Game Programming

Robin Bing-Yu Chen
National Taiwan University

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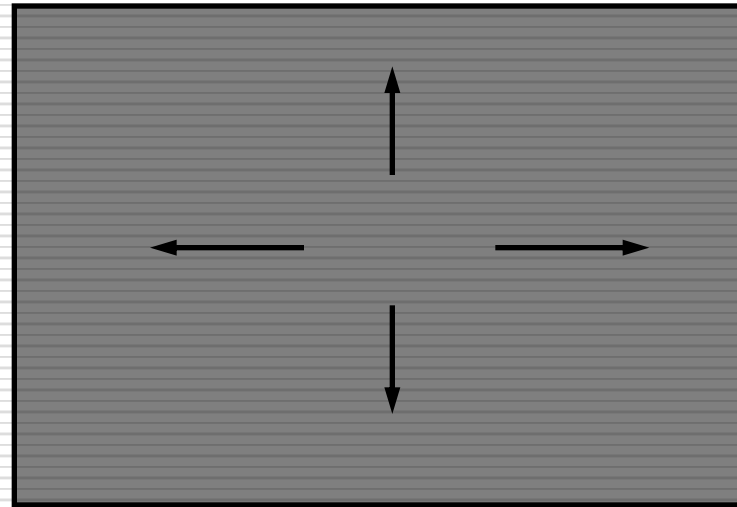- ☐ Keyboard
    - ■ Hotkey
        - ☐ Key pressed or released
    - ■ Typing
        - ☐ Since players need to chat in MMOG, using keyboard for typing is the major input way.
- ☐ Gamepad (few)

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

https://en.wikipedia.org/wiki/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

這群孩子帶來了一種希望。
2020-03-16 00:50 By 歪力

https://www.4gamers.com.tw/news/detail/42409/japanese-elementary-school-students-use-minecraft-to-hold-their-graduation-

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
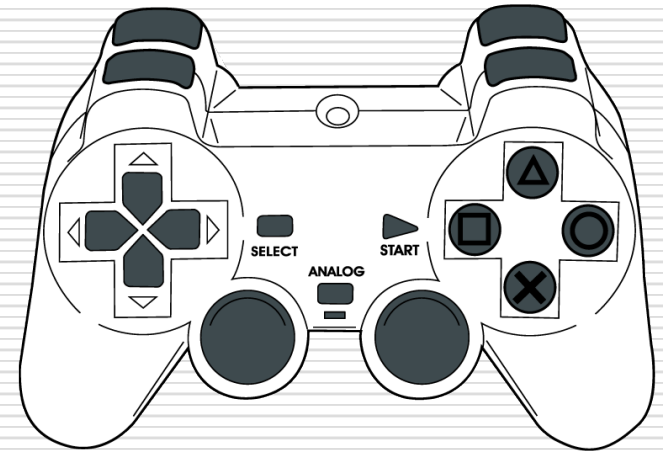
Gamepad Control

- ☐ 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 著迷說 發表于遊戲

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一個遊戲平台，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

Kinect v1	Kinect v2
RGB camera	
640x480 30fps	1920x1080 30fps
一般	廣角
Depth sensor	
320x240 30fps	512x424 30fps
1.2~3.5 meters	0.5~4.0 meters
Skeletal tracking	
Max：2 Skeletons	Max：6 Skeletons
Joints：20	Joints：25

Body Remote

J.-S. Yeh, J.-Y. Chiang, T.-H. Huang, L.-F. Lin, M.-Y. Yu, J. Y. C. Tsai, C.-L. Wen, L.-K. Wang, D.-Y. Chen, Y.-Y. Chuang, B.-Y. Chen, M. Ouhyoung. **Hand-shadow illusions and 3D DDR based on efficient model retrieval**. *ACM SIGGRAPH 2006 E-Tech*.

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

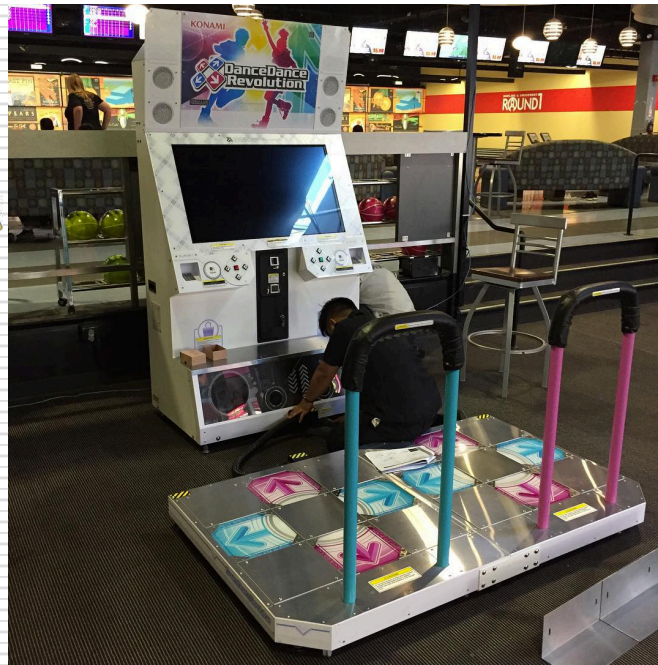リングフィット アドベンチャー featuring 新垣結衣

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

©BANDAI NAMCO Entertainment Inc.

Game Control Design Principle #4
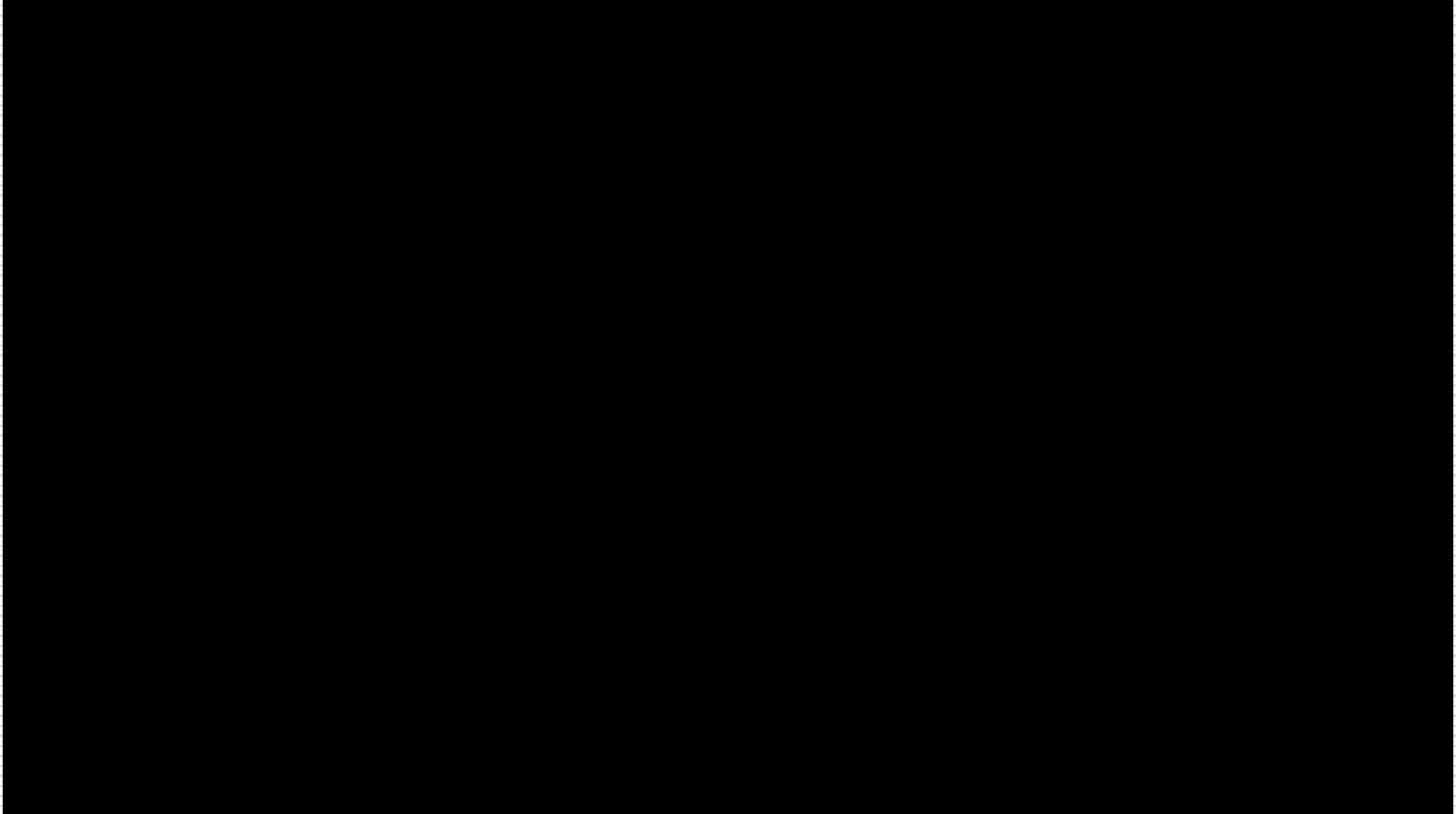
USERS' EXISTED ENVIRONMENTS AND PERCEPTIONS CAN BE USED.

太鼓の達人

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

Dance Dance Revolution

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

3Glasses S1

VR Tracking

☐ Outside-In
- ■ HMD in 6-DOF Tracking
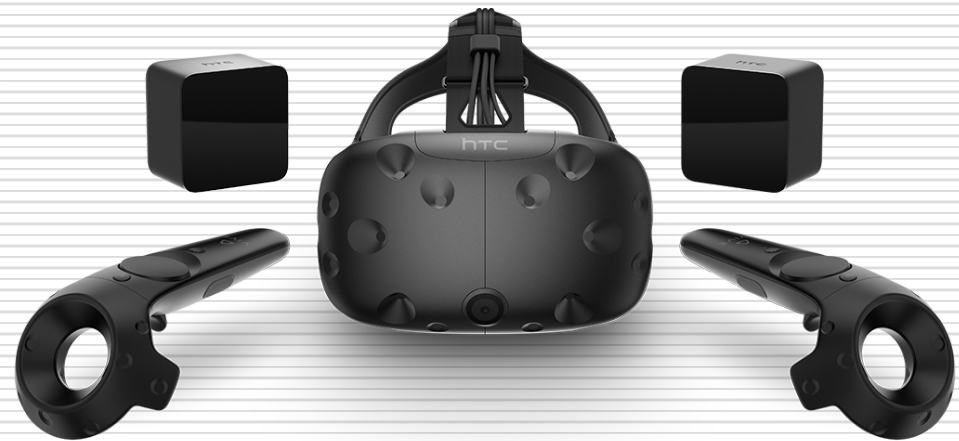- ■ Game Controllers in 6-DOF Tracking

☐ Inside-Out
- ■ SLAM (Simultaneous Localization and Mapping)
- ■ Hand Gesture

Outside-In Tracking

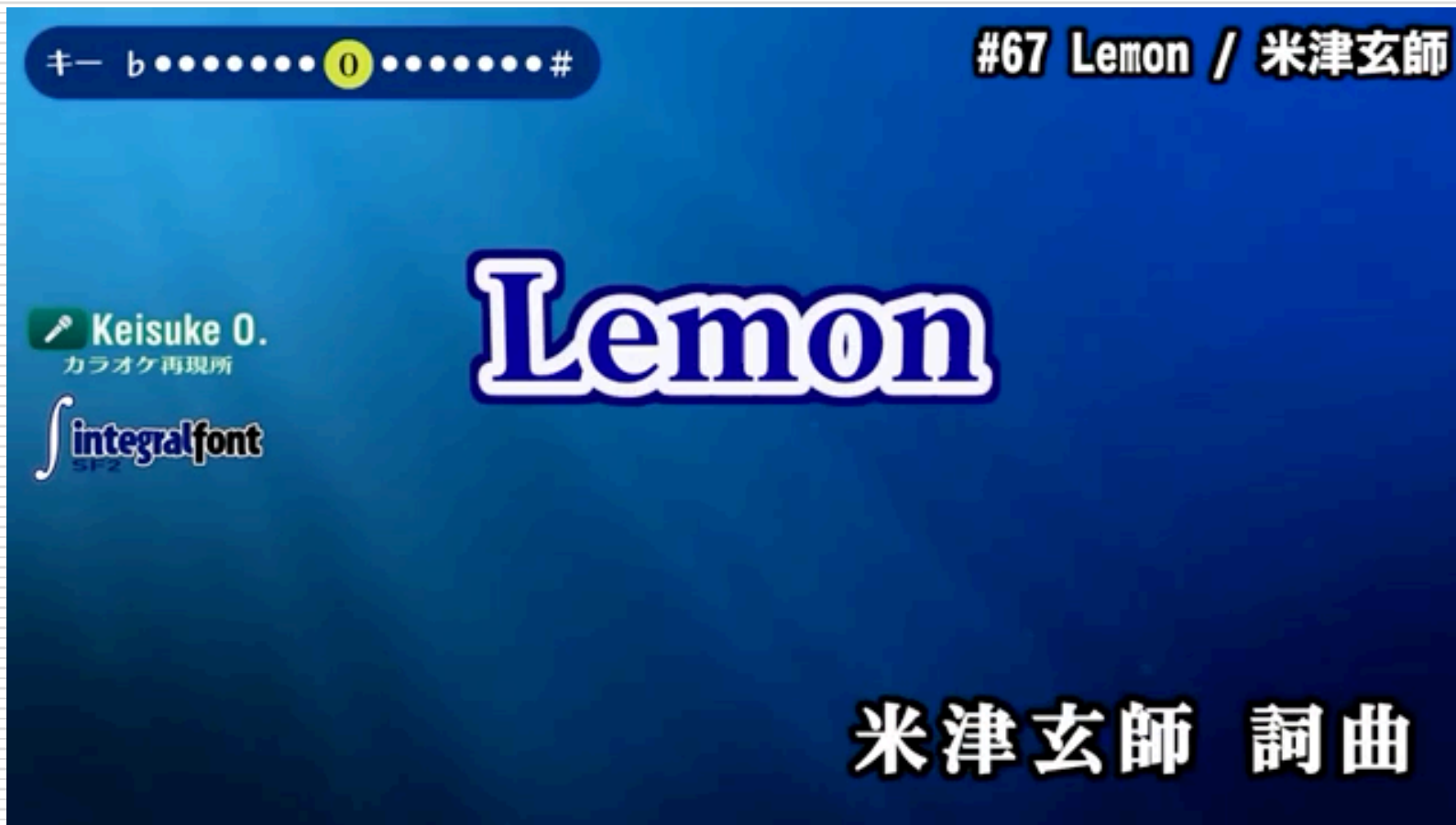

oculus

Outside-In Tracking

Outside-In Tracking

PlayStation.VR

Inside-Out Tracking

Inside-Out Tracking

Microsoft
HoloLens

Other Possible Controls?

カラオケの採点ゲーム

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