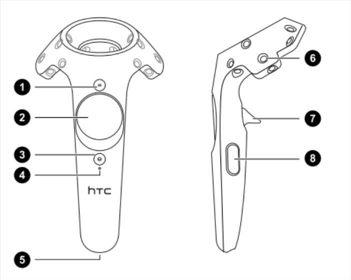
HTC Vive will headset and its controllers will be mapped to the player movement.

Click here for more details

Controllers

- The player will use **digital input** (O/I) via the HTC Controller's buttons
- There are a small number of features that require different inputs:
  - Interacting with buttons on the Mixer Platform
    - All buttons can have one input button combined with motion input
      Eg: Switching a button on and off will only require digital input. Turning a button to adjust strength will require the player to press a button then turn his hand.
- The player will use **analogue** input via the motion sensors in the HTC Controller
  - Accelerometer and gyroscope

HTC Vive Controller



#	Name	Note
1	**Menu button**	used for game menu
2	Trackpad	not used
3	**System button**	Steam interface toggle. On/Off. Pair to headset
4	Status Light	used for status indication
5	USB charging adaptor	n/a
6	Tracking sensor	used for movement tracking
7	**Trigger**	used for main light input trigger
8	**Grip button**	unused

Tech info
"The Vive has a refresh rate of 90 Hz. The device uses two screens, one per eye, each having a display resolution of 1080x1200.[16] The device uses more than 70 sensors including a MEMS gyroscope, accelerometer and laser position sensors, and is said to operate in a 15-by-15-foot (4.6 by 4.6 m) tracking space if used with both "Lighthouse" base stations that track the user's movement with sub-millimeter precision."

Input types

There are 3 input types on the HTC controller that we will use for the game:

- **Button**
  - This is a simple button that can be:
    - Pressed once (This is a simple input sequence)
    - Held
      - Holding a button will require a secondary input from gyro or accelerometer
- **Gyroscope (gyro)**
  - Gyroscope is used for gathering rotational data
    - We will use this to turn switches
    - We need to use this in combination with button hold
- **Accelerometer**
  - Accelerometer is used for gathering translation data
    - We will use this to slide switches
    - We need to use this in combination with button hold

Controls list and sequences

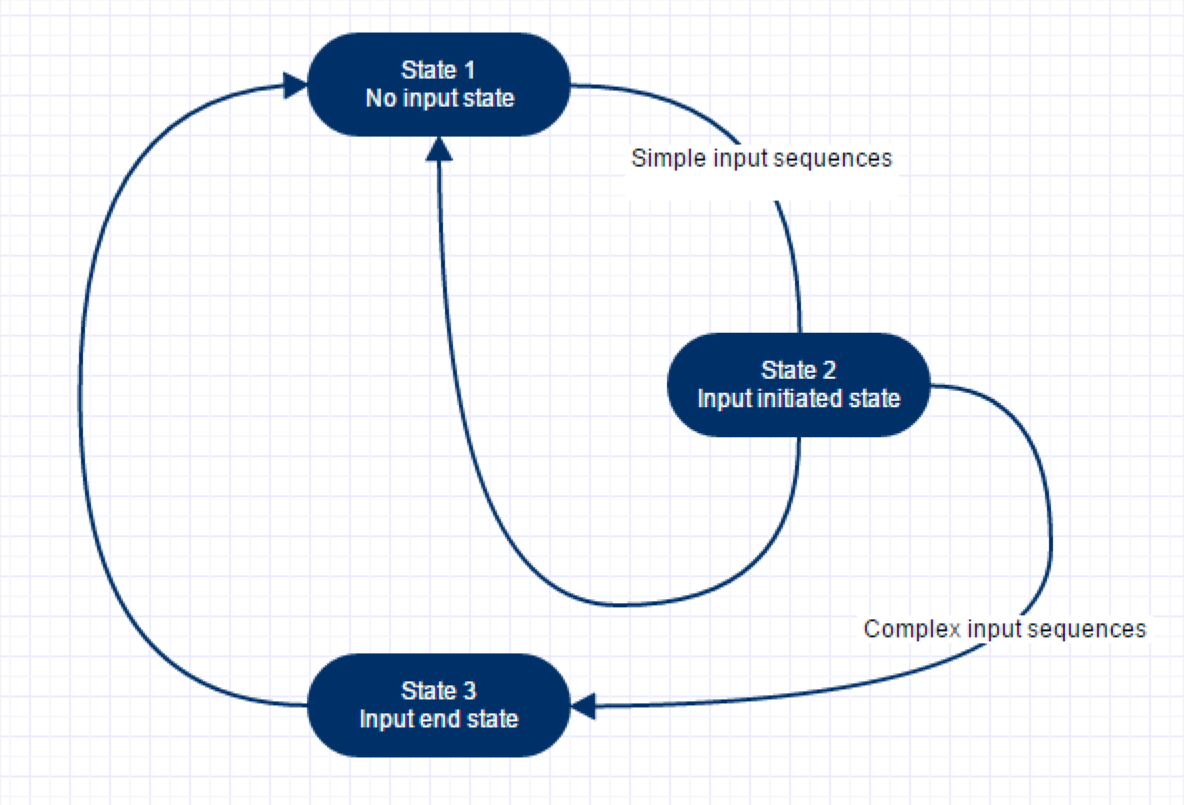
- The following list represent the possible input sequences
    - All the sequences are executed in input State 2 and State 3

ID	Name	Input 1	Input 2	Input 3	Notes
0	Menu	Button 1 press	-	-	simple input sequence
1	I/O	Button 7 press	-	-	simple input sequence
2	hold	Button 7 press and hold	Button 7 let go	-	complex input sequence
3	turn	Button 7 press and hold	Gyro turn on Z	Button 7 let go	complex input sequence
4	slide	Button 7 press and hold	Accelerate on X or Y	Button 7 let go	complex input sequence

Design note
"Light hold" is technically the same as "Light I/O" with a longer hold interval. However we still need to differentiate for design purposes.

- Simple input states mean that there's only 1 button pressed
- Complex input states mean that there is a combination of input types

Controller input sates



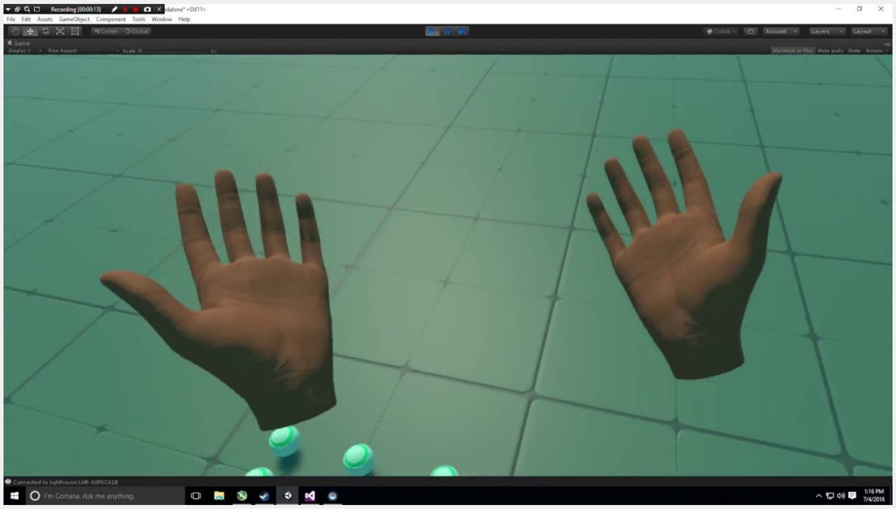
There are 3 input states:

- **State 1 : No input state**
    - This is the default idle state when there is no input given
    - The system is waiting for input sequence
    - Any input can be accepted at this point
- **State 2 : Input initiated state**
    - User has started an input sequence in this state
        - I/O sequences like "Menu" will return to State 1 directly from State 2 as it is only a single button press
        - Complex sequences such as "Light hold" or "Light turn" go into State 3 after State 2
    - No other input should be accepted from other buttons
        - Gyro input can be accepted
- **State 3 : Input end state**
    - This applies for only input sequences such as "Light hold" or "Light turn".
        - State 3 marks the end of the input

Haptic feedback

- The HTC Vive controllers are capable of providing haptic feedback to the user, such as vibrations.
    - We do not currently have any vibration feedback but it is a possibility

Click here for references


File Edit Assets GameObject Component Tools Window Help
Game
Display 1
Free Aspect
Scale
Maximize on Play Mute audio Stats Gizmos
Account
Layers
Layout
I'm Cortana. Ask me anything.

Article on haptic feedback in Audioshield : http://kotaku.com/theres-already-an-excellent-vr-rhythm-game-1776865372

Study on haptic feedback in video games: http://cdn.intechopen.com/pdfs/26941.pdf

Positioning

The player will view the environment from a medium height above the crowd.

Click here for more details

Position General

- As mentioned before the player will not be able to move his position in the environment
- The player will be placed on a gallery-like stage to have a good view of the crowd
  - The position of the player will be raised by level
- The default position on start is to face the crowd directly
- As the player progresses further ahead, his position elevates to provide a sense of achievement

Diagram

- The following diagram is a guideline of positioning of the player
  - Use the differences as ratio only, as the actual outcome might give a different effect in the game

Carrier Performance Level 1 (CPL1)	**Carrier Performance Level 2 (CPL2)**	**Carrier Performance Level 3 (CPL3)**	**Carrier Performance Level 4 (CPL4)**	**Carrier Performance Level 5 (CPL5)**

- The diagrams are used as guidelines of how high the player should be positioned depending on their current CPL.
  - When the player looks at the audience centred in his vision, the effect of the angle should be as seen on the diagram
  - The higher the player is positioned the more he can see from the top of the audience

Click here for references