

3D Game Programming Introduction

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<https://goolink.cc/jPDqt>

Goal

- 📎 Introduction to Game Development using Roblox / Unity3D or ...
- 📎 Introduction to Computer Graphics
- 📎 Introduction to Game Design
- 📎 (optional) OpenGL programming

Related Courses

Programming
(C/C++, ...)



3D Game Programming

Computer Graphics



Advance
Computer Graphics

Visual Effect

Computer Animation

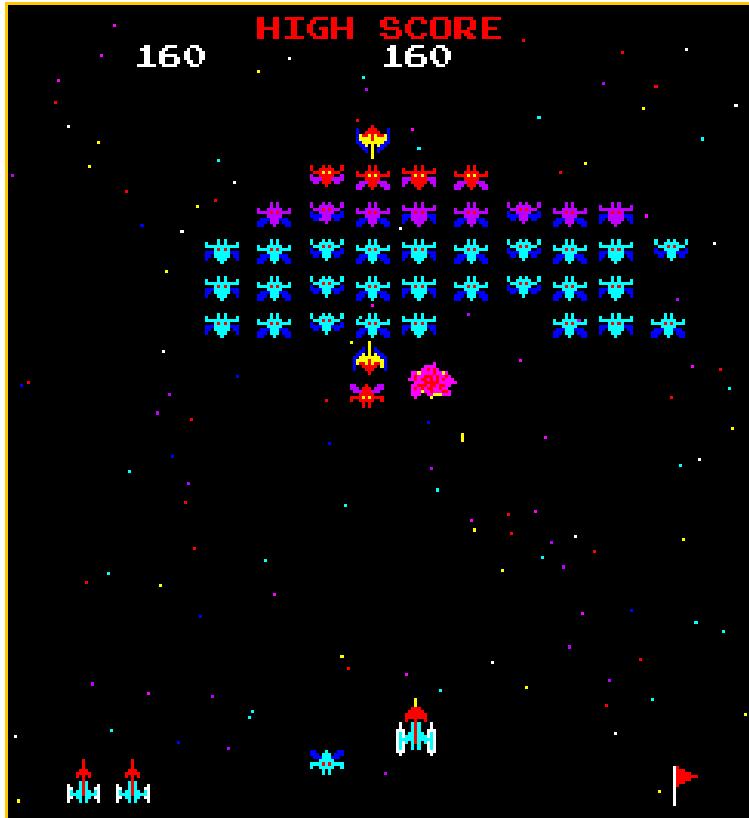
Human Computer Interface

GAME

What is video game?

- 📎 Visual feedback
- 📎 User interface
- 📎 Gameplay

Galaxian 1979 by Namco



Elements

- Airplane
- Alien
- Bullet
- Life count
- Score

Game Components

Fun

Start

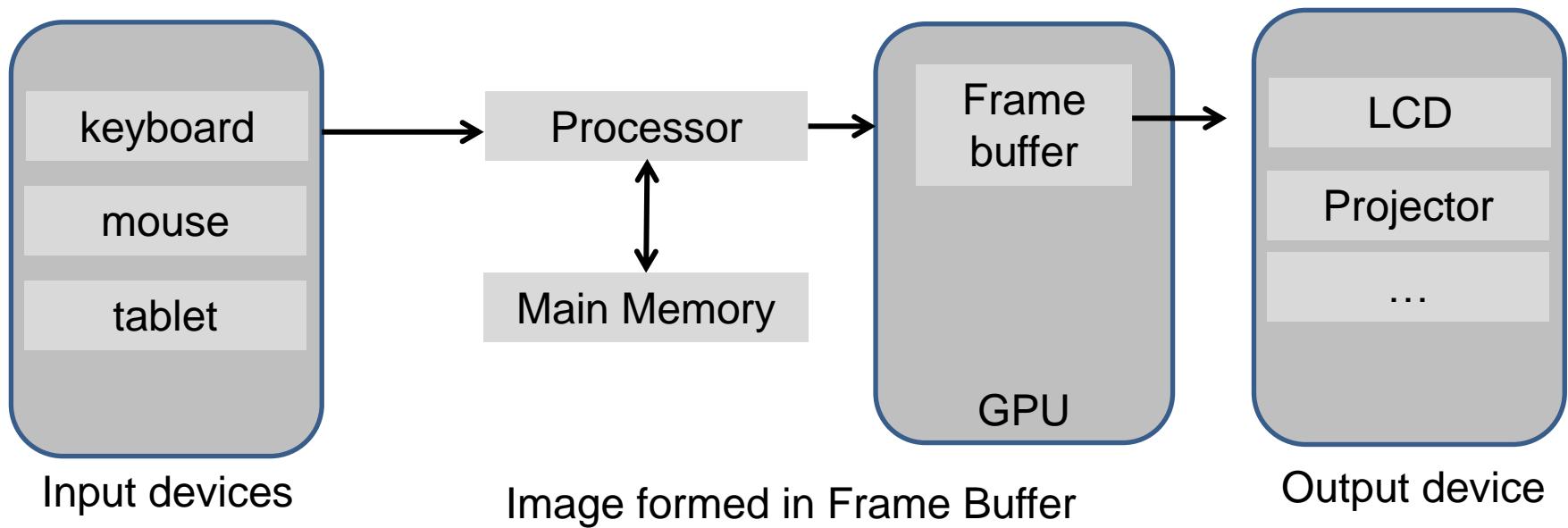
Rule

State

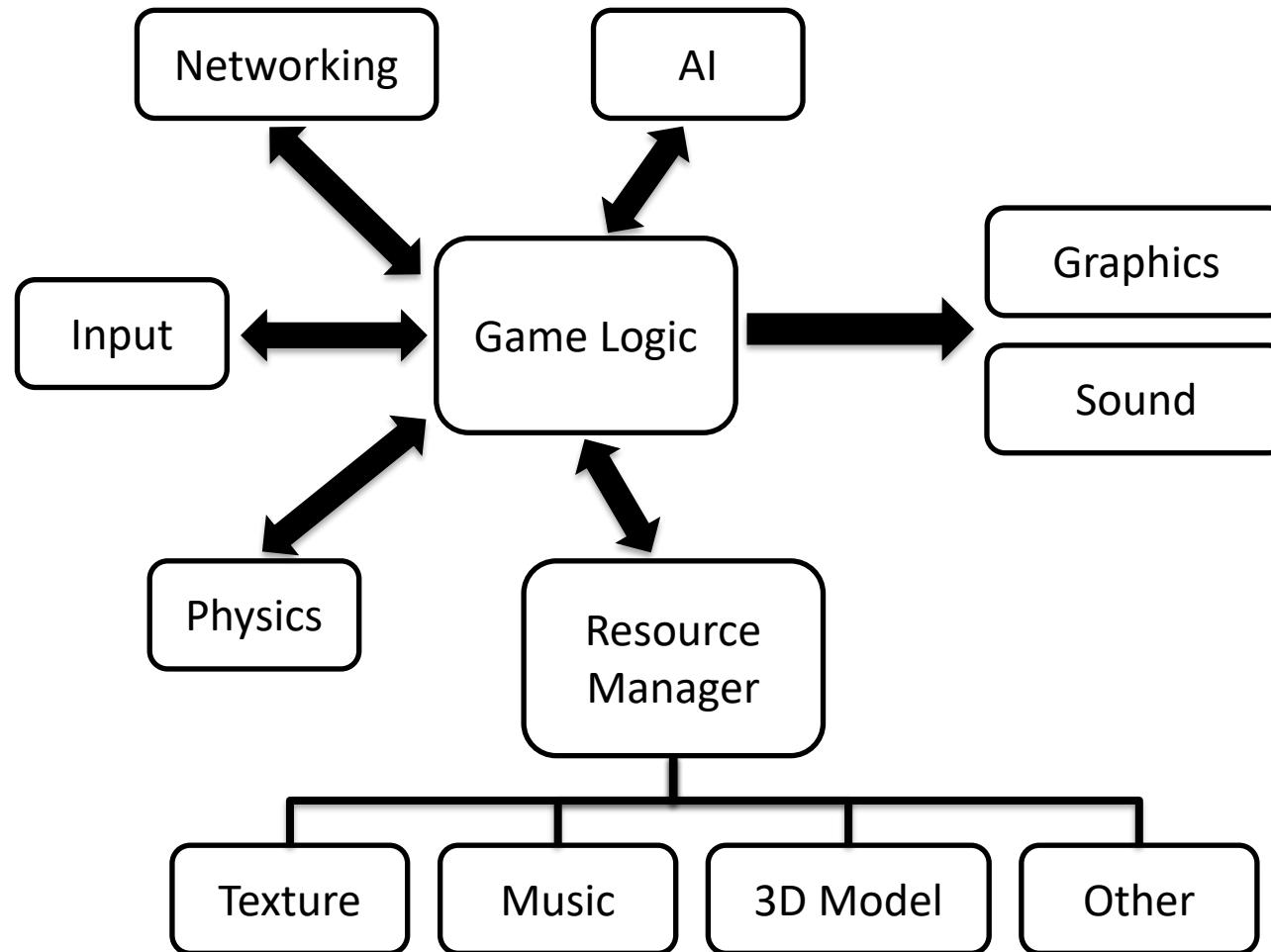
Interaction

End

Basic Graphics System



Game Architecture



Grading

- 📎 Homework (30%)
- 📎 3 Team Projects (20%*3)
- 📎 Participation (10%)

Content

- clip 設計遊戲機制與開發互動遊戲
- clip 掌握遊戲的開發環境與工作流程
- clip 理解遊戲所需多媒體素材的編輯與應用
- clip 開發電腦遊戲所需的即時繪圖技術
- clip 關卡設計與遊戲世界中的物理行為和人工智慧
- clip 3 module, 3 team projects
- clip Demo, Demo, Demo,

Module 1

週次	主題
1	Introduction to game development
2	Game loop and mechanism design
3	Game assets and editing
4	Physics simulation
5	Lighting and material
6	First project demo

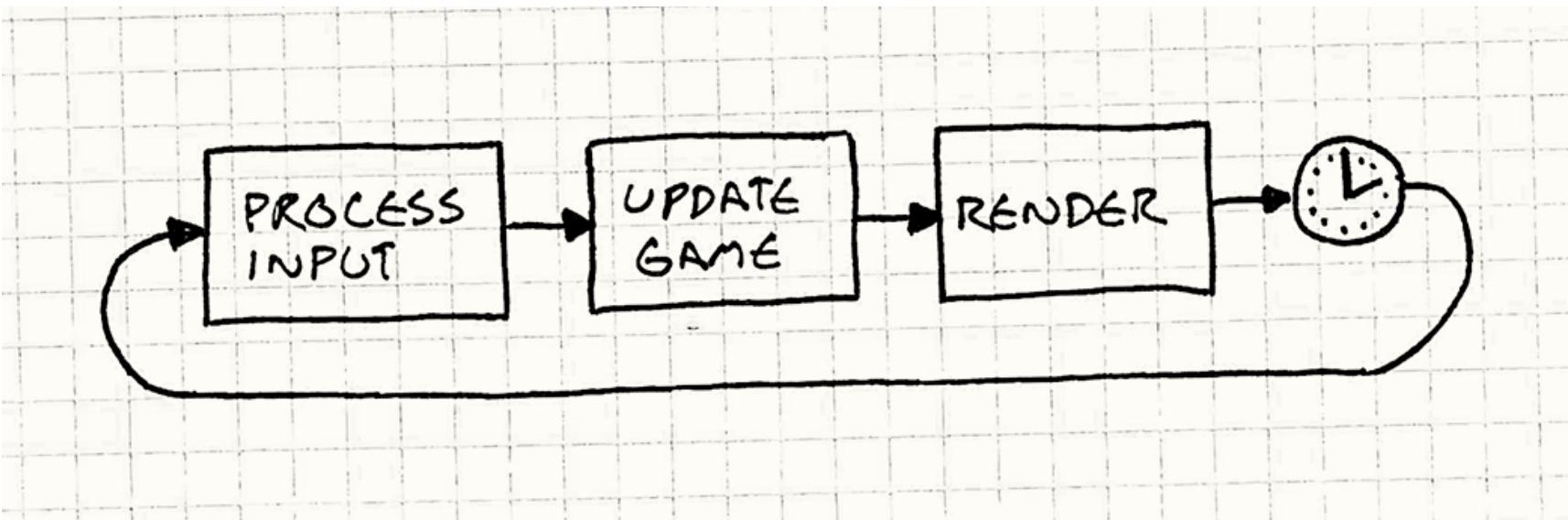
Module 2

週次	主題
7	Realtime rendering techniques
8	Level design
9	Character/avatar) design
10	Physically Based Rendering
11	Particles and Special effect
12	Second project demo

Module 3

週次	主題
13	Building Virtual world
14	AR/VR interface and interaction
15	AI in games
16	Game engine and Universal Scene Description
17	The next generation of the game
18	Third project demo

Game loop



<http://gameprogrammingpatterns.com/game-loop.html>

Game architecture

Game Loop

init()

update(delta)

paint(delta)

I/O System

Keyboard, mouse

audio

storage

Asset Management

loading

saving

caching

The Life of a vertex

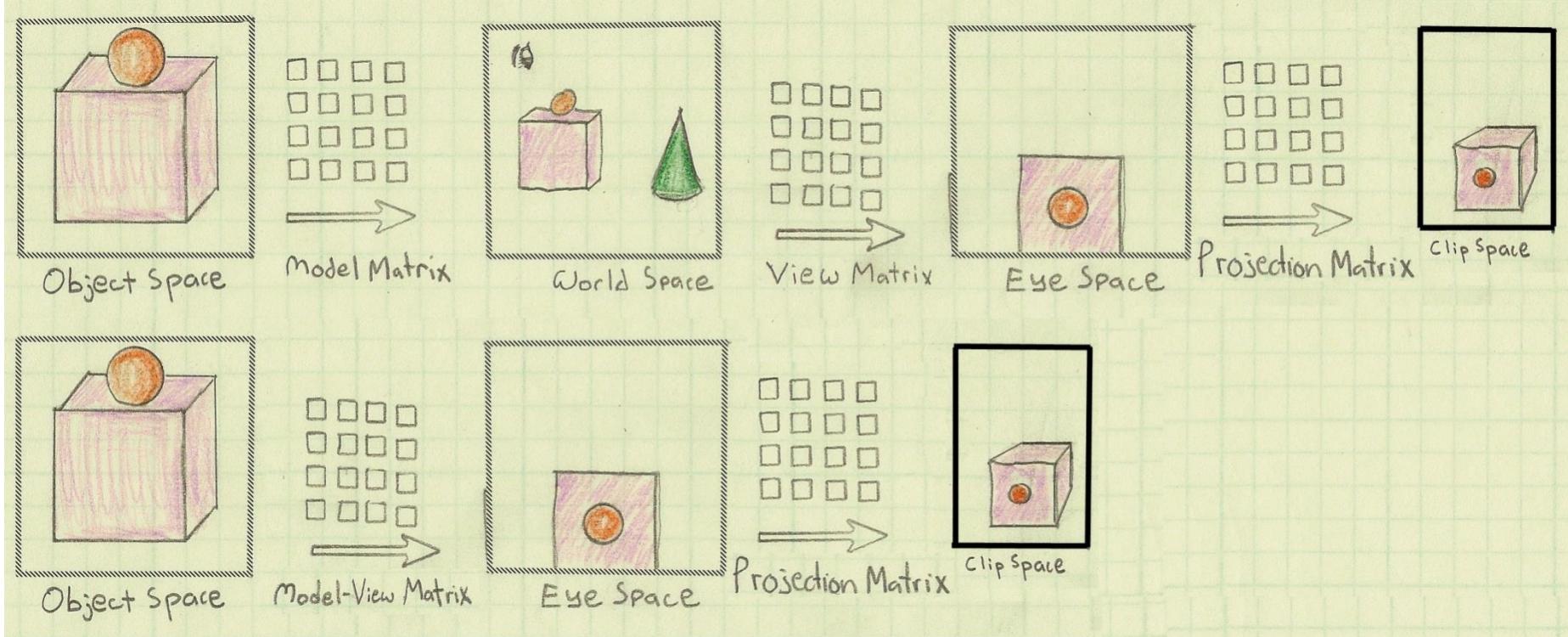
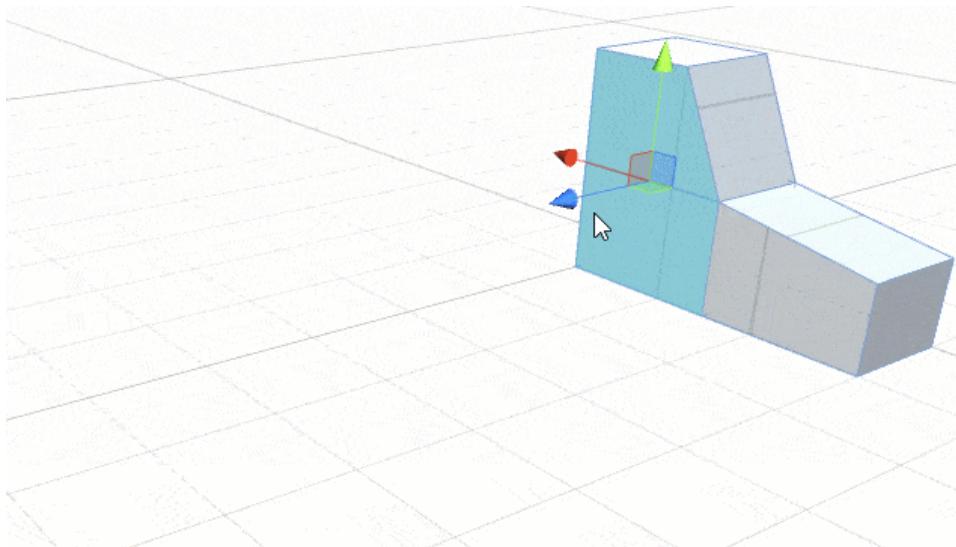
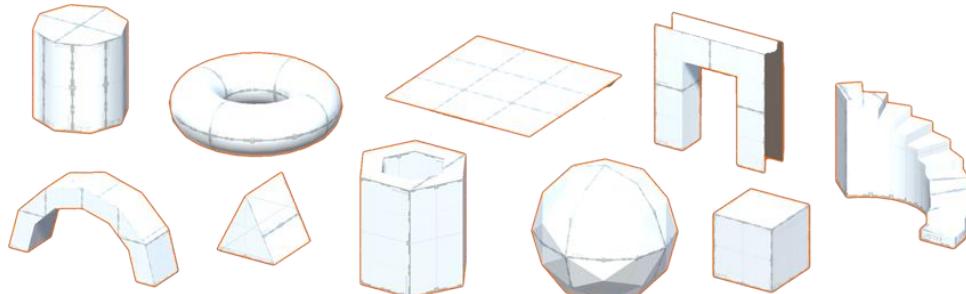
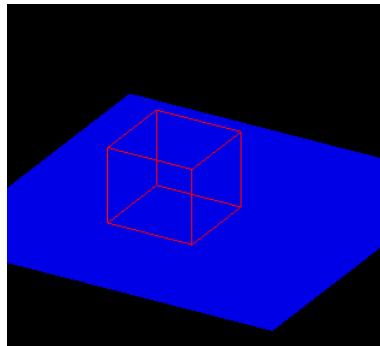


Image by Philp Rideout

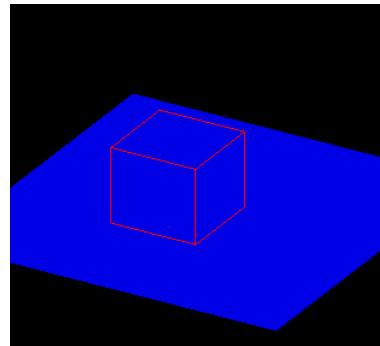
幾何物體顯示



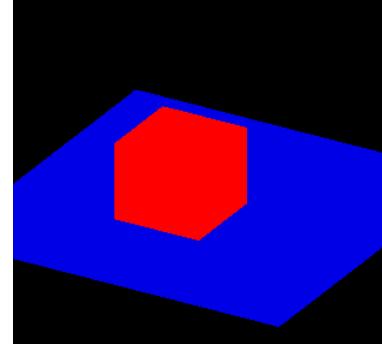
3D effect



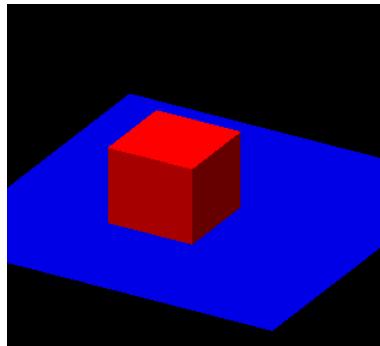
Wired-frame



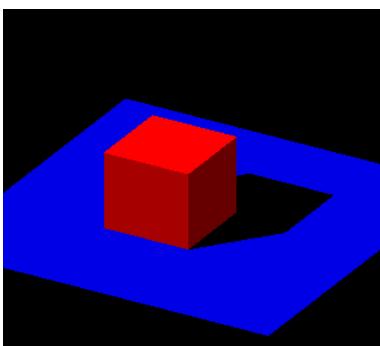
Hidden surface
remove



Coloring



shading



shadow



Texture

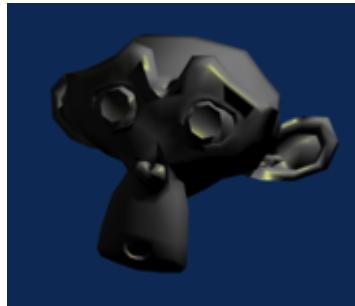
光源與材質



No shading



Diffuse



Specular

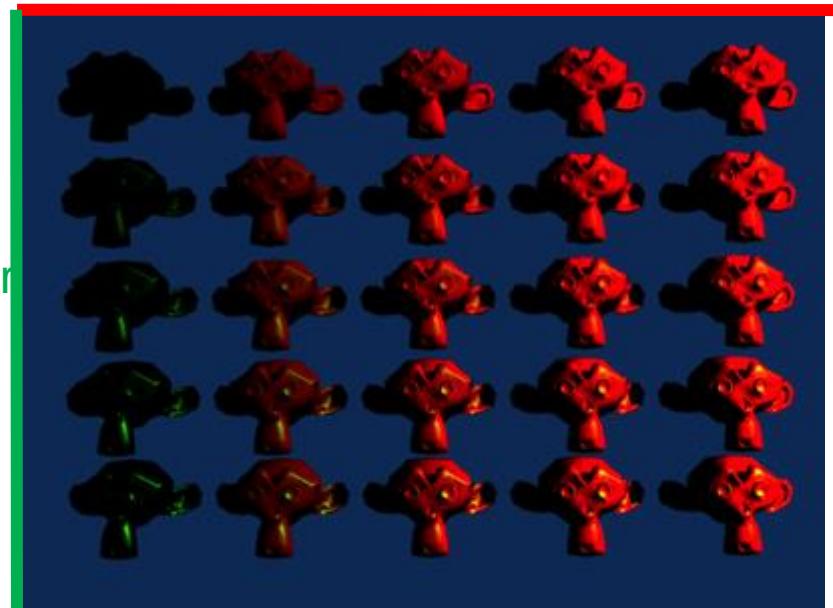
small

diffuse

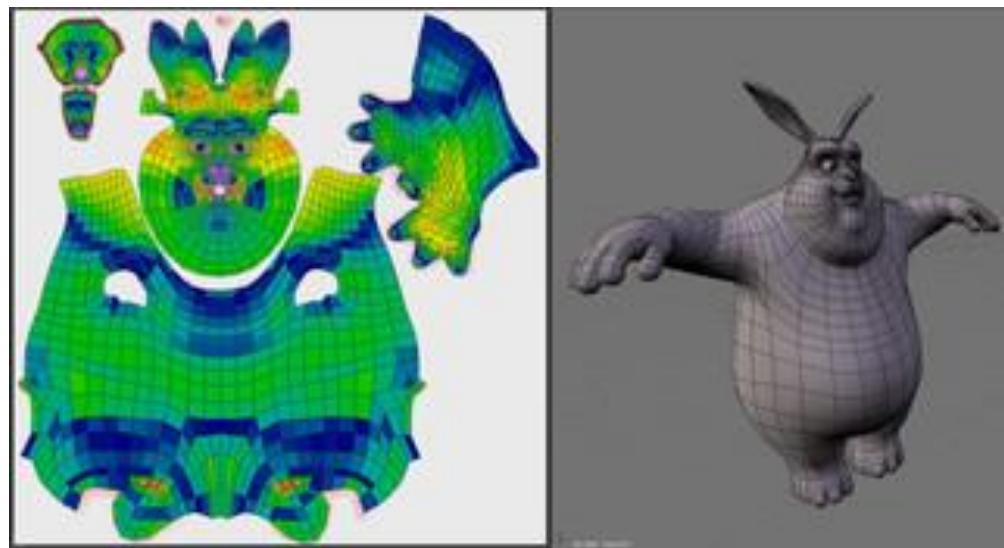
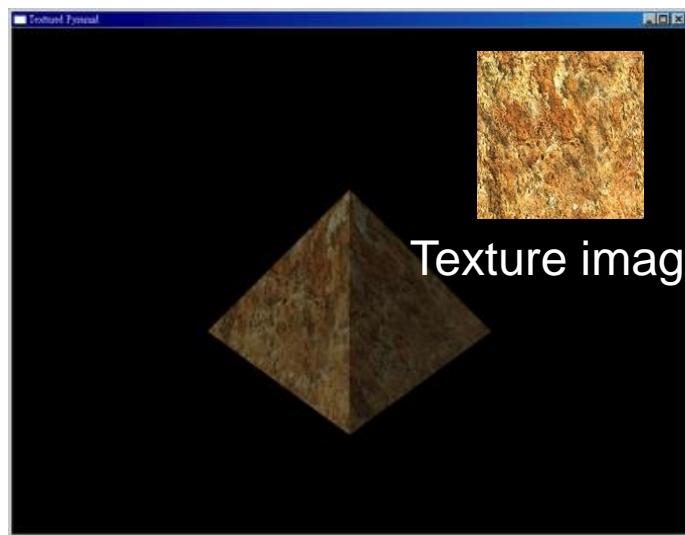
large

specular

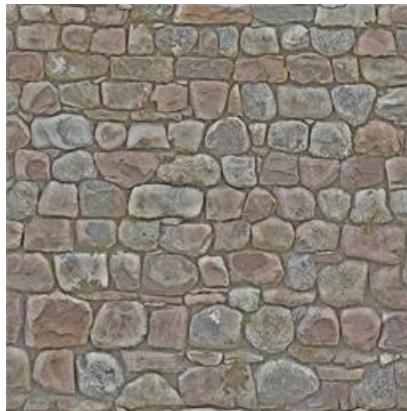
large



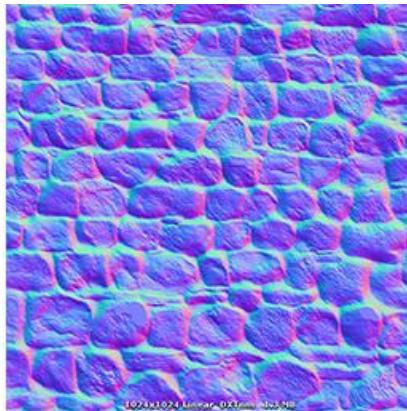
Texture



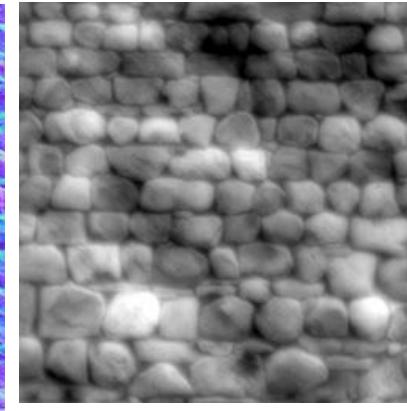
Texture - Height Maps



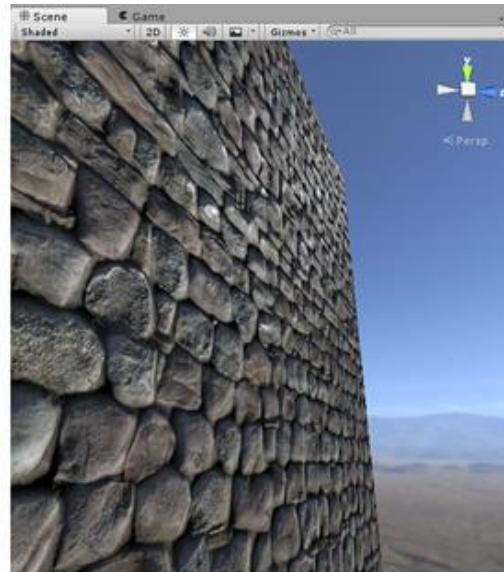
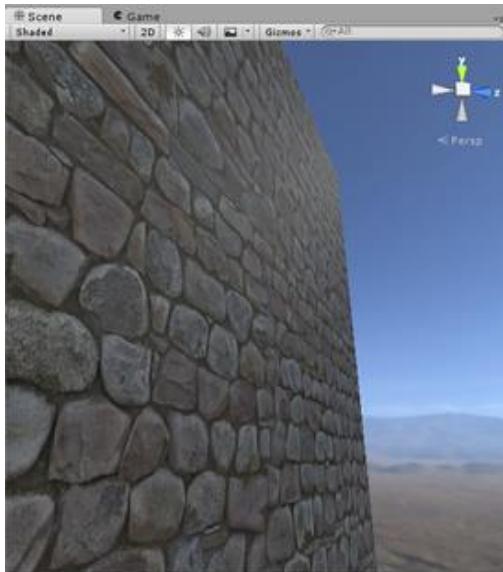
albedo



Normal

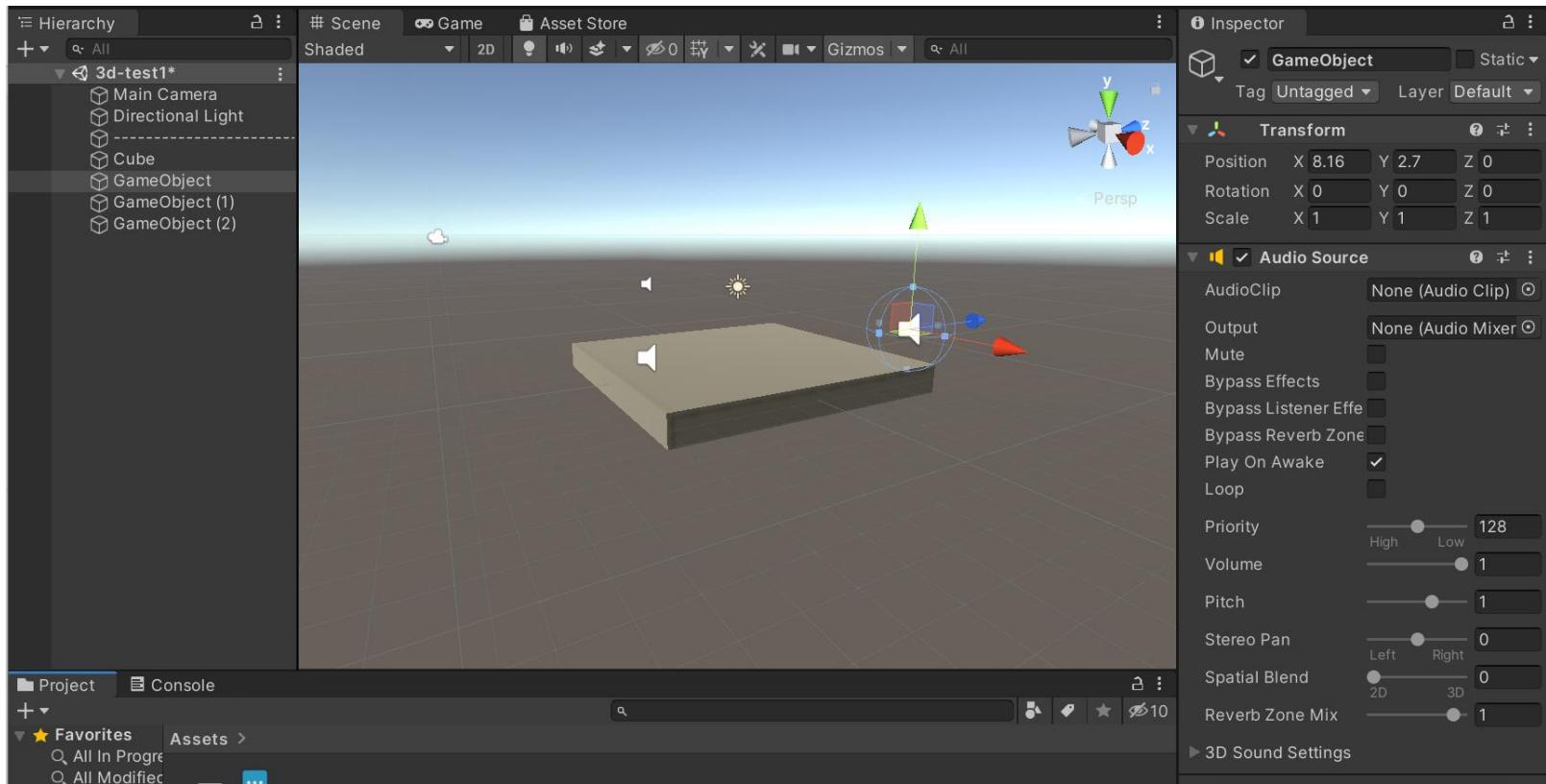


Height



音效

- 熟悉音效載入和播放的相關功能，用音效和音樂增添遊戲的豐富度

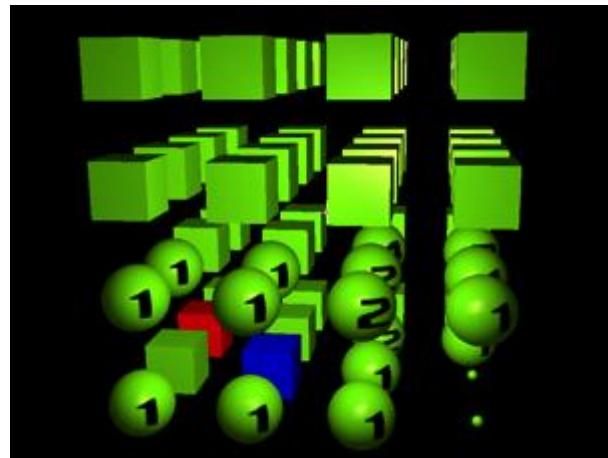
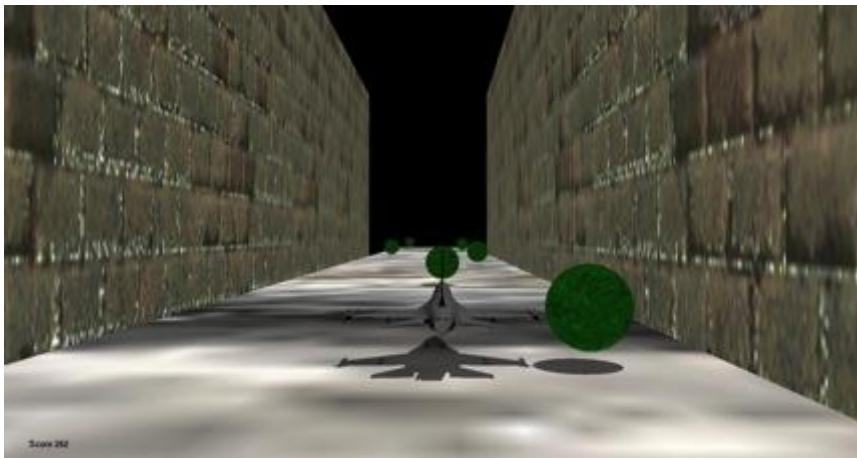
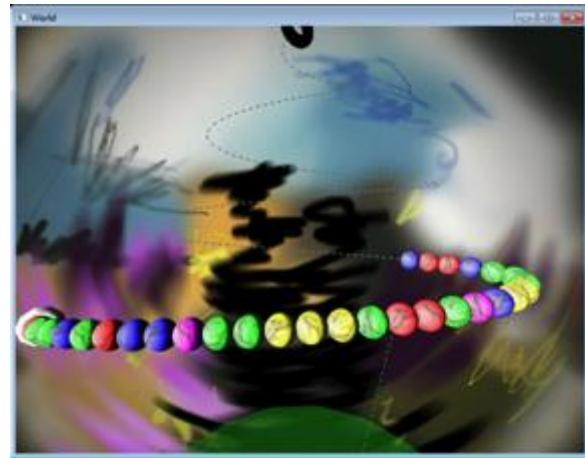


立體顯示與虛擬實境

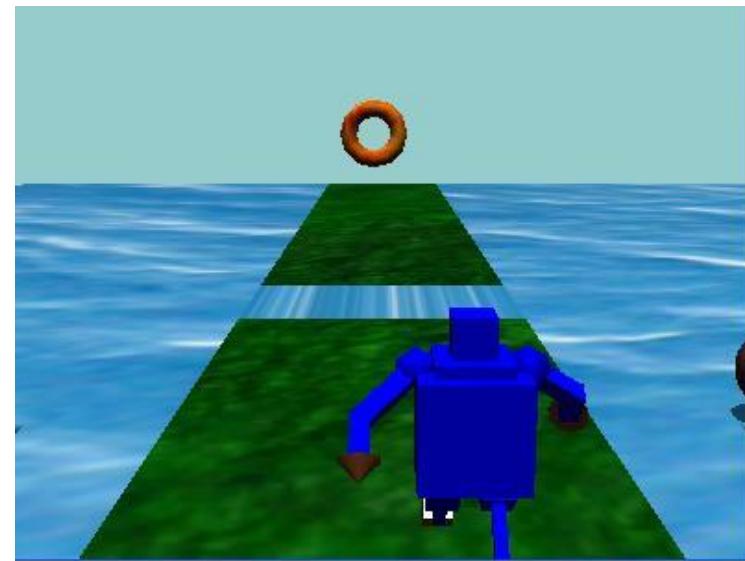
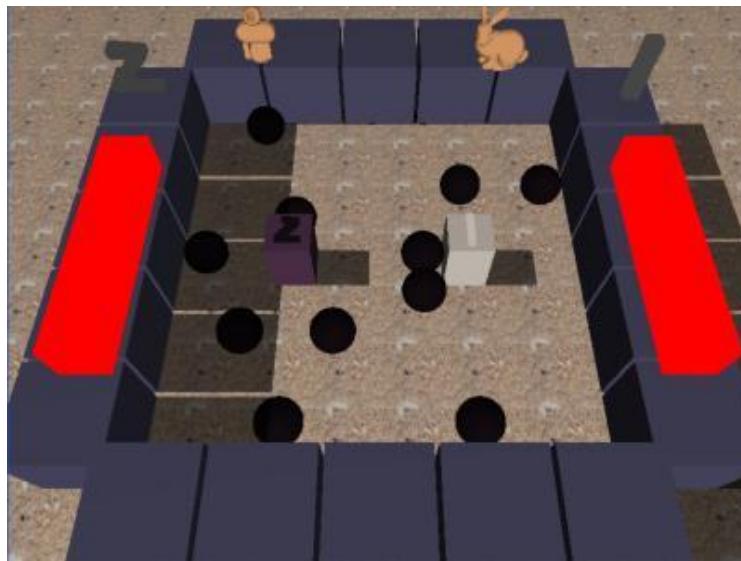
- 介紹各式立體顯示的裝置，並提供對應的程式範例，讓學生可修改讓遊戲具體立體顯示功能



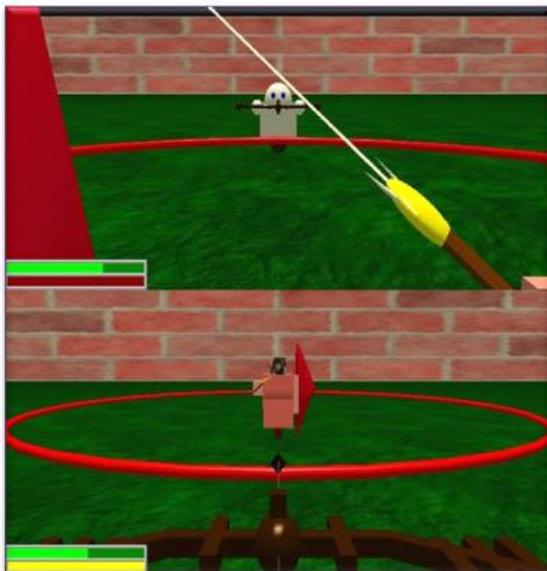
2010期末專題成果(OpenGL)



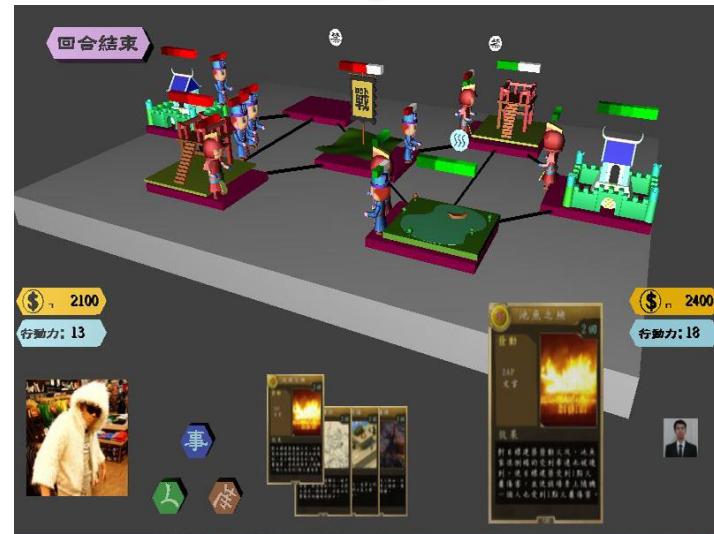
2011期末專題成果



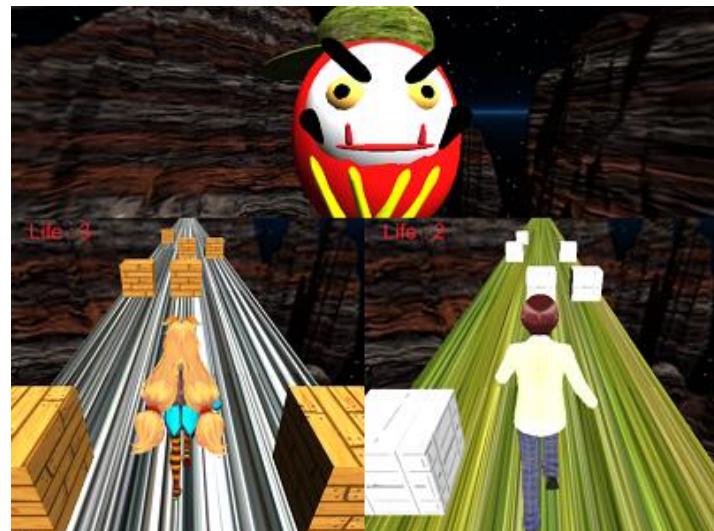
2012期末專題成果



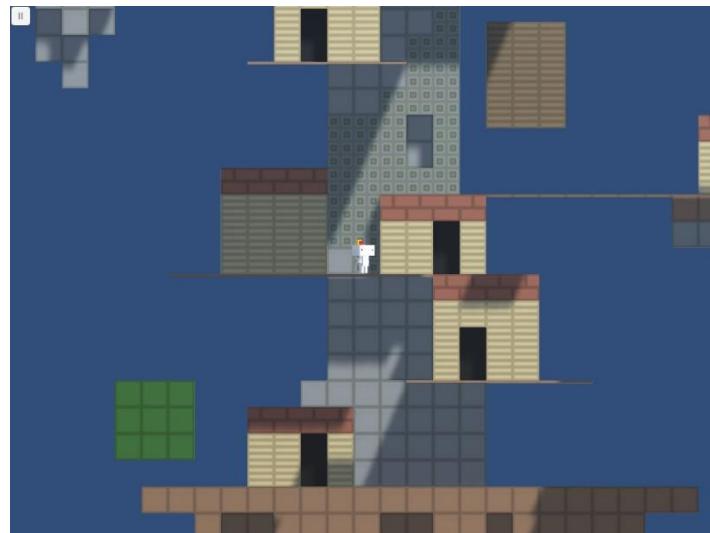
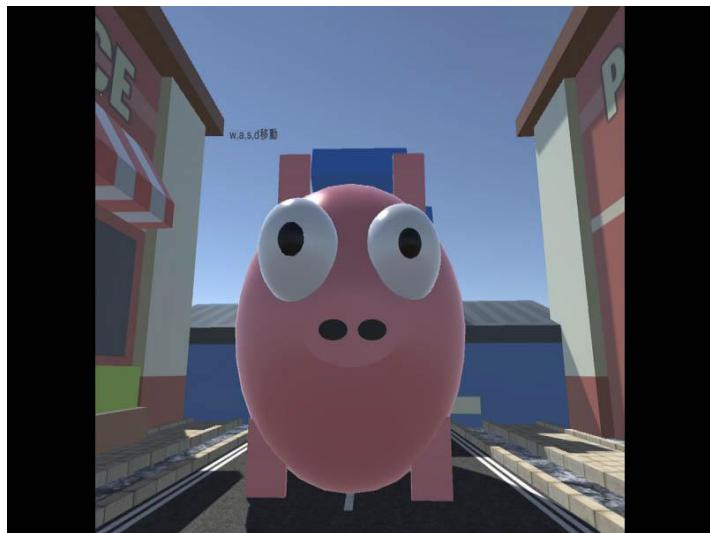
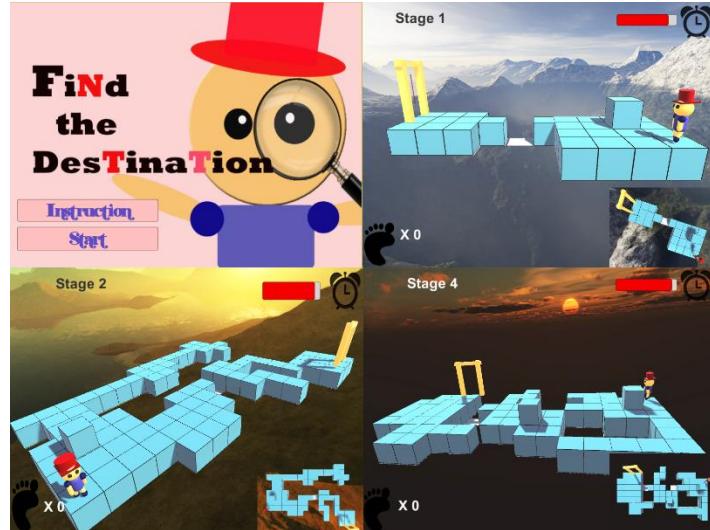
2013期末專題成果(Unity)



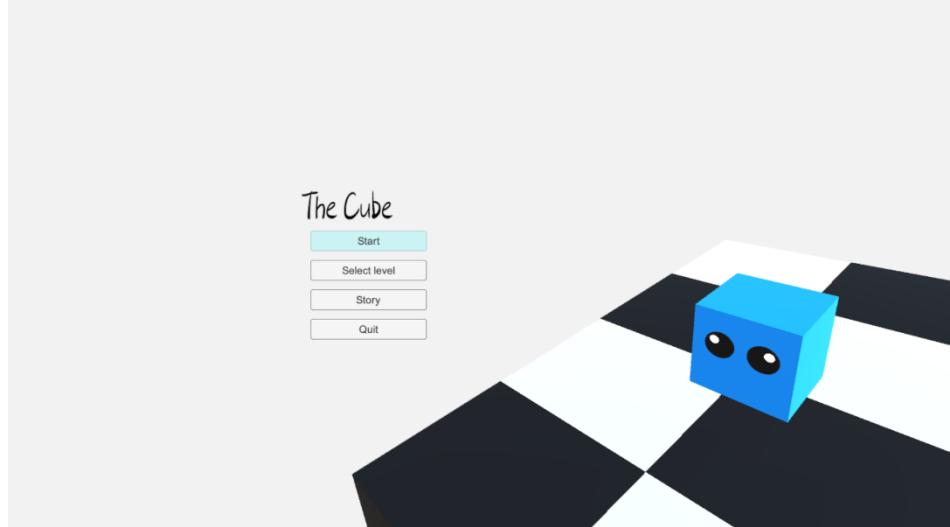
2014期末專題成果



2015期末專題成果



2016期末專題成果



2017期末專題成果



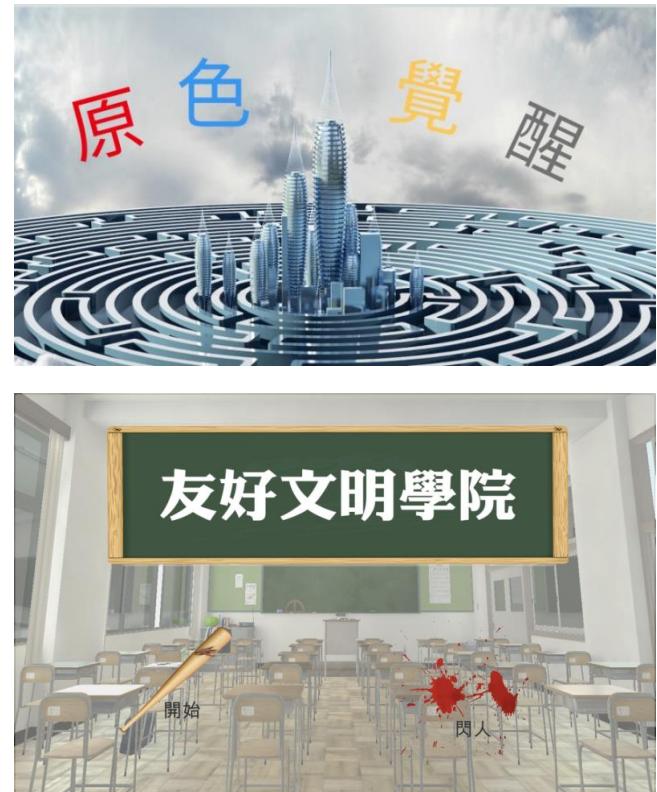
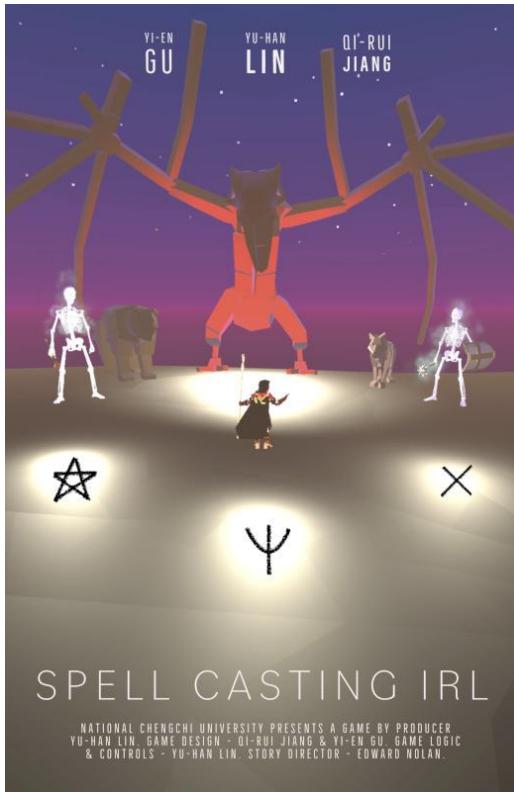
2018期末專題成果



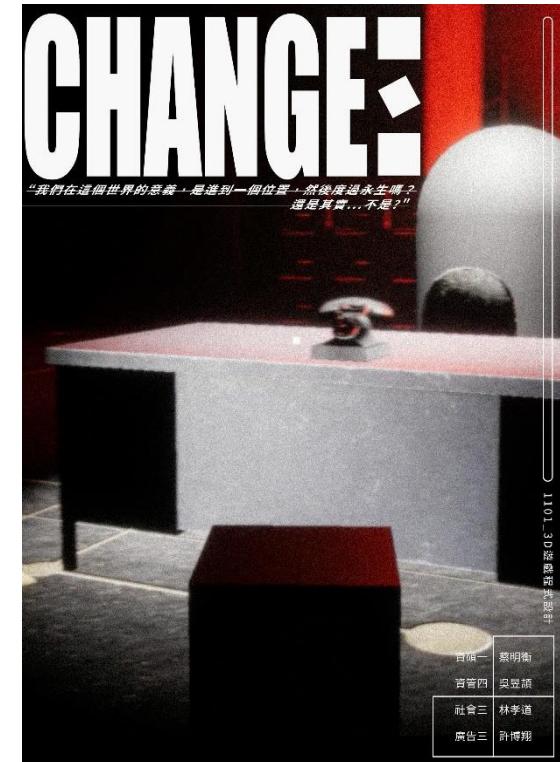
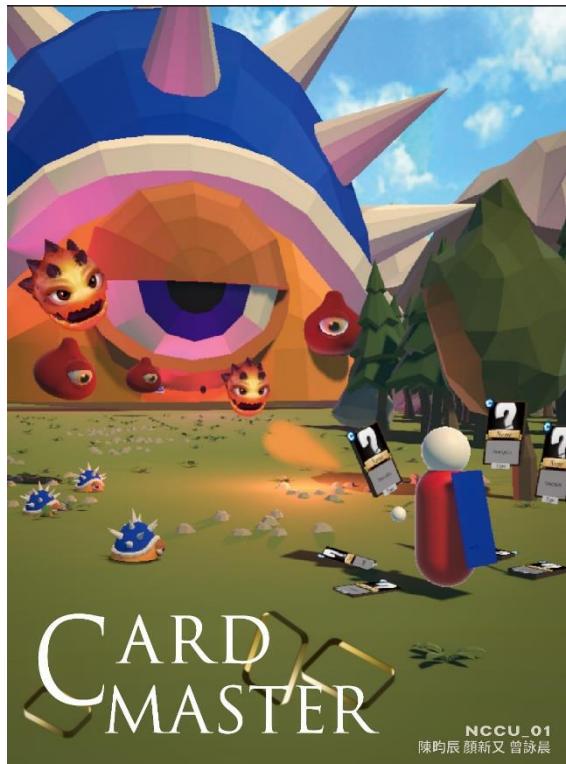
2019期末專題成果



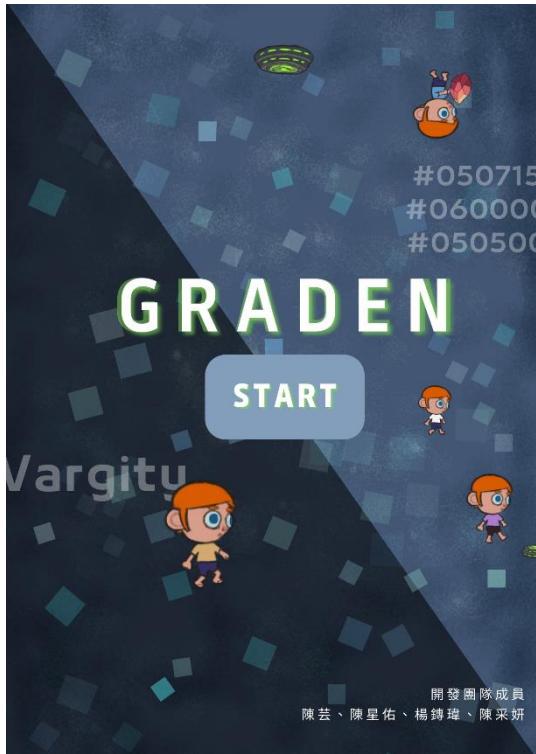
2020期末專題成果



2021期末專題成果



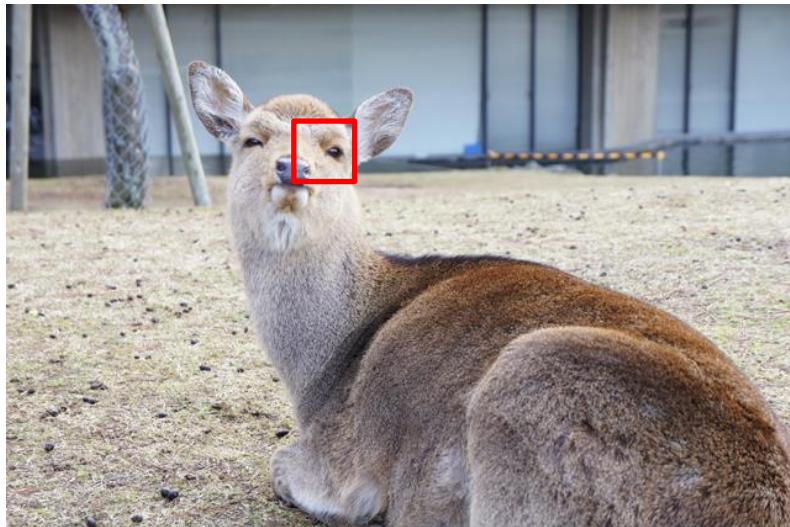
2022期末專題成果(13組)



DISPLAY

Raster Graphics

- 📎 Image produced as an array (**the *raster***) of picture elements (***pixels***) in the *frame buffer*



(179, 161, 153)

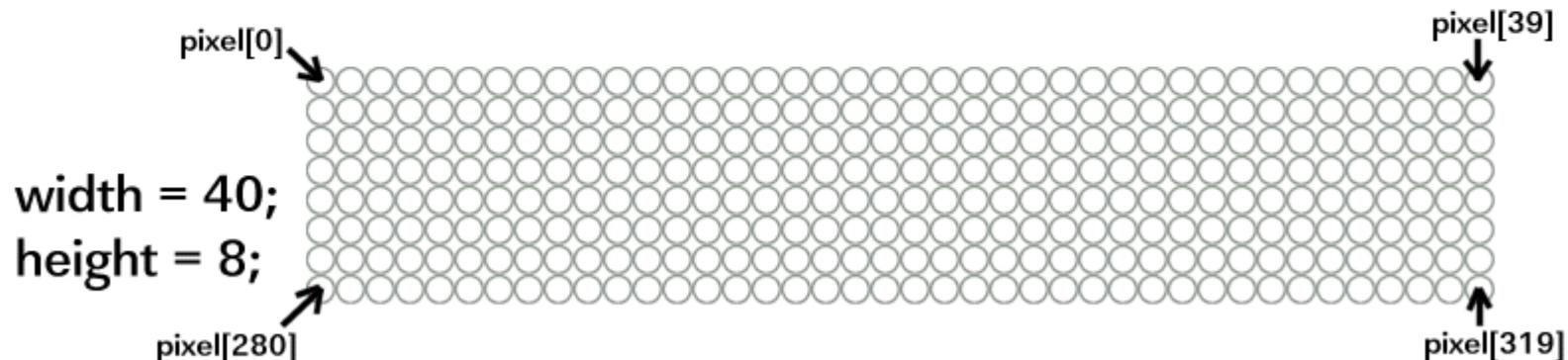
Lets Talk About Pixels

- Pixels are stored as a 1-dimensional array of *ints*
- Each *int* is formatted according to Java's standard pixel model



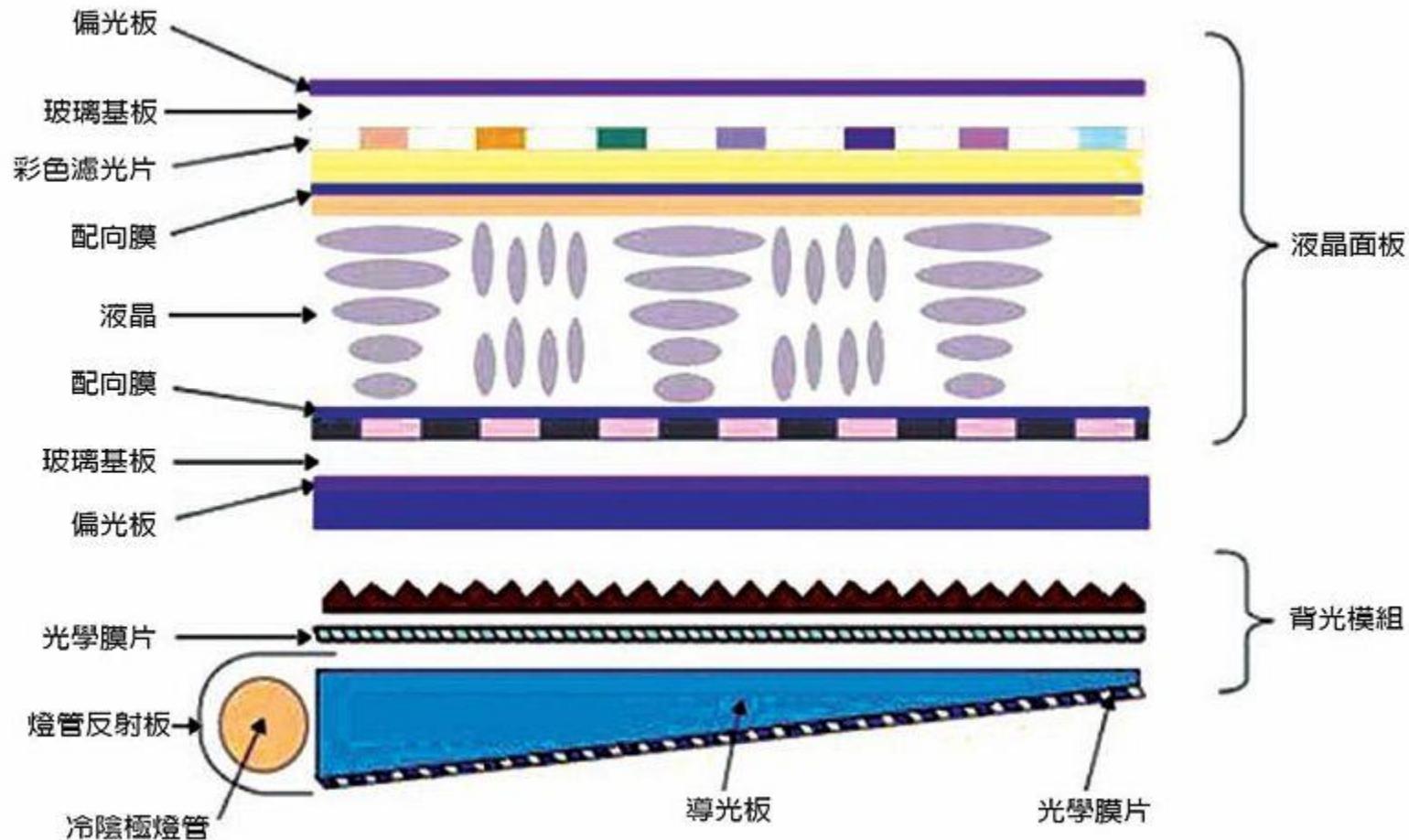
The 4 bytes of a 32-bit *Pixel* int.
if Alpha is 0 the pixel is transparent.
if Alpha is 255 the pixel is opaque.

- Layout of the pixel array on the display:



- This is the image format used internally by Java

Display Technologies



Liquid Crystal Display(LCD)

Head-Mounted Displays



Htc vive



Oculus Rift



Sony VR

APPLICATIONS



Game engine

📎 Unreal 4/5



UNREAL
ENGINE

📎 Unity3D



📎 LÖVE

📎 raylib



Roblox Studio

FILE

What's New gd22friday

All Templates Theme Gameplay

Recent

Archive

Baseplate

Classic Baseplate

Flat Terrain

Village

Castle

Suburban

Racing

Pirate Island

Western

City

Obby

Starting Place

Line Runner

Capture The Flag

Team/FFA Arena

Combat

Move It Simulator

Mansion of Wonder

模擬器

[愛心] Axolotl! Pet Simulator X! Strongman Simulator Animal Simulator Ninja Legends 尋寶模擬器 Legends Of Speed

Axolotl! Pet Simulator X! Strongman Simulator Animal Simulator Ninja Legends 尋寶模擬器 Legends Of Speed

94% 232.2K 94% 11.3K 82% 28.8K 91% 9K 90% 4.5K 90% 6.4K

推薦給您

[50M] Clicker Simulator! Weapon Fighting Simulator ADOPT ME! DESERT! FIND THE MARKERS LIVETOPIA Roleplay 造船尋寶

Clicker Simulator! Weapon Fighting Simulator ADOPT ME! DESERT! FIND THE MARKERS LIVETOPIA Roleplay 造船尋寶

95% 39.3K 94% 18.3K 83% 220.9K 82% 41.5K 91% 47.2K 92% 46K

戰鬥

[太陽] UPDATE 17] Blox Fruits BedWars MAD CITY ? LUCKY BLOCKS KAT! PILFERING PIRATES

Blox Fruits BedWars MAD CITY ? LUCKY BLOCKS KAT! PILFERING PIRATES

93% 102.6K 82% 52.4K 83% 16K 73% 8.3K 88% 9.5K 83% 5.3K

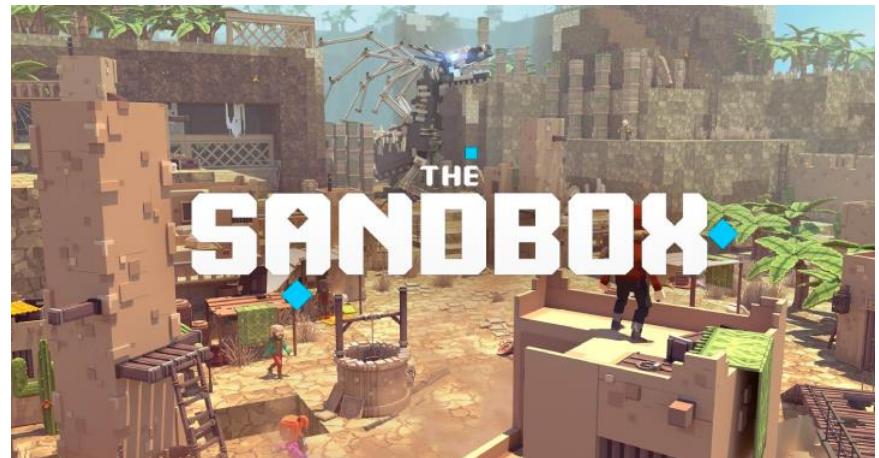
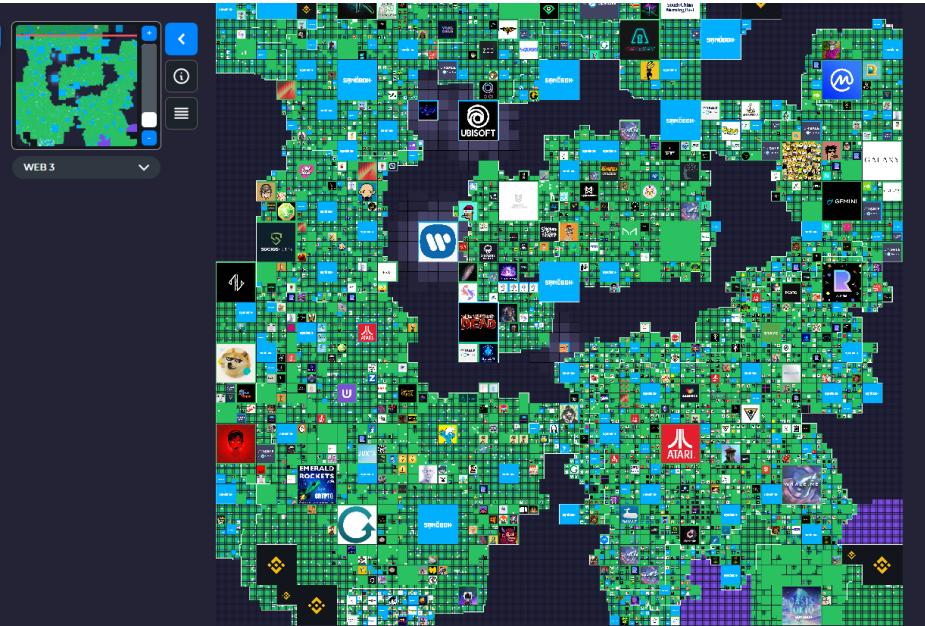
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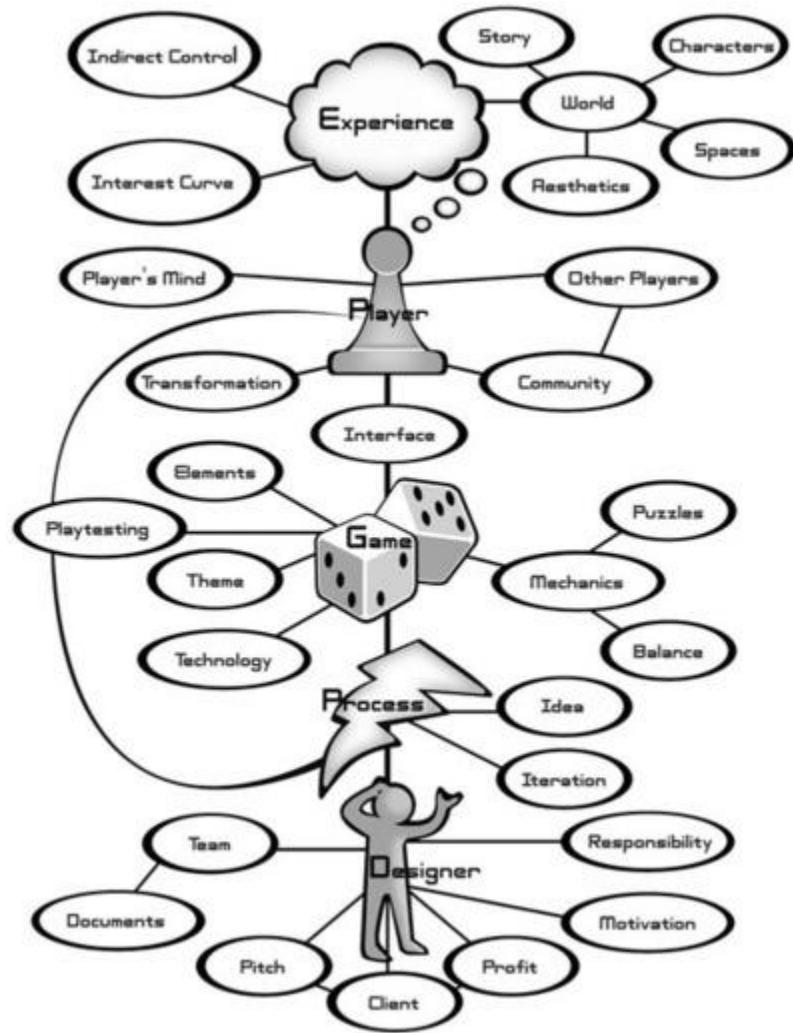
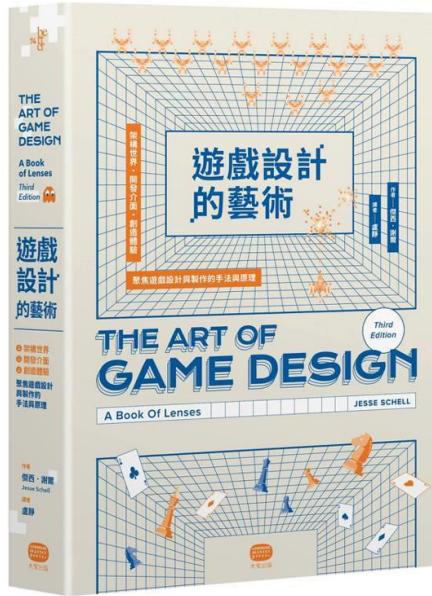
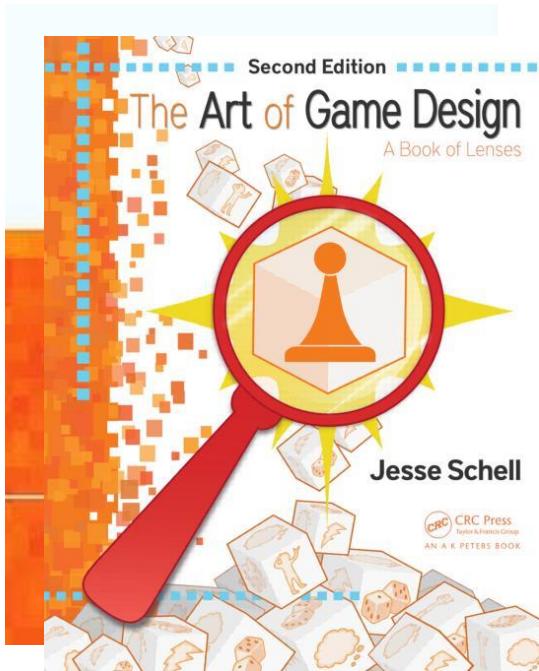
查看全部 →

Blockchain game



REFERENCE

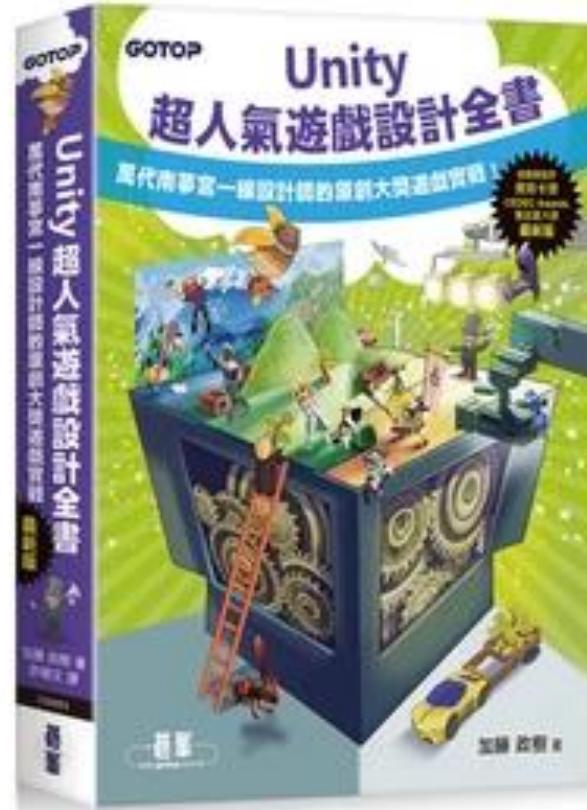
Game Design



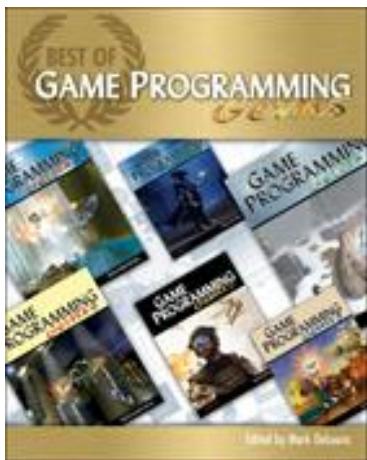
The Art of Game Design,
Jesse Schell

Unity 3D

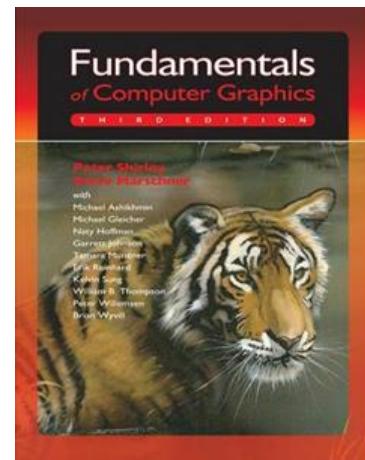
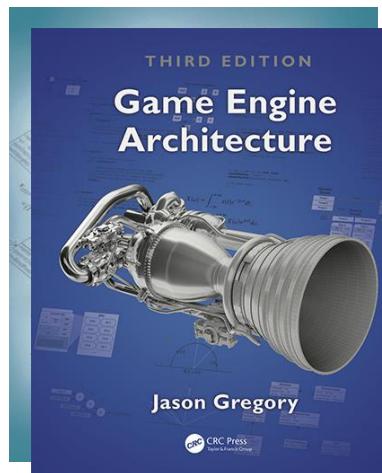
<https://unity3d.com/learn>



Reference



Game gems series



過程中，你會慢慢習慣 ...

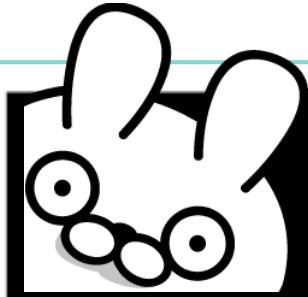
- 撞牆：Try and Error
- 遇到問題，找：Google、Stackoverflow
- 在 moodle 群組發問，等高手幫你回答
- 下策，直接來實驗室找助教

還有，你會需要懂得問問題！！！

1. 你想要製作什麼功能：？
2. 目前你完成了什麼功能：？
3. 你在哪裡卡關：？
4. 錯誤訊息是什麼：？
5. 提供截圖：

```
for i in people.data.users:  
    response = client.api.statuses.user_timeline.get(screen_name=i.screen_name)  
    print 'Got', len(response.data), 'tweets from', i.screen_name  
    if len(response.data) != 0:  
        ldate = response.data[0]['created_at']  
        ldate2 = datetime.strptime(ldate, '%a %b %d %H:%M:%S +0000 %Y')  
        today = datetime.now()  
        howlong = (today-ldate2).days  
        if howlong < daywindow:  
            print i.screen_name, 'has tweeted in the past' , daywindow,  
            totaltweets += len(response.data)  
            for j in response.data:  
                if j.entities.urls:  
                    for k in j.entities.urls:  
                        newurl = k['expanded_url']  
                        urlset.add((newurl, j.user.screen_name))  
        else:  
            print i.screen_name, 'has not tweeted in the past', daywindo
```

壞例子



請問KEYCODE_NAVIGATE_PREVIOUS
這個事件都收不到是什麼原因呢？

1 Comment

Like

Comment

Share



程式寫錯.....一定是這個原因 2

好例子



請問我想取得射線碰到的物件應該怎麼寫？我想用 `Destroy(GameObject);`，然而 `RaycastHit` 貌似只能取得 `collider` 屬性而已。

```
15 // Update is called once per frame
16 void Update () {
17     RaycastHit hit;
18     Ray myRay = new Ray(gameObject.transform.position, direction * distance);
19
20     Debug.DrawRay(gameObject.transform.position, direction * distance, Color.green);
21     if (Physics.Raycast(myRay, out hit, 1.5f) && Input.GetKey(KeyCode.X)) {
22         }
23     }
24 }
25 }
26 }
```



3

7 Comments 1 Share



Like



可以用 `Destroy(hit.collider.gameObject);`；如果我沒記錯



Comment



Share

Like · Reply · 1w



可以欸，謝謝

Like · Reply · 1w