

# HCI Tools

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## 1. Leap Motion

It is an iPod sized gesture recognition human computer interface that connects to the computer via USB and is 200 times more sensitive than existing touch free technologies. It is more accurate than mouse and keyboard.

### 1.1 Characteristics

- From a hardware perspective, the Leap Motion Controller is actually quite simple. The heart of the device consists of two cameras and three infrared LEDs. These track infrared light with a wavelength of 850 nanometers, which is outside the visible light spectrum.
- Once the image data is streamed to your computer, it's time for some heavy mathematical lifting. Despite popular misconceptions, the Leap Motion Controller doesn't generate a depth map instead it applies advanced algorithms to the raw sensor data.
- Filtering techniques are applied to ensure smooth temporal coherence of the data. The Leap Motion Service then feeds the results – expressed as a series of frames, or snapshots, containing all of the tracking data – into a transport protocol.

### 1.2 Specifications

- The minimum system requirements are:
  - Windows 7+ or Mac OS X 10.7+
  - AMD Phenom II or Intel Core i3/i5/i7 processor
  - 2 GB RAM
  - USB 2.0 port
  - Internet connection
- For VR use, the minimum system requirements are as follows:
  - NVIDIA GTX 970 / AMD R9 290 equivalent or greater
  - Intel i5-4590 equivalent or greater
  - 8GB+ RAM
  - Compatible HDMI 1.3 video output
  - 2x USB 3.0 ports
  - Windows 7 SP1 or newer

### 1.3 Merits

- Portable.
- Leap is more accurate, cheaper and high resolution.
- Affordable and Inexpensive.
- Most easiest method in computer interaction.
- In further it may develop in Robotic areas and also in Business fields.
- Plug and play via USB.

### 1.4 Demerits

- Specific hardware and special programs required to obtain and process the data.
- The real life performance may not translate on to the computer model as expected.
- Limited number of apps available in airspace.
- Not able to perform well on all light conditions.

## **2. Guile3D**

Denise is an advanced Virtual Assistant software. She comes with our real-time proprietary graphic engine, a high quality English Text to speech voice and the best dictation Speech Recognition system (Nuance Dragon), available in 6 languages.

### **2.1. Characteristics**

- AIML stands for Artificial Intelligence Markup Language. It's an XML dialect for creating natural language applications and a worldwide free software community.
- Guile 3D Studio has expanded the already great power of AIML with many custom tags and scripts.
- These tags and scripts allow us to make several custom computer and internet operations from within AIML categories.

### **2.2. Specifications**

- Hardware:
  - Celeron, Atom N280 or Pentium 4 processors
  - 1 Gig RAM Memory
  - Soundboard and Speakers
  - Headset Microphone (for better Speech Recognition)
  - 1.3 MP Webcam (for Face Detection and Recognition)
  - 3 Gigabytes free Hard Disk space available
- Software:
  - Windows XP or Windows Vista and 7

### **2.3. Merits**

- Voice connectivity.
- Email modules and RSS feeds.
- Web connectivity.
- Ease of compatibility.

### **2.4. Demerits**

- Still in development phase.
- Face detection and Recognition is not employed yet.

### 3. Wii Remote

The Wii Remote (Wiimote), is the primary controller for Nintendo Wii console.

#### 3.1. Characteristics

- Motion sensing capability which allows the user to interact with and manipulate items on screen via gesture recognition and pointing through the use of accelerometer and optical sensor technology.
- Expandability through the use of attachments. The attachment bundled with the Wii console is the Nunchuk, which complements the Wii Remote by providing functions similar to those in gamepad controllers.
- Wii is a one-handed remote control-based design instead of the gamepad controllers of previous gaming consoles. This was done to make motion sensitivity more intuitive.
- The Wii Remote has the ability to sense acceleration along three axes through the use of an ADXL330 accelerometer.

#### 3.2. Specifications

- Connectivity technology is wireless.
- Maximum operating distance is 30ft.
- The sensor bar to detect motion from Wii remote is about 20 cm (7.9 in) long and features ten infrared LEDs, five at each end of the bar.
- Uses two AA batteries as a power source, which can power a Wii Remote for 60 hours using only the accelerometer functionality and 25 hours using both accelerometer and pointer functionality.
- A 3300 $\mu$ F capacitor provides a temporary source of power during quick movements of the Wii Remote when connection to the batteries may be temporarily interrupted.

#### 3.3. Merits

- Although the flash memory provided is less, it comes with SD memory card bay to expand memory.
- Runs quietly. Uses technologies that minimise power consumption.
- Simplistic design that allows non-gamers to play too.

#### 3.4. Demerits

- The use of an infrared sensor to detect position can cause some detection problems when other infrared sources are around, such as incandescent light bulbs or candles.
- Inferior graphics when compared to its Xbox or PS counterparts.

## 4. Microsoft Kinect

Kinect is a line of motion sensing input devices that was produced by Microsoft for Xbox 360 and Xbox One video game consoles and Microsoft Windows PCs. Based around a webcam-style add-on peripheral, it enables users to control and interact with their console/computer without the need for a game controller, through a natural user interface using gestures and spoken commands.

### 4.1. Characteristics

- Provides full-body 3D motion capture, facial recognition and voice recognition.
- The depth sensor consists of an infrared laser projector combined with a monochrome CMOS sensor, which captures video data in 3D under any ambient light conditions.
- Kinect is capable of simultaneously tracking up to six people, including two active players for motion analysis with a feature extraction of 20 joints per player.
- Kinect's various sensors output video at a frame rate of  $\approx 9$  Hz to 30 Hz depending on resolution.
- Includes a motorised pivot that can tilt the sensor. The motorised pivot is capable of tilting the sensor up to  $27^\circ$  either up or down. However this consumes more power.

### 4.2. Specifications

- Prime Sensor:
  - Colour lenses
  - Depth sensing lenses
- View:
  - Horizontal field of view: 57 degrees
  - Vertical field of view: 43 degrees
- Tracks up to 6 people, including 2 active players.
- Tracks 20 joints per active player.
- Speech recognition.
- Echo cancellation system that helps enhancing the voice input.

### 4.3. Merits

- Kinect is compatible with both Xbox and Windows.
- Easy setup and installation with minimal hardware requirement.
- Comes bundled with 'Kinect Adventures' set of 5 games.
- No controllers which eliminates the need to memorise buttons.

### 4.4. Demerits

- The motion control technology used prior to 2010 consumed about 10-15% of Xbox 360's computing resources.
- Although it is capable of tracking upto 6 people, the number of people the device can "see" is only limited by how many will fit in the field-of-view of the camera.
- Requires too much of room. The Kinect requires that you stand at least 7 ft away (or 9 ft for two players) from the sensor in order to play.

## 5. Google glass

Google Glass is an optical head-mounted display designed in the shape of a pair of eyeglasses. It was developed by X (previously Google X) with the mission of producing a ubiquitous computer. Google Glass displayed information in a smartphone like handsfree format. Wearers communicated with the Internet via natural language voice commands.

### 5.1. Characteristics

- Touchpad: A touchpad is located on the side of Google Glass, allowing users to control the device by swiping through a timeline like interface displayed on the screen. Sliding backward shows current events, such as weather, and sliding forward shows past events, such as phone calls, photos, circle updates, etc.
- Camera: Google Glass has the ability to take photos and record 720p HD video.
- Display: The Explorer version of Google Glass uses a liquid crystal on silicon (LCoS), field sequential colour system, LED illuminated display.
- Google Glass applications are free applications built by third party developers. Glass also uses many existing Google applications, such as Google Now, Google Maps, Google+, and Gmail.
- Other than the touchpad, Google Glass can be controlled using just "voice actions". To activate Glass simply tap the touchpad, and say "O.K., Glass." Once Glass is activated, wearers can say an action, such as "Take a picture", "Record a video" etc.

### 5.2. Specifications

- Fit: Adjustable nose pads and durable frame fits any face and Extra nose pads in 2 sizes.
- Display: High resolution display and 25 inch high definition screen from eight feet away.
- Connectivity: WiFi 802.11 b/g 2.4GHz and Bluetooth.
- Storage: 12 GB of usable memory, synced with Google cloud storage, 16GB Flash total.
- Charger: Included Micro USB cable and charger.
- Mobile compatibility: The MyGlass companion app lets you set up Glassware, screencast and other features. It is available for Android and iOS
- Glass can be used as a Bluetooth headset with any Bluetooth compatible phone.

### 5.3. Merits

- Users can easily send messages without using their hands through the usage of hand gestures or voice.
- Translation:
  - This is a neat feature that may come in handy when travelling abroad.
- The clarity of sound is better when compared to normal headphones or speakers.

### 5.4. Demerits

- Google Glass cannot be used by those people who already wear glasses in their daily routine.
- Can be easily broken.
- Expensive.

## 6. Oculus Rift

The Oculus Rift is a virtual reality headset developed and manufactured by Oculus VR, a division of Facebook Inc.

### 6.1. Characteristics

- The Rift has a Pentile OLED display, 1080×1200 resolution per eye, a 90 Hz refresh rate, and 110° field of view.
- It has integrated headphones that provide a 3D audio effect and rotational and positional tracking. The positional tracking system, called "Constellation", is performed by a USB stationary infrared sensor that picks up light that is emitted by IR LEDs that are integrated into the head-mounted display.
- The sensor normally sits on the user's desk. This creates 3D space, allowing for the user to use the Rift while sitting, standing, walking, or even jumping around the same room.

### 6.2. Specifications

- Comes outfitted with vibrant OLED displays, each of which offers 1,080 x 1,200-pixel resolution for each eye. Said displays bring the final resolution to 2,160 x 1,200, with 90Hz refresh rates, thus ensuring the frame rate is high enough to prevent motion sickness and provide a smooth experience overall.
- Offers a 110-degree field of view (FOV).
- The Touch controllers have a joystick and button setup. They utilize the same low-latency tracking technology that determines the relative position of the headset, and allow for some simple gesture mapping based on how you're holding the controller.
- Uses a Constellation tracking camera, which uses infrared light to offer 360-degree positional head tracking in a short, but broad and deep play area. The second camera bundled with the Touch motion controllers improves that tracking space depending on placement.

### 6.3. Merits

- Adjustable Velcro straps and comfortable padding on the interior faceplate.
- Showcases a sleek, fabric-coated exterior design and small footprint. It's easier to get on and off, and may feel more comfortable over time due to its lighter weight.
- Connects via USB and HDMI to your PC.

### 6.4. Demerits

- To get the Rift running comfortably on the PC (and face), Oculus recommends an Intel i3-6100 or AMD FX 4350 or better processor, at least 8GB of RAM, and Windows 7 SPI. A GTX 960 or AMD RX 470 graphics card and a few USB ports are also required. These minimum requirements bog down the customers.
- It's competitor Vive offers a slightly wider and certainly taller field of view.
- Oculus has 5 x 5 feet (two sensors), 8 x 8 feet (three) tracking area while Vive has 15 x 15 feet.