DIPLOMA IN GAMES DESIGN AND DEVELOPMENT

MD234Z GAME PROGRAMMING IV

Class: DGDD/FT/3B/31 & 32
Session: AY2019/2020 Semester 1
Release Date: Term 1 Week 7, 28th May 2019
Interim Critique Date: Tuesday, 3rd December 2019
Final Submission Date: Tuesday, 7th January 2020 at 1pm
Critique Date: Tuesday, 7th January 2020 at 1pm (Session #1)
Wednesday, 8th January 2020 at 9am (Session #2)
Critique Venue: SD406 (VR Experience Lab)
Weightage: 30%
Prepared by: Cheong Chee How Terry

Graded Assignment T2: VR Game Development

Virtual Reality (VR), which can be referred to as immersive multimedia or computer-simulated life, replicates an environment that simulates physical presence in places in the real world or imagined worlds and lets the user interact in that world. Virtual reality artificially creates sensory experiences, which can include sight, hearing and touch.

To produce a visceral feeling of being in a simulated world, a form of spatial immersion known as presence is necessary. This is achieved through an immersive digital environment which serves as an artificial, interactive, computer-created scene or universe within which a user can immerse themselves. It could be thought of as synonymous with virtual reality, but without the implication that actual "reality" is being simulated. An immersive digital environment could be a model of reality, but it could also be a complete fantasy user interface or abstraction, as long as the user is immersed within it.

The success with which an immersive digital environment can actually immerse the user is dependent on many factors such as believable 3D computer graphics, surround sound, interactive user input and other factors such as simplicity, functionality and potential for enjoyment. Emerging new technologies are currently under development which claim to bring more realism to the players' sensory experiences like gestural controls, motion tracking, haptics and force feedback that respond to the user's actions and movements.

1.0 Objectives

1. To design and develop an interactive virtual reality application through demonstration of programming to incorporate game mechanics, features and gameplay.
2. To identify a list of systems required and to design and develop an architecture that links up these systems.
3. To learn to integrate various types of hardware for immersive gameplay.
4. Apply the fundamentals of coding, data structures, mathematical concepts, level design and construction using Unity.

2.0 Game Requirements

For this assignment, you are required to:

- Create a first/third person camera game of any genre with given world sandbox builder for VR goggles.

Demonstration in gameplay features design implementation through understanding of coding techniques that display:

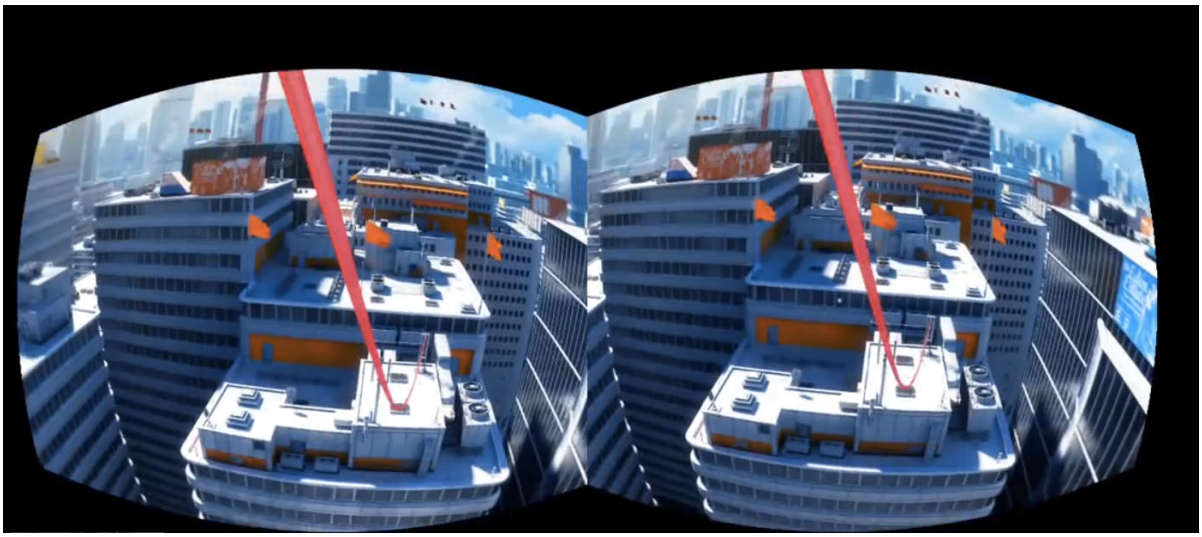
- Head mounted display integration (Windows Mixed Reality Samsung Odyssey or HTC Vive)
- Handheld controller input implementation for navigation and object interaction i.e. through touch, grab and use
- Advanced character animation control using Mecanim through following techniques:
  - Finite State Machine (FSM) design e.g. sub-states, layers, blend trees, masking, etc
  - Script control
  - Animation retargeting
  - Ragdoll simulation
- Incorporation of artificial intelligence behaviors and pathfinding capabilities in NPCs and vehicles by coding and/or advanced Navmesh features
- Adoption of game optimization techniques e.g. lightmap baking, occlusion culling management, object pooling, etc
- Interaction control and display various forms of user feedbacks e.g. use of various casting techniques like Raycast, Linecast, Spherecast or Capsulecast, collider detection and event triggering
- UI design with canvas display features e.g. adoption of spatial and/or meta UI in world space
- UI interaction by either headset gazing or controller touch/pointer selection
- Auto save, load and clear player achievement or inventory status e.g. checkpoints, leaderboard score, items collected, player statistics, etc
- Use of audio source, listener with spatial blending effect for background music and sound effects

- Transformation controls i.e. translation, rotation and scaling
- Time control e.g. slow motion, pause, fast forward
- Material control i.e. color, transparency, texture
- At least 2 stages of level construction with increasing level of difficulty
- Each level should have a gameplay duration of at least 5 minutes.
- **It is strongly discouraged to just simply use shooting as the core mechanic as there should be emphasis on other forms of interactions.**
- No restriction on number of camera used and manipulation
- Scenes minimally required are:
  1. Main menu containing Play, Instructions, Credits and Options
  2. Level Completion menu and/or Win (Mission Cleared)/Lose (Mission Failed) screen
  3. Instructions menu containing all game mechanics and controls explanation (recommended to be incorporated inside gameplay as either spatial or diegetic form)
  4. Pause function for stopping and resuming gameplay and returning back to main menu
  5. Options menu for controlling of background music or sound effects
  6. Credits menu containing your particulars i.e. name, ID and class together with other assets taken from other sources
- Use of appropriate visuals and sense of aesthetics to match game theme
- Commenting against written codes is required as demonstration of understanding

The following are some VR games for your reference and research:
1. Temple Run
2. Mirror's Edge
3. Affected The Manor
4. Battlefield 4
5. Time Crisis 5

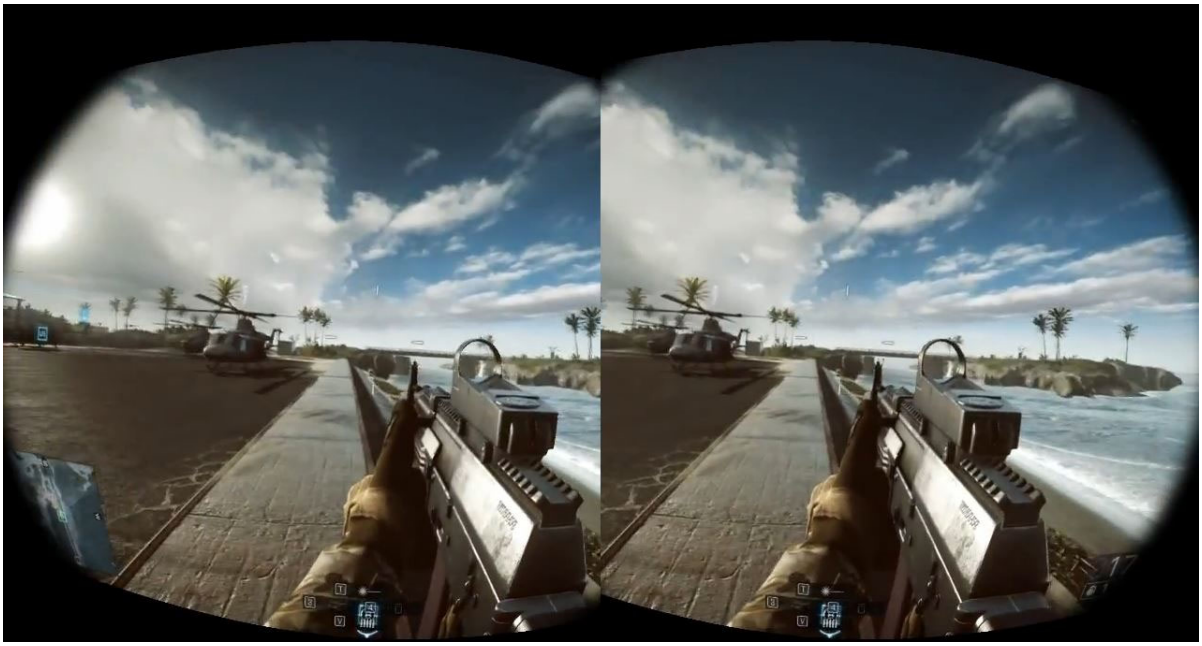
Gameplay videos of abovementioned titles are made available in Blackboard for your game design consideration.

Temple Run



Mirror's Edge

Affected The Manor



Battlefield 4

Time Crisis 5

1. This is an individual graded assignment which constitutes **30%** of overall module weightage.
2. Interim presentation will constitute **10%** of the overall assignment weightage.
3. Requirements for interim presentation on **Tuesday, 3rd December 2019 at 2pm** will be:
   - **Confirmation of game genre, its mechanics, game controls and level design.**
   - **Identification and sourcing of all assets needed for game (environment, characters, props, animations)**
   - **Identification and implementation of various VRTK controller interactive features with chosen props inside chosen environment.**

- **Able to navigate around environment with one or more movement techniques e.g. teleportation with pointer.**

4. Development platform is Unity and strictly limited to 3D.
5. Published game EXE prototype must be runnable on PC platforms.
6. Ready or custom-made textures and 3D models are both accepted as game assets.
7. Final submission date will be on **Tuesday, 14th January 2020 at 1pm**. Submission channel is through Google Drive by sharing the download link via email containing **published executable game in *.EXE and packaged Unity project** containing student name and student ID in zipped format e.g. P1234567 Koh Heng Jun Caleb.zip.
8. Critique date will be on **Tuesday, 14th January 2020 at 1pm (Session #1)** and **Wednesday, 15th January 2020 at 9am (Session #2)**. Venue is at **SD406 (VR Experience Lab)**.
9. Sequence of presentation order will be released when nearer to date.
10. Game must also be ported to given PC before submission deadline.
11. Presentation of game prototype using given Windows Mixed Reality Samsung Odyssey or HTC Vive VR goggles and accessories will be conducted.
12. Weekly hands-on practice and in-class exercises do help you towards building up the game to be delivered. Hence, it is extremely important to make an effort to attend these lessons promptly.
13. Late or non-submissions and plagiarism will be awarded zero mark. Incomplete submission will be penalized for not fulfilling requirements.

3.0 Assessment Criteria

This assignment is based on the following assessment criteria.

Item	Category	Description	Weightage	"A" Grade Rubrics
1	Planning of systems	Clarity and systematic design in planning of game objects and prefabs to achieve game design requirements	15%	Efficient, systematic and clear organization of game objects and prefabs. Meets all of game design needs. Optimized, and allows scope to expand the game and level design.
2	Algorithms	Coding structures that perform intended behaviors	20%	Algorithm was implemented in the game code, for a variety of purposes. Everything was functional. The algorithm also demonstrates good optimization, and flexibility to handle changes or modifications.
3	Programming Syntax	C# syntax, use of keywords, flow control, condition checking, variables and program structure are correct and function as intended	10%	Game program runs. A good variety of syntax demonstrated. Clear understanding of syntax logic is shown. Coding is well-structured, very clear and concise.
4	Professional	Use of comments, proper	10%	Good commenting throughout,

	Practice	indentation, clear variable and function naming convention		and with clear planning, brief overview of intended function. Good naming convention applied, such that the intended purpose is understood immediately.
5	Features Implementation	Level construction, VR game immersion, gesture-based controls, UI functionalities, persistent data handling	35%	Extremely detailed with extensive planning and development of game maps outlining game progression and interconnectivity. Very clear delineation of levels/stages.
6	Visual and Audio Aesthetics and Appeal	Quality of overall layout and presentation	10%	Very strong in presentation style. All graphics and audio elements are very well developed and have excellent control layout, typography and sense of color. Design has good focus and match closely with theme.
		Total	**100%**	