Game Programming

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Game Control

- Introduction on Game Control
- Diff. Game Controls on Diff. Devices
- VR Tracking
- UI/UX
Introduction

- Game control is the interface between the game and the user.
- Game control is not only input device control but also the camera control.
- Game control system usually means:
  - How to control avatar(s)’ (walk-through)?
  - How to control camera’s (view angle)?
  - How to interact with player(s)’ (device(s))?
Camera Control

- First-personal view
- Third-personal view
- God-view
- Pre-set camera view
- etc.
Game Control on PC

- Mouse
  - The most easy way to use.
  - The games for bird-view or god-view controlling are usually using mouse.

- Keyboard
  - Hotkey
    - Key pressed or released
  - Typing
    - Since players need to chat in MMOG, using keyboard for typing is the major input way.

- Gamepad (few)
Mouse Control

- Mouse is a 2D device.
  - 2-axis moving
  - Related movement
  - 2 or 3 buttons

- Mouse can:
  - Move
  - Drag
  - Double-click

- Behaviors
  - Hit test
  - Selection
  - Pilot
  - Position & Orientation
Mouse Control

- Typical game types using mouse control
  - Real-time strategy games
  - Role Playing Game

- Typical game play examples:
  - Path finding for playable character
  - Hitting the enemy
  - Selecting a group of units
  - Orientating the camera in FPS games
  - Menu selection
  - ...
Keyboard Control

- Standard PC input device
- Simulating the gamepads
  - Not every PC game player having gamepad
  - Using keyboard as the alternative device
- Hotkey system
  - Each key has two states.
    - Pressed
    - Released
  - 256 keys
- Behaviors
  - Key presses/released
  - ASCII code
- One hotkey can represent a set of commands
  - Very fast input device
Keyboard Control

- Communication tool
  - Typing messages

- Typical game types using keyboard
  - MMORPG
    - Needs chatting with friends
  - Real-time strategy games
  - Hotkey system
  - First-person shooting games
  - Fighting games

- Typical game play examples:
  - Chatting
  - Character controls
    - Move forward
    - Turning
Game Control Design Principle #1

USERS ARE NOT WHO YOU THINK.
My experience on Doom

Mahjong vs. Shisen-Sho

Minecraft vs. COVID-19

全國停課防疫，日小學生在《Minecraft》舉行他們的畢業典禮

https://www.4gamers.com.tw/news/detail/42409/japanese-elementary-school-students-use-minecraft-to-hold-their-graduation-ceremony?fbclid=IwAR0H3FQ_E_fdD05VBiPckL
Game Control on Console

- Gamepad (major)
  - buttons: 0 or 255
  - wireless
- Joystick
  - 0 ~ 255
- Microsoft Xbox Kinect
  - using computer vision tech.
- Nintendo Wii Remote
- Nintendo DS Stylus
- Nintendo Switch Joy-Con
Gamepad Control

- Recent gamepad capable of two extra digital joysticks
  - For buttons
    - Value range: 0 or 255
  - For joystick
    - Value range: 0 to 255

- Typical game types using gamepad
  - Almost all types of games except
    - Need typing
    - Need large-range selection for game units

- Typical game play examples:
  - Character controls
    - Move forward
    - Turn
Game Control Design Principle #2

**USERS’ CUSTOM BEHAVIORS ARE NOT EASY TO CHANGE.**
My experience on FPS

同樣是玩射擊遊戲，手柄怎麼就不如滑鼠了?

2019-04-04 由 着迷說 規例子遊戲

各位喜歡玩射擊遊戲嗎？作為最熱火的遊戲玩法之一，可以說幾乎每一位遊戲玩家應該都多多少少接觸過一點射擊遊戲。

現如今，射擊遊戲幾乎遍布每個遊戲平台，從手游到街機，甚至在VR遊戲里，你都能體驗到各色各樣的射擊遊戲。

https://kknews.cc/game/bpq3696.html
Xbox Kinect

<table>
<thead>
<tr>
<th></th>
<th>Kinect v1</th>
<th>Kinect v2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RGB camera</strong></td>
<td>640x480 30fps</td>
<td>1920x1080 30fps</td>
</tr>
<tr>
<td><strong>Depth sensor</strong></td>
<td>320x240 30fps</td>
<td>512x424 30fps</td>
</tr>
<tr>
<td></td>
<td>1.2~3.5 meters</td>
<td>0.5~4.0 meters</td>
</tr>
<tr>
<td><strong>Skeletal tracking</strong></td>
<td>Max : 2 Skeletons</td>
<td>Max : 6 Skeletons</td>
</tr>
<tr>
<td></td>
<td>Joints : 20</td>
<td>Joints : 25</td>
</tr>
</tbody>
</table>
Body Remote

No keyboard, no mouse, no joystick or any other remote controls. What you need is just a simple webcam. Through our computer vision approach, your body will act like a remote control. You can play video game by just moving your body or using your gesture. We believe it is the most natural way to experience what you need to experience in the virtual world, in the game world.

Wii Remote

- Input
  - Accelerometer
  - Gyroscope (Wii Remote Plus)
  - Infrared Sensor
  - Digital Buttons
  - D-pad
- Bluetooth
- Speaker
Switch Joy-Con
Nintendo Labo
Nintendo Switch
Ring Fit Adventure

リングフィット アドベンチャー featuring 新垣結衣
Game Control Design Principle #3

ACCURACY MAY NOT SO IMPORTANT.
Nintendo Switch
Just Dance 2020
Game Control on Arcade Game

- Joystick and (BIG) Button(s)
- Some (most) are with special controllers
Game Control Design Principle #4

**USERS’ EXISTED ENVIRONMENTS AND PERCEPTIONS CAN BE USED.**
太鼓の達人

by NAMCO since 2001
https://en.wikipedia.org/wiki/Taiko_no_Tatsujin
Dance Dance Revolution

by Konami since 1998

Game Control on Smartphone

- Multi-touch Screen on all smartphones
- On smartphones & handheld game console
  - GPS (Global Positioning System)
  - Wi-Fi
  - Bluetooth
  - Compass
  - IMU (Inertial Measurement Unit)
    - Gyroscope
    - Accelerometer
  - RGB-D camera
Game Control Design Principle #5

THE BEST WAY FOR ONE THING MAY NOT BE THAT FOR ANOTHER.
My experience on にゃんこ大戦争
Game Control for VR
VR Tracking

- **Outside-In**
  - HMD in 6-DOF Tracking
  - Game Controllers in 6-DOF Tracking

- **Inside-Out**
  - SLAM (Simultaneous Localization and Mapping)
  - Hand Gesture
Outside-In Tracking
Outside-In Tracking
Outside-In Tracking
Inside-Out Tracking
Inside-Out Tracking
Other Possible Controls?
カラオケの採点ゲーム

https://www.youtube.com/watch?v=uCBU7scxX0A
Conclusions

- Users are not who you think.
- Users’ custom behaviors are not easy to change.
- Users’ existed environments and perceptions can be used.
- The best way for one thing may not be that for another.
- Accuracy may not so important.

- UX is important!
Thank you