0. Introduction

Game Engine Basics

Prof. H. Kang

H. Kang?

HyeongYeop Kang

- ***Research Field***: Extended Reality (virtual reality, mixed reality, augmented reality, etc.), Computer Graphics, Human-computer interaction
- ***Courses***: Game Graphics, Game Engineering, Game PX Design, etc.
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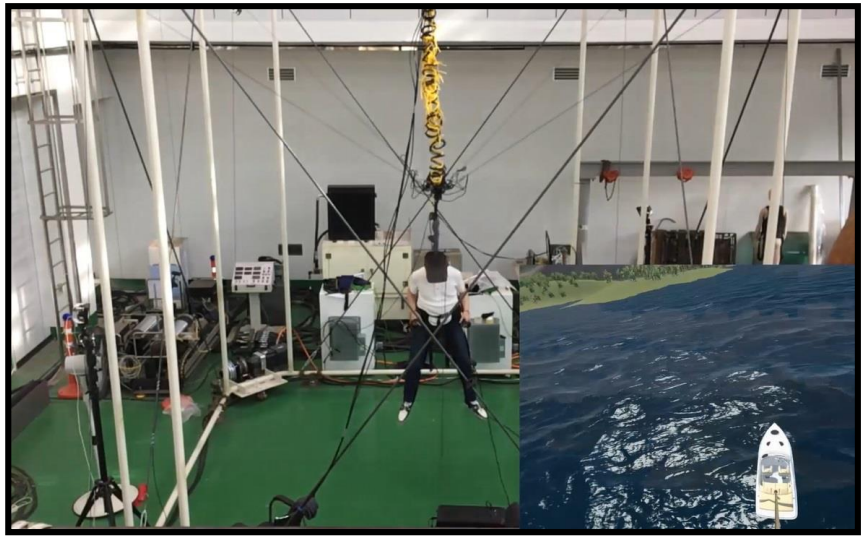


H. Kang?

I'M BUSY

LEAGUE OF LEGENDS
탈리야 청글

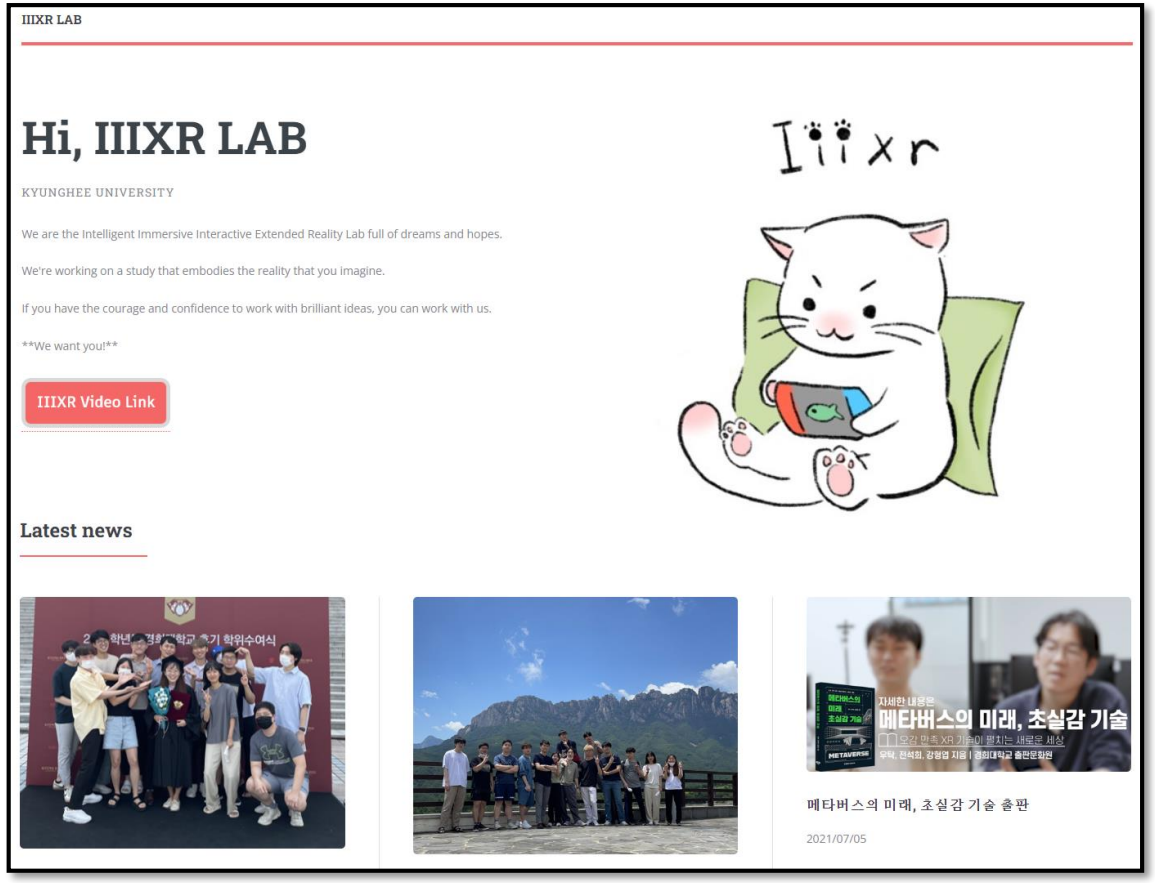
게임공학
보라돌이
승재야노묻은소가쓰니
승재

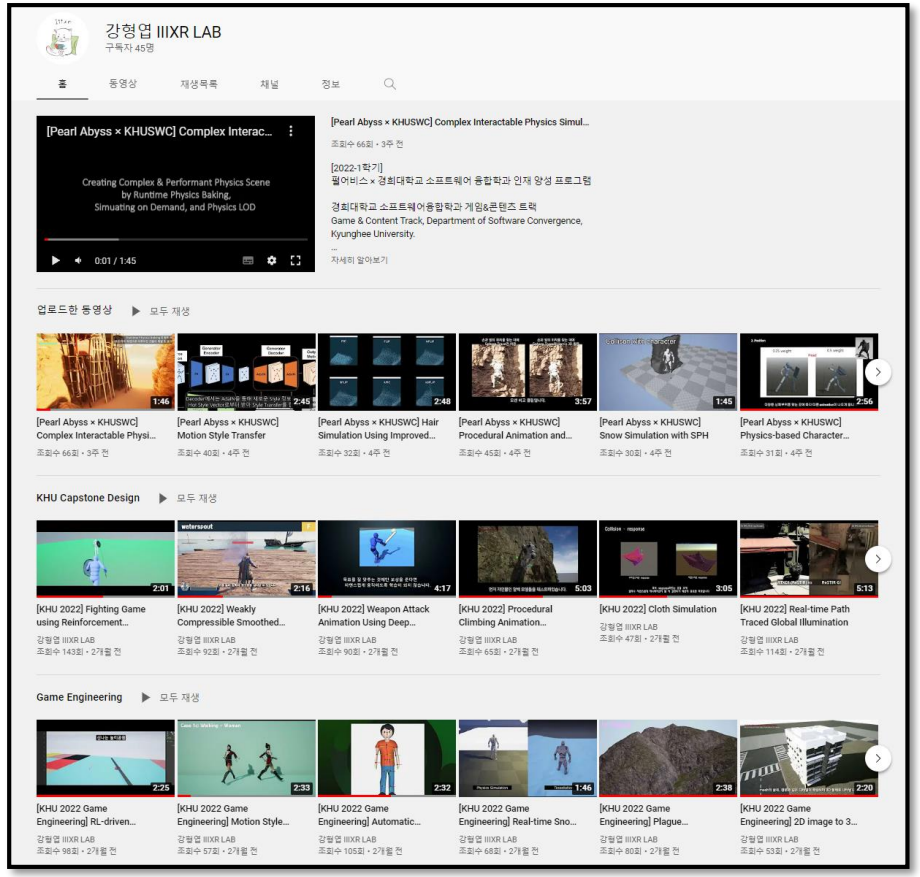
SID MEIER'S CIVILIZATION V
완벽 전략의 승리
신 난이도에서 승리하십시오.
잠긴 도전
2010년 11월 3일 오후 6:21에 달성
2.8%의 플레이어가 이 도전 과제를 달성했습니다

H. Kang?

Current research

- Reinforcement Learning for Character Animation
- Interaction Technique for Extended Reality Users
- Avatar Animation in Virtual Reality
- Obstacle Detection For Safety



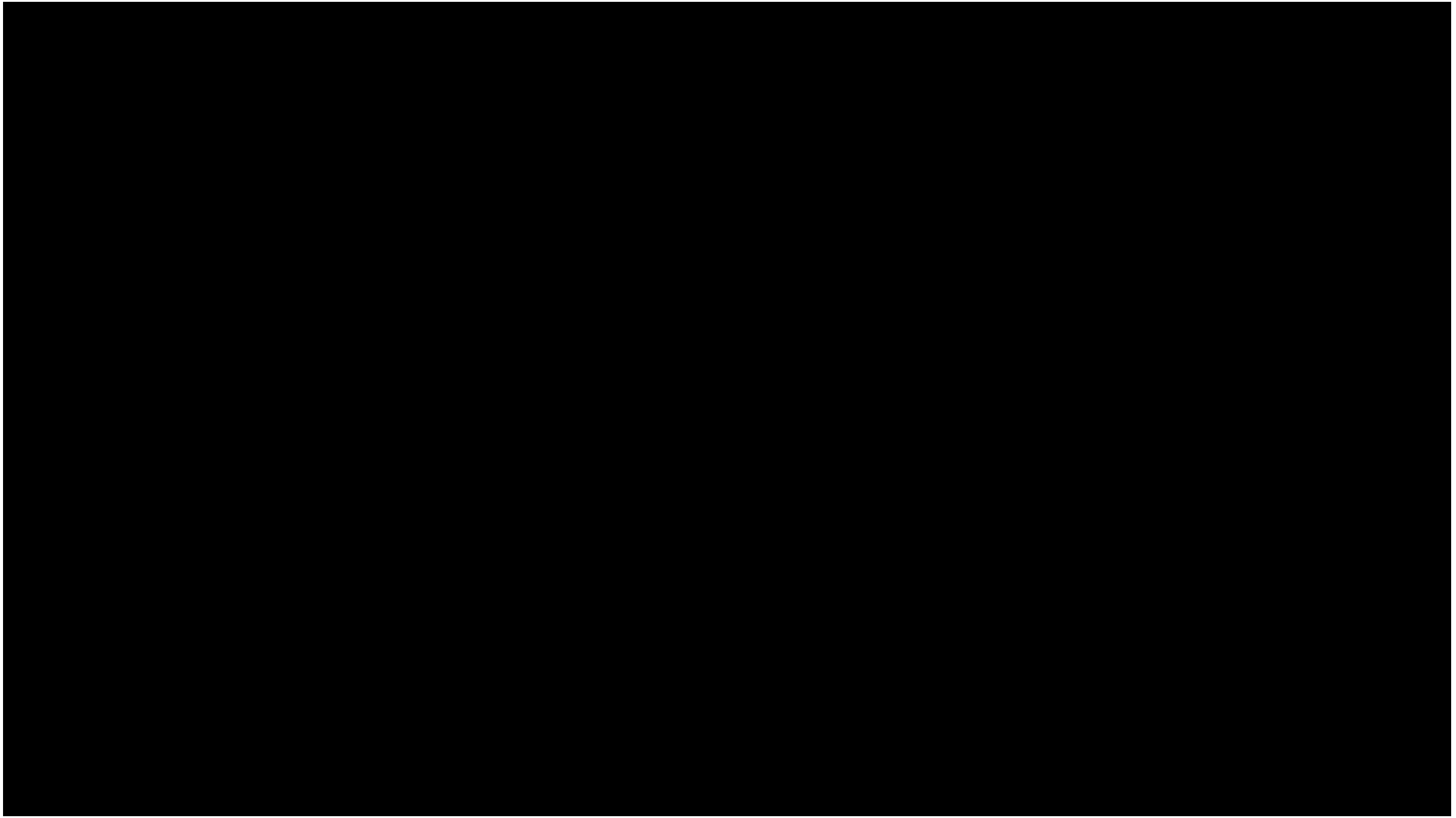


VR-HandNet: A Visually and Physically Plausible Hand Manipulation System in Virtual Reality

DongHeun Han RoUn Lee KyoungMin Kim HyeongYeop Kang

Kyunghee University, IIIXR LAB

Blowing air in VR:
A novel interaction technique for blowing virtual wind.



Game industry

"800만원? 우린 2천만원"…IT·게임업계 연봉인상 끝판왕은?

등록 :2021-02-26 11:35 수정 :2021-02-26 17:24

직방 "개발직 연봉 2천만원씩 인상

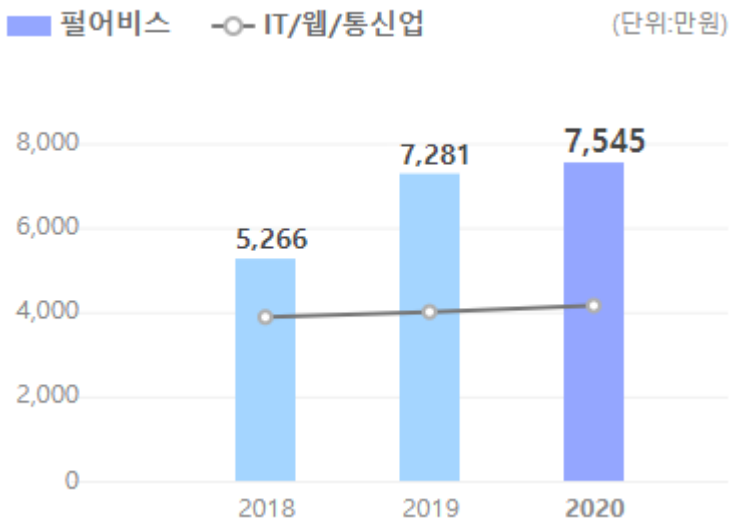
신입사원 초봉은 6천만원으로 결정"

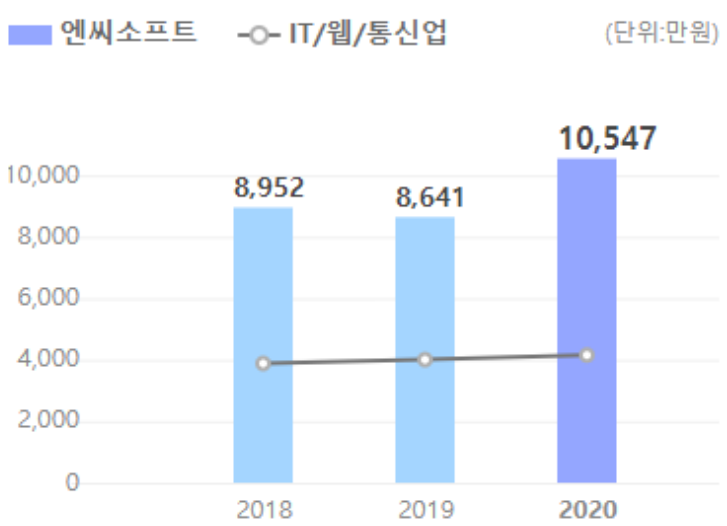
'배그' 크래프톤도 "2천만원 인상"

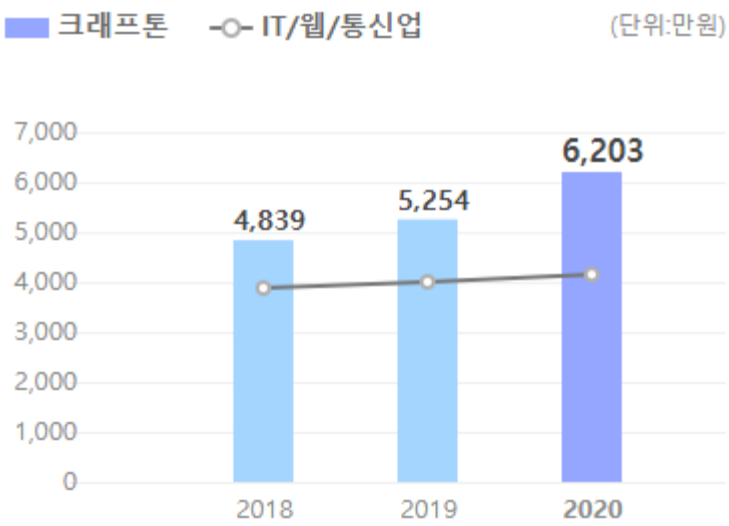
'넥슨 발' 연봉인상 레이스 점입가경

넥슨 채용 현황

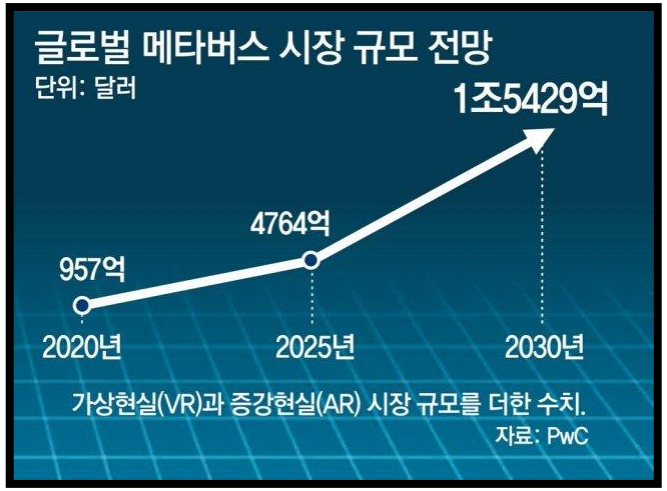
현재 인원	2018년말 5,125명 → **2020년말 5,107명** (한국 기준)
채용	**수백명(예정)**
연봉	**800만원 인상**(초봉 기준 기술직 5,000만원, 비기술직 4,500만원)

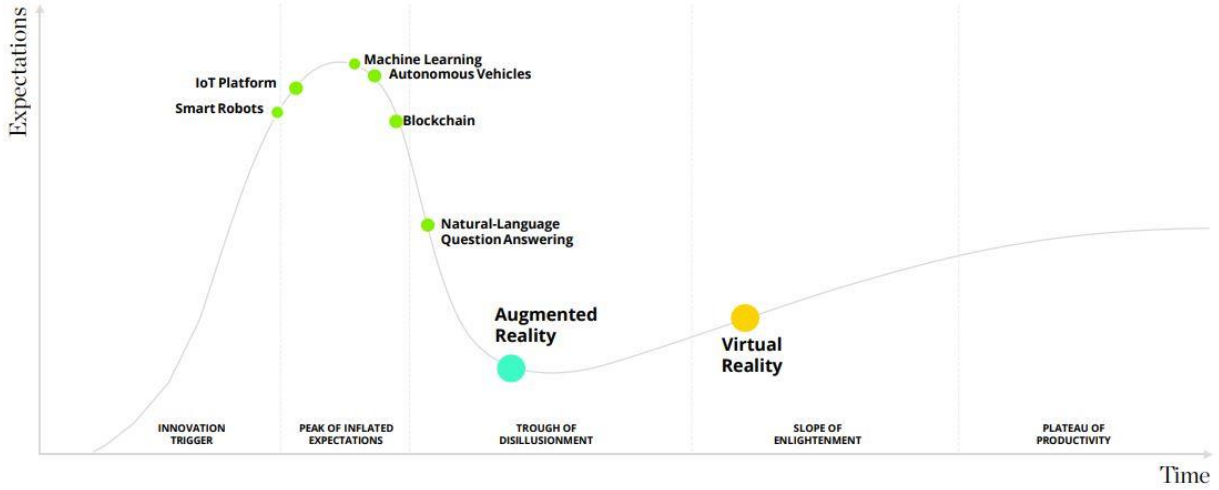


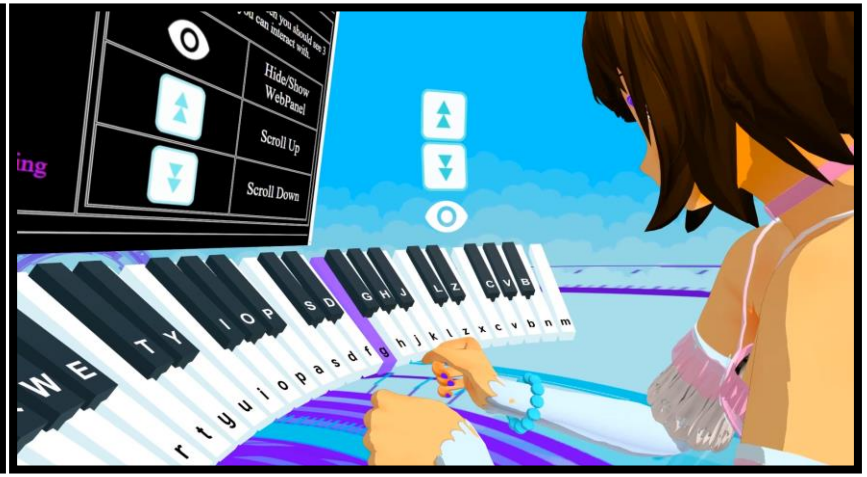




Metaverse







가상 현실 (VR Chat) 에서 수행되는 다양한 활동들. 모여서 파티를 하고, 춤을 추는 광경을 SNS에 공유하고, 피아노 연습을 하는 광경

(출처 – 공식 steam 페이지)

Class Overview

Ultimate goal

- (Theory) Understand the game engine architecture.
- (Practice) Experience the entire process of game development.
- (Practice) Improve your game by taking player experience into consideration.

Evaluation

- Team project - interim (20%)
- Team project - final (30%)
- Final exam (30%)
- Homework (10%)
- Additional points – MVP, leader, etc. (10%)

Class Overview

Team building

- 3~4 students per team.
- One team leader (+2 additional points)
- MVP (optional, +3 additional points, if recommended by at least 2 team members)
- Black list (optional, -5 deduction, if reported by at least 2 team members)

Team building process

- You can choose up to one friend you want to be with.
- The team will be constructed automatically. (manually by Prof..)

Team project

- Developing a 3D game based on Unreal Engine.
- Presentation is of importance.
- Incomplete game = no team project score

Class Overview

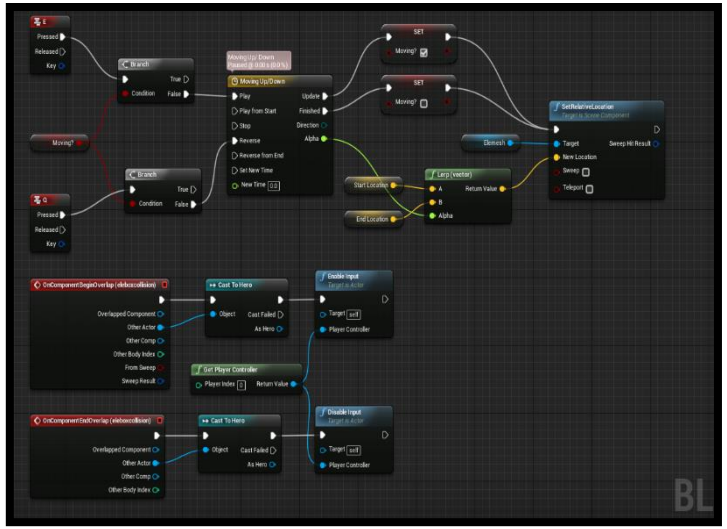
Important events

Week 1	Introduction	Week 9	
Week 2	Team building	Week 10	
week 3		Week 11	
Week 4		Week 12	
Week 5		Week 13	
Week 6		Week 14	
Week 7		Week 15	Final exam
Week 8	Team project presentation (Intermediate check)	Week 16	Team project presentation (Final presentation)

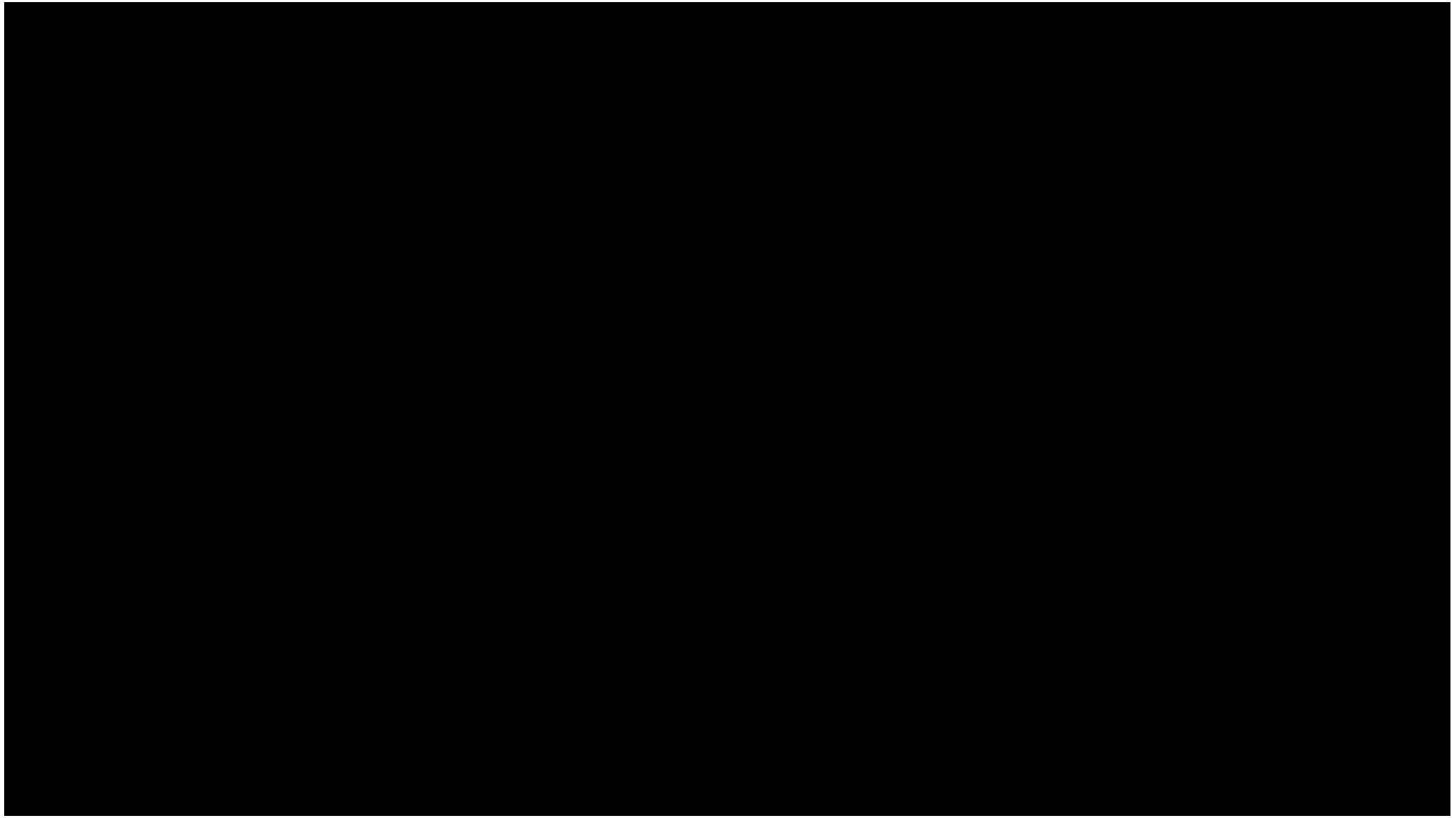
Class Overview

Practice with Unreal Engine

- One of the famous game engines.
- Unreal includes a lot of features.
- Maybe, you cannot master the Unreal.
- The goal is to try out all the features.



Class Overview



Real-time graphics with Unreal 4

Game Team Structure

Structure of a typical game team

- Engineers
- Artists
- Game designers
- Producers
- Other management and support staff

^^?[2]

Game Team Structure

Engineers

- The engineers design and implement the software that makes the game, and the tools, work.
- Engineers are often categorized into two groups:
  - Runtime programmers (who work on the engine and the game itself)
  - Tools programmers (who work on the offline tools that allow the rest of the development team to work effectively)
- Some engineers focus their careers on a single engine system, such as rendering, artificial intelligence, audio, or physics.
- Some engineers are generalists who can jump around and tackle whatever problems might arise during development.

Engineering-related position

- *Senior engineers*: they are asked to take on a technical leadership role. (> 3 years)
- *Lead engineers*: they help to manage the team's schedule, make decisions regarding the overall technical direction of the project, and manage people from a human resources perspective. (> 5~7 years)
- *Technical directors (TD)*: they oversee one or more projects from a high level, ensuring that the teams are aware of potential technical challenges, upcoming industry developments, and new technologies.
- *Chief technical officer (CTO)*: The highest position at a studio.

Richard Garriott

Game Team Structure

Artists

- The artists produce all of the visual and audio content in the game, and the quality of their work can literally make or break a game.
- *Concept artists*: they produce sketches and paintings that provide the team with a vision of what the final game will look like.
- *3D modelers*: they produce the three-dimensional geometry for everything in the virtual game world. There are foreground modelers and background modelers. The former create objects, characters, vehicles, weapons and the other objects. The latter build the world's static background geometry (terrain, buildings, bridges, etc.).
- *Texture artists*: They create the two-dimensional images known as textures.
- *Lighting artists* : they lay out all of the light sources in the game world to maximize the artfulness and emotional impact of each scene.
- *Animators*: they imbue the characters and objects in the game with motion.
- *Motion capture actors*: they are often used to provide a rough set of motion data.
- *Sound designers*: they work closely with the engineers to produce and mix the sound effects and music in the game.

concept art[3]

Game Team Structure

concept animation[3]

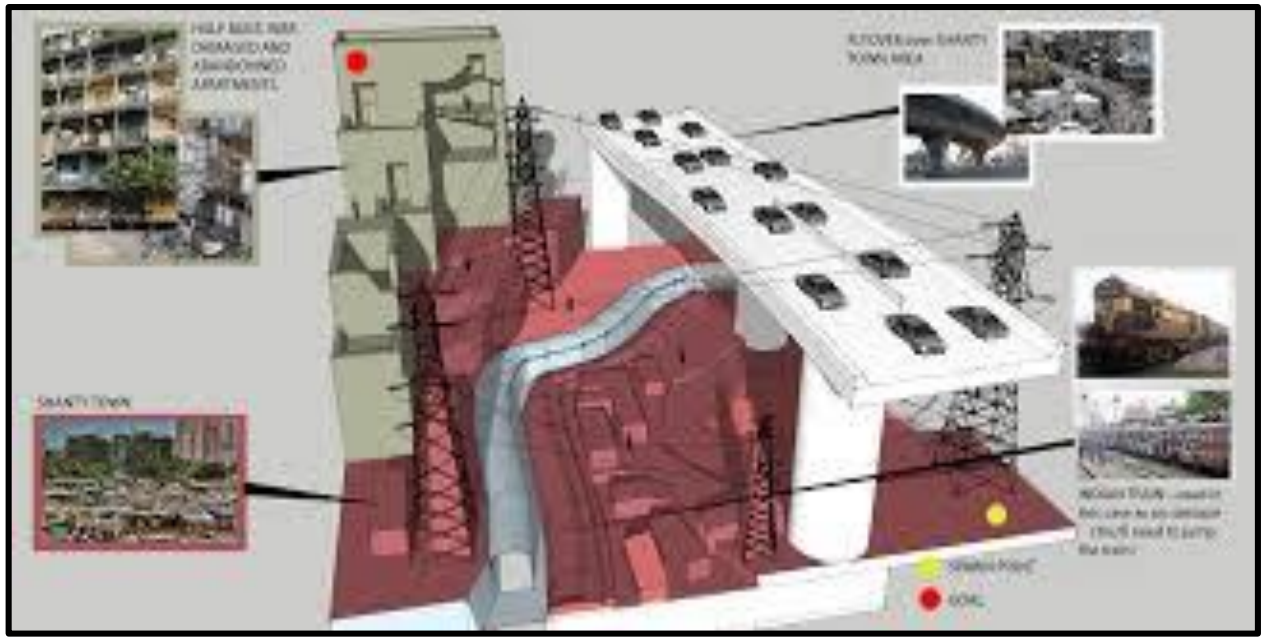
Game Team Structure

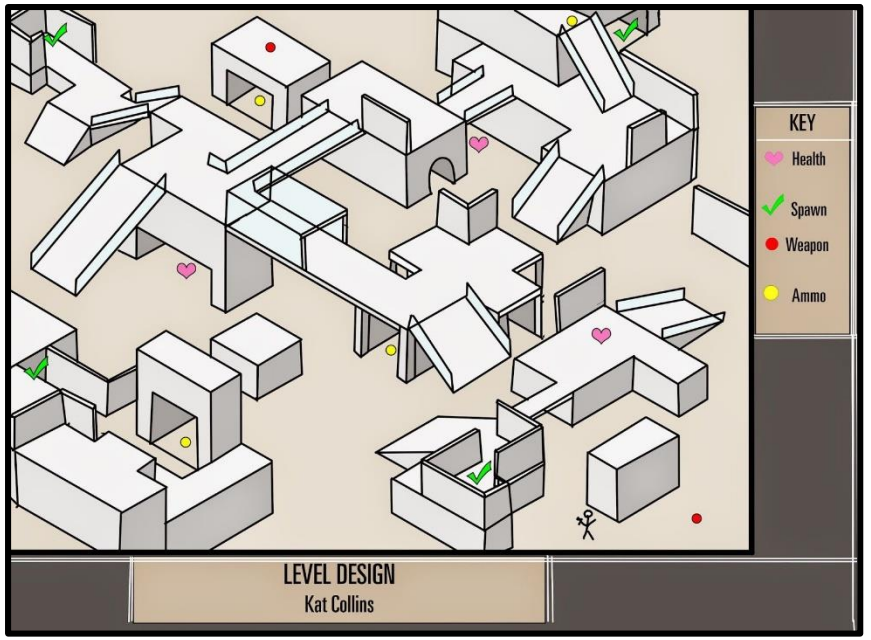
concept animation[3]

Game Team Structure

Game designers

- The game designers' job is to design the interactive portion of the player's experience.
- Some game designers work at the macro level, determining the story arc, the overall sequence of chapters or levels, and the high-level goals and objectives of the player.
- Other designers work on individual levels or geographical areas within the virtual game world, laying out the static background geometry, determining where and when enemies will emerge, placing supplies like weapons and health packs and so on.
- Some game designers are ex-engineers, who decided they wanted to play a more active role in determining how the game will play.



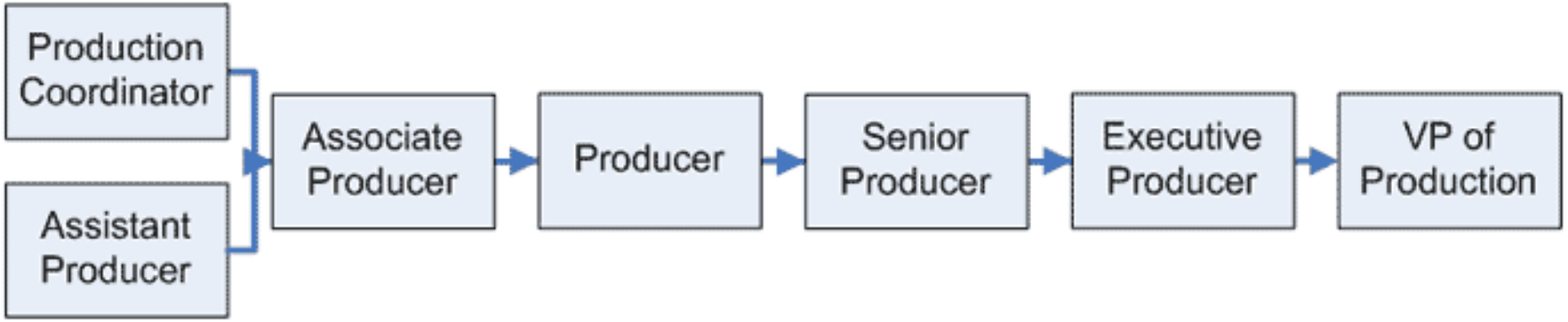


level design[4][5]

Game Team Structure

Game producers

- The role of producer is defined differently by different studios.
- In some companies, their job is to manage the schedule and serve as a human resources manager.
- In other companies, they serve in a senior game design capacity.
- Still, other studios ask their producers to serve as liaisons between the development team and the business unit of the company (finance, legal, marketing, etc.)

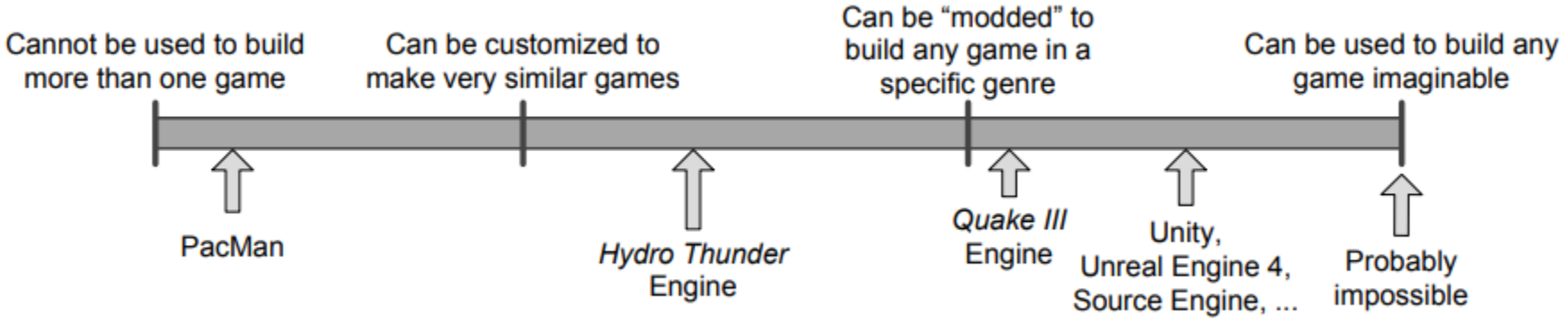


career path of producer[6]

What is Game Engine?

Game engine

- A game engine (or game framework) is a software-development environment for people to develop games.
- It provides a suite of development tools to enable the simplified and rapid development of games.
- A data-driven architecture is what differentiates a game engine from a game software.
- When a game contains hard-coded logic or game rules, or employs special-case code to render specific types of game objects, it becomes difficult or impossible to reuse that software to make a different game.

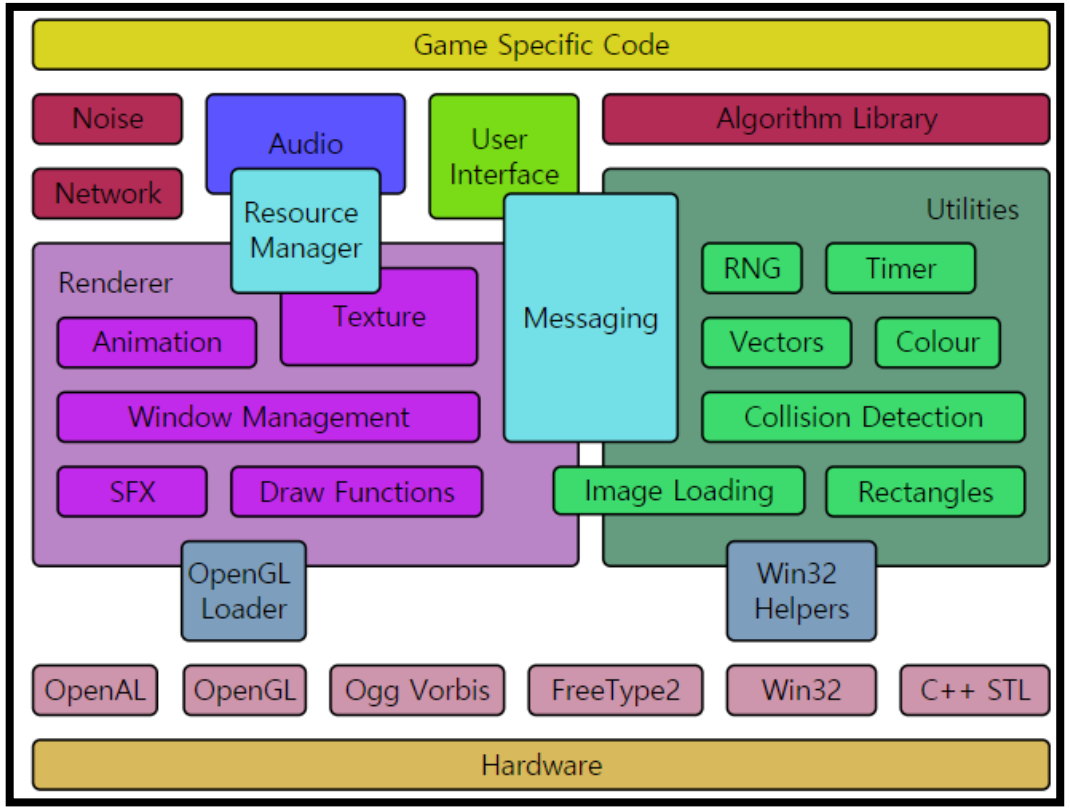


game engine reusability gamut

What is Game Engine?

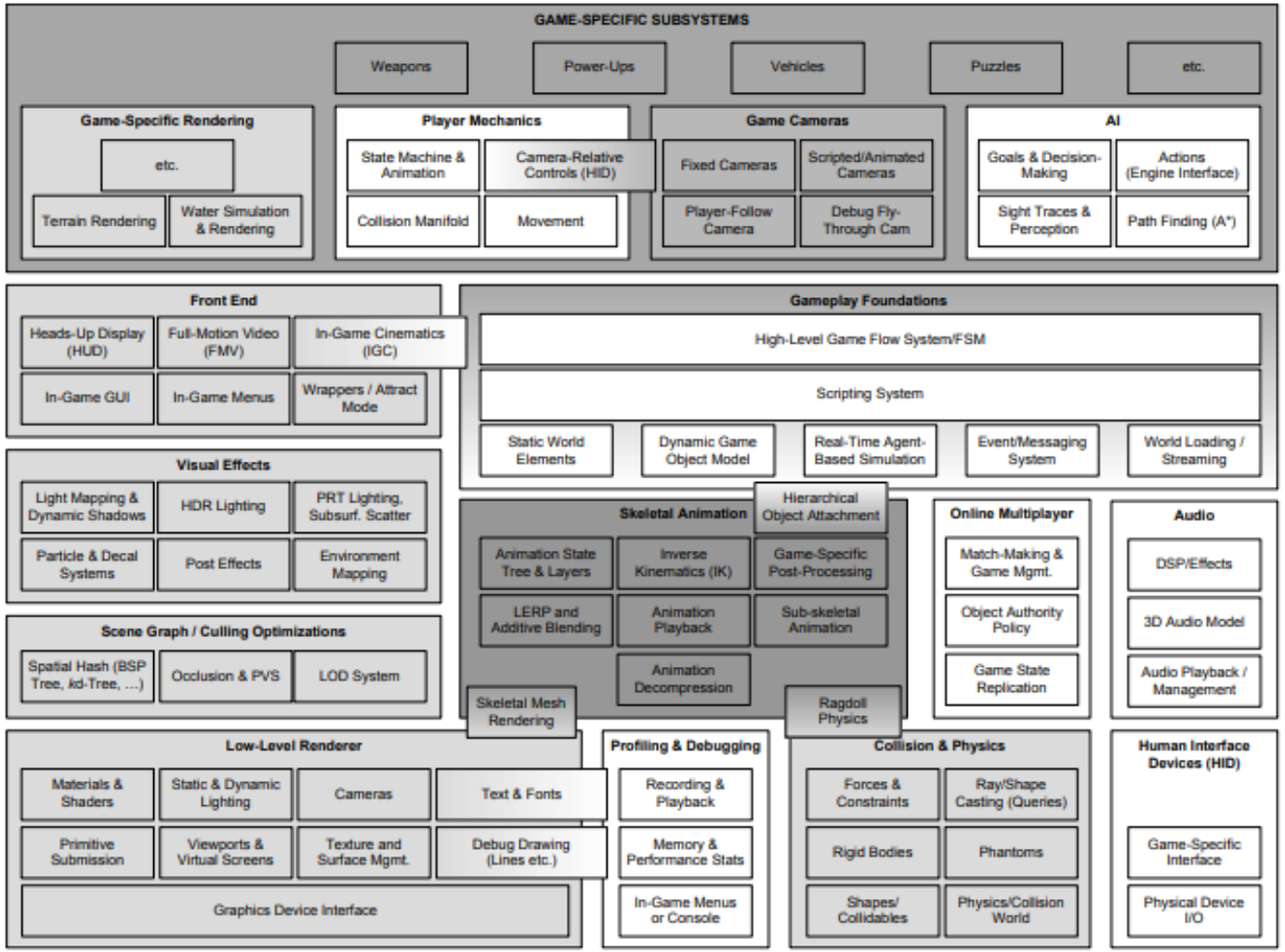
Typical components of game engine

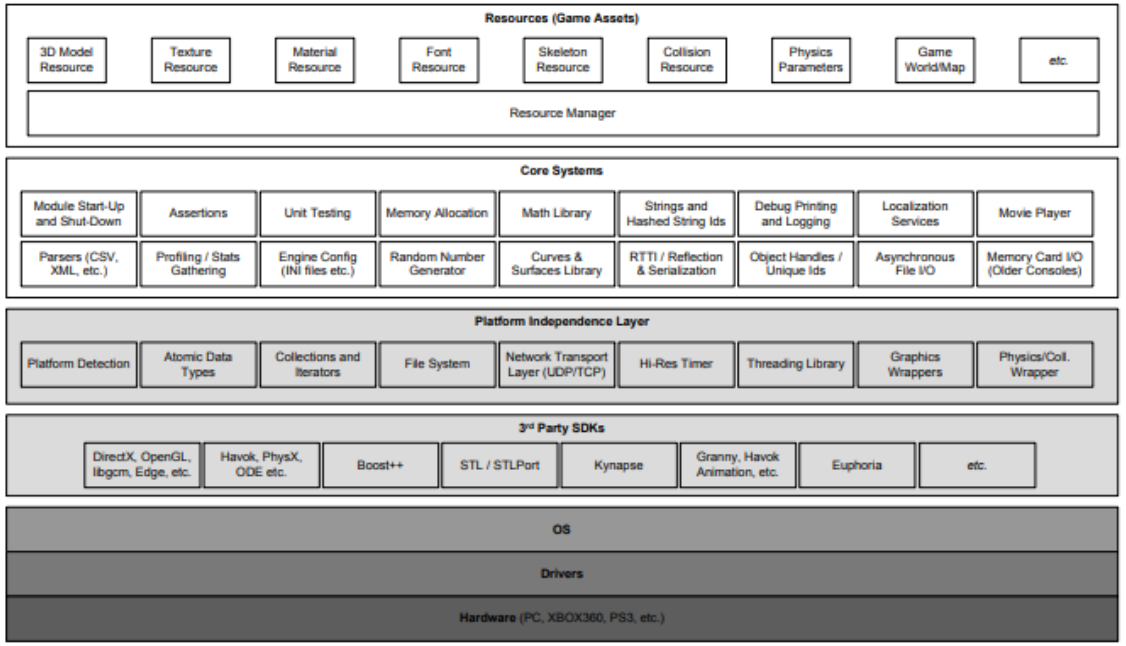
- Rendering
- Audio
- Physics
- Artificial intelligence
- Network
- Memory management
- Threading
- Etc.



an example of game engine components[1]

What is Game Engine?





Reference

[1] https://indiegamedev.net/2020/01/15/game-engine-development-for-the-hobby-developer-part-2-engine-parts/
[2] https://www.slideshare.net/joanby/a-gaming-company-structure
[3] https://page.onstove.com/epicseven/global/view/3377045
[4] https://line.17qq.com/articles/depbhbfhz.html
[5] https://www.pinterest.co.kr/lewissmithe1/
[6] http://www.animationarena.com/video-game-producer.html