Video Games and Interfaces: Past, Present and Future
Class #2: Intro to Video Game User Interfaces

Content based on Dr. LaViola’s class: 3D User Interfaces for Games and VR
What is a User Interface?

- Where the interaction between humans and machines occurs.
  - User interface refers to the parts of a computer and its software that you (the user) see, hear, touch, or talk to.
  - Input – allowing the users to manipulate a system.
  - Output – allowing the system to indicate the effects of the input.

- For example, if I use a mouse to point and click, or I speak instructions to the computer those are input. And the output is what I see displayed on the screen.
Why Video Games?

- **Video Games**
  - Major driving force in home entertainment.

- **Driving force in technological innovation**
  - Graphics algorithms, hardware, sound, AI, etc. can be applied to other fields.
  - Technological transfer to healthcare, biomedical research, defense, and education.
User Interfaces in Video Games

- Types of User Interfaces
  - Keyboard and mouse – control a Graphical User Interface (GUI).
  - Console controller (XBOX, PlayStation)
  - Nintendo Wii – wiimote, balance board.
  - Arcade games, specialized UIs, Dance Dance Revolution.
  - Microsoft Kinect – webcam using gestures or spoken commands.
History of Game UIs

- **1947:** Cathode-ray tube amusement device.
  - Earliest proposal for an electronic gaming device.
  - The interface consisted of knobs and buttons.
  - Based on WWII radar displays, players use knobs to adjust the trajectory of light beams (missiles) in an attempt to hit targets.
  - Nobody knows if it was actually implemented, but the idea was patented.
Early Video Games

- Tennis for two: Second ever video game:
  - 1958
  - Display: oscilloscope
  - Input: dial and a button
Early Video Games

- **Spacewar!** First computer game:
  - 1961: by Russel, Graetz, and Wiitanen at MIT.
  - Interface: mostly buttons, but also joysticks and light pen.
  - 2 armed spaceships attempt to shoot one another while maneuvering in the gravity well of a star.
Early Video games

- 1971: “Computer Space” is the first ever arcade game.
  - Spacewar! clone.
  - Interface is mostly buttons.
  - Not very popular, since its rules were too complex.
Early Video Games

- 1972: Magnavox
  “Odyssey” is a first ever home game console.
  - Could play Ping-Pong with 2 people.
  - Buttons and dials, 1D.
- 1975: Atari creates Pong for home and arcades.
  - Game industry is born.
Early Video Games

- 1977: Atari 2600 console
  - Cartridge based system, so you could change games.
  - 2D controllers – joystick and a trackball.
  - Introduce quality sound hardware, which is still popular today.
Early Video Games

- **1978: Magnavox Odyssey2**
  - Includes full-sized keyboard.
  - Used for educational software and programming.
  - First home electronics device with speech synthesis.
Modern Consoles

- **1983: Nintendo Famicom**
  - Modern controller layout: controls for both hands, directional buttons.
  - Increasingly complex controllers and interfaces: games are still 2D, but interaction is more complex and rich.

- **1994: Nintendo 64**
  - First “true” 3D console
  - Adds joystick to controller, game pad gets more controls.
Modern Consoles

- **1996: Sony dual-shock controller**
  - Adds second joystick and shoulder buttons.
  - Standard controller for PS, PS2, PS3.

- **Observations**
  - Increased complexity of game interface allows for more expression in games.
  - Difficult to master
  - Focuses more and more on “hard-core” games, since casual gamers often find games more difficult.
Arcade Games

“Easy to learn, but difficult to master”
- Has to be learned immediately.
- Interface can’t be too complex.

Began in the mid 1970’s
- First game with 3D graphics – Battlezone (1980).

Specialized interfaces
- Often based on simulation activities:
  - Shooting, driving, snowboarding.
- Many innovative and original interfaces…
Arcade Games – UI Innovation

Football Power

Aliens Extermination
Arcade Games UI Innovation

Manx TT

Dance Dance Revolution
Virtual Reality Arcade Games

- Arcades were first to introduce VR and 3DUI in games (1990’s)
  - Head/body tracking
  - Stereoscopic vision
  - Immersive displays
  - 3D spatial interaction
Virtual Reality Arcade Games

- Disney Quest: Indoor interactive theme park (opened 1998)
- Several VR games
  - Pirates of the Caribbean: Battle for Buccaneer’s Gold
    - Uses motion platform, shoot cannons, navigate with steering wheel.
    - Surround screen display, users wear stereo glasses.
  - Virtual Jungle Cruise
    - Users sit in raft, steer and paddle.
  - Aladdin’s Magic Carpet Ride
    - Users wear Head Mounted Display (HMD), sit on motorcycle-like device to steer.
3D and VR on Game Consoles

Several attempts to introduce 3D/VR for game consoles.

- **1986: Sega Master System**
  - 3D glasses, LCD shutters, few games.

- **1995: Nintendo Virtual Boy**
  - Virtual reality goggles, monochrome, stereo.

Not successful

- Low quality, didn’t work well.
- Not necessary since games were so simple.
Conclusions from History

- **Games complexity increases**
  - 1970: Pong
  - 1980: Donkey Kong
  - 2000: Halo
- **Interaction complexity increases.**
Some Conclusions from History

- The complexity of controllers increased
  - Use same interface components as in the 60s
    - Buttons, Joysticks, Keyboard/mouse
  - Combined together / increased number.
  - More difficult to learn and master.
  - Less accessible to casual user.
- 3D spatial controllers / 3DUI
  - Very successful in arcades.
  - Failed in home devices.
  - Inaccurate/low quality.
3D User Interfaces - Today
3DUI – What?

- Goal of 3DUI in games
  - Designing input devices and interaction techniques to effectively control highly dynamic 3D content.
  - 3 basic approaches:
  - Mapping 2D input to interact with 3D world
    - Keyboard and mouse, joysticks, game controllers.
    - Ex. Flight Simulator, Second Life, Halo 3
  - Simulating real world tools or using physical props
    - Simulation: steering wheels, light guns, musical instruments.
    - Physical props: dance pads.
  - True spatial tracking of user gestures
    - Camera, ex. Sony Eyetoy, Microsoft Kinect.
    - Acceleration/infrared tracking: Wii controllers.
3DUI in the Home Today

- Rapid growth of 3D spatial interfaces for games today
  - Cheaper and higher quality of sensors
  - Fast game hardware can perform complex tracking/recognition
  - Need for simpler and more intuitive interaction with games.
  - Games has become mainstream culture, more casual not only hard-core gamers.
3DUI in the Home Today

- 2003: Sony PS2 Eye Toy
  - Video camera interface for PS2
  - Casual/party games
  - Significant success in Europe/US
  - Based on several decades of research on visual tracking in robotics and computer vision.
3DUI in the Home Today

- Nintendo Wii
  - Latest game console from Nintendo
  - Key innovation – Wiimote controller
    - Provides 3D UI in the home.
  - Makes games accessible to casual users.
    - Great competitive edge over Xbox 360 / PS3
3DUI in the Home Today

- Nunchuk
- Steering Wheel
- Zapper
- Wii Helm
- Boxing Gloves
- Sports Pack
- Fishing Reel
Spatial UIs in the Home Today

- Microsoft Kinect
3DUI in the Home Today

Conclusions:

- Renaissance of 3D / spatial user interfaces in gaming.
- For the first time very successful with public
- Attracts casual gamers
- Allows for easier introduction of new 3D user interfaces in the future.
- Still very simplistic when compared with 3DUI developed in research labs.
- Great possibilities for future growth!