

Gesture Tracking

Leap Motion and Kinect

By

Michael Simmet and Qaiser Jamal

What is Gesture Tracking?

- Gesture recognition helps computers to understand human body language. This helps to build a more potent link between humans and machines, rather than just the basic text user interfaces or graphical user interfaces (GUIs). These old-fashioned input methods still limit all inputs to mouse and keyboard.
- The most common tracking technology is video tracking. That is what this presentation is about.

General requirements for a tracking system

- Similar to the requirements of photography, consisting out of:
 - Illumination
 - Definition
 - Distortion
 - Resolution
 - Frame rate
 - Reflections
 - Background

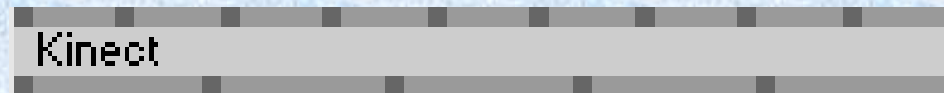
Kinect

- Infrared sensors
- RGB camera
- Microphone
- Motor



Kinect in VVVV

- Kinect Node:



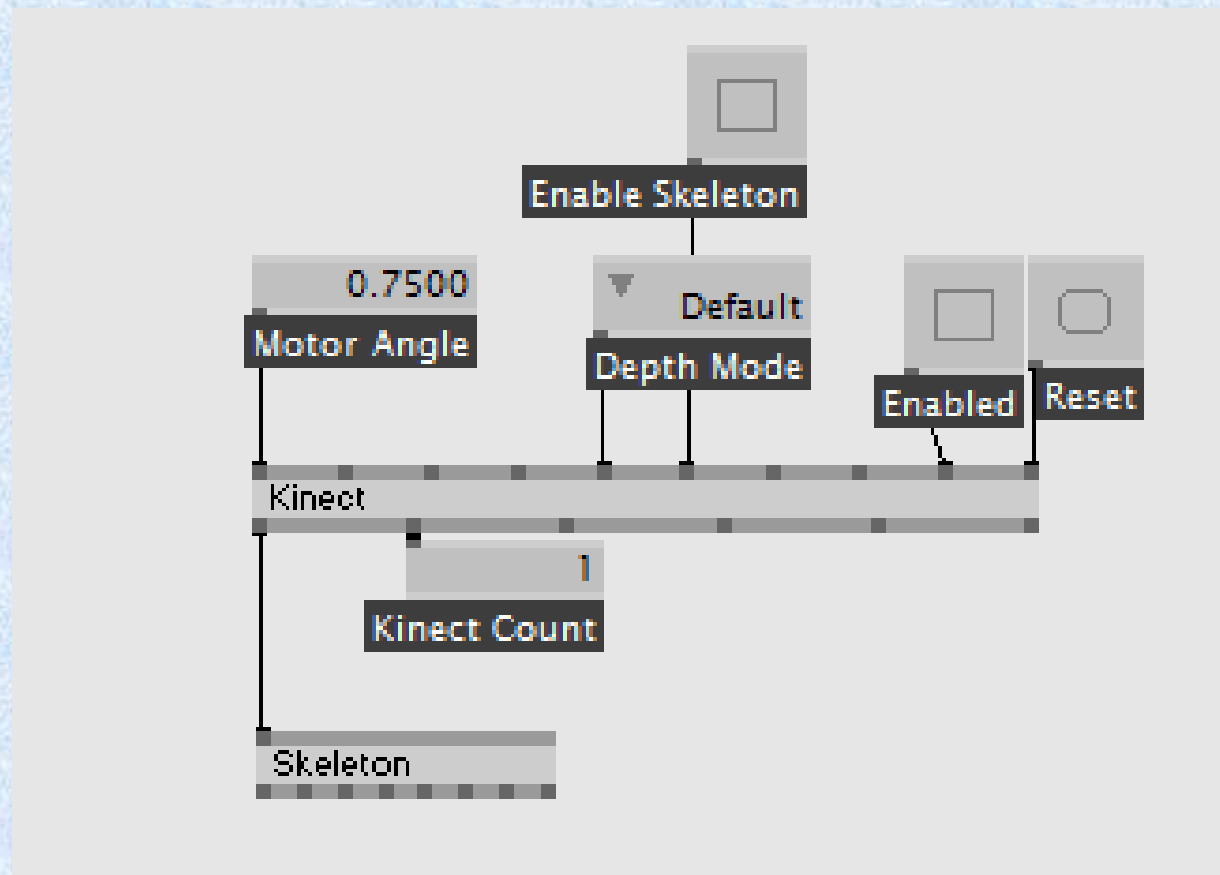
Attach to Selection		Descriptive Name
<input type="text"/>		
0.5000		Motor Angle
0		Index
<input type="text"/>		Enable Color
<input type="text"/>		Enable Depth
▼ Default		Depth Range
<input type="text"/>		Enable Skeleton
<input type="text"/>		Enable Skeleton Smoothing
<input type="text"/>		Smooth Parameters
<input type="text"/>		Enabled
<input type="text"/>	>	Reset
		Kinect Runtime
<input type="text"/>		Kinect Count
1		Kinect Status
Connected		Is Started
<input type="text"/>		
0.1722	>>	Color FOVXY
0.3250	>>	Depth FOVXY
100050		ID

- Skeleton Note:

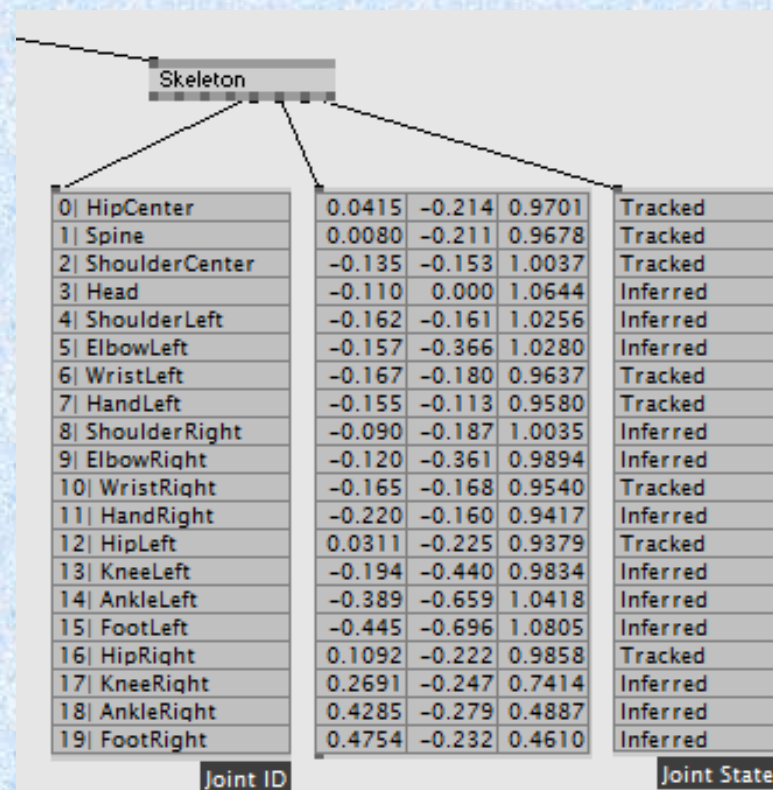
Skeleton

Attach to Selection		Descriptive Name
	v	Kinect Runtime
	0	Skeleton Count
	0 0	User Index
	0 0	PositionXYZ
	0.0000 v v	ClippingXYZW
	0 0	Joint ID
	0 0	Joint PositionXYZ
	0 0	Joint State
	0	Frame Number
	100050	ID

- Together:



- Data of the single parts of the body:



Skeleton				
0 HipCenter	0.0415	-0.214	0.9701	Tracked
1 Spine	0.0080	-0.211	0.9678	Tracked
2 ShoulderCenter	-0.135	-0.153	1.0037	Tracked
3 Head	-0.110	0.000	1.0644	Inferred
4 ShoulderLeft	-0.162	-0.161	1.0256	Inferred
5 ElbowLeft	-0.157	-0.366	1.0280	Inferred
6 WristLeft	-0.167	-0.180	0.9637	Tracked
7 HandLeft	-0.155	-0.113	0.9580	Tracked
8 ShoulderRight	-0.090	-0.187	1.0035	Inferred
9 ElbowRight	-0.120	-0.361	0.9894	Inferred
10 WristRight	-0.165	-0.168	0.9540	Tracked
11 HandRight	-0.220	-0.160	0.9417	Inferred
12 HipLeft	0.0311	-0.225	0.9379	Tracked
13 KneeLeft	-0.194	-0.440	0.9834	Inferred
14 AnkleLeft	-0.389	-0.659	1.0418	Inferred
15 FootLeft	-0.445	-0.696	1.0805	Inferred
16 HipRight	0.1092	-0.222	0.9858	Tracked
17 KneeRight	0.2691	-0.247	0.7414	Inferred
18 AnkleRight	0.4285	-0.279	0.4887	Inferred
19 FootRight	0.4754	-0.232	0.4610	Inferred

Joint ID

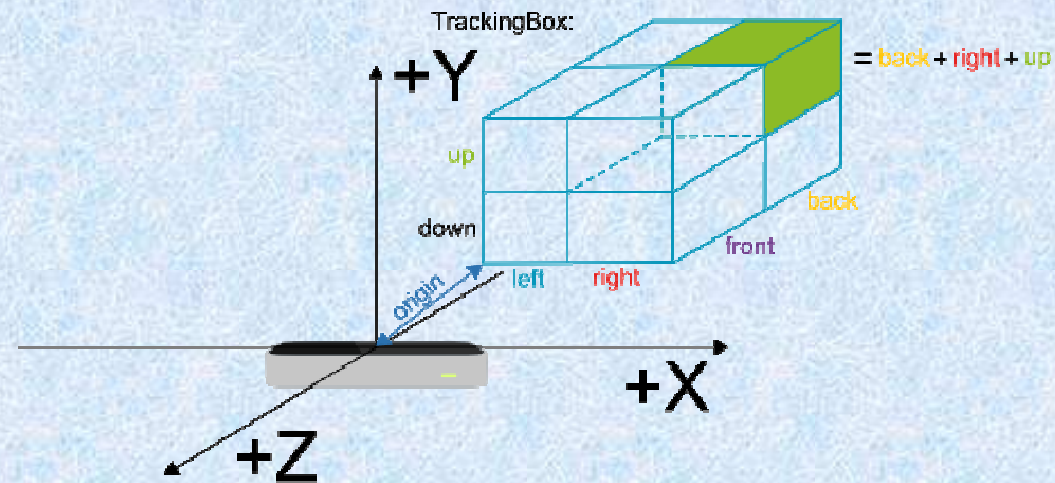
Joint State

Kinect skeleton demo patch

- [Demo patch Kinect](#)

Leap Motion

- two monochromatic IR cameras
- three infrared LEDs



Leap motion in VVVV

- Leap Node:

Leap

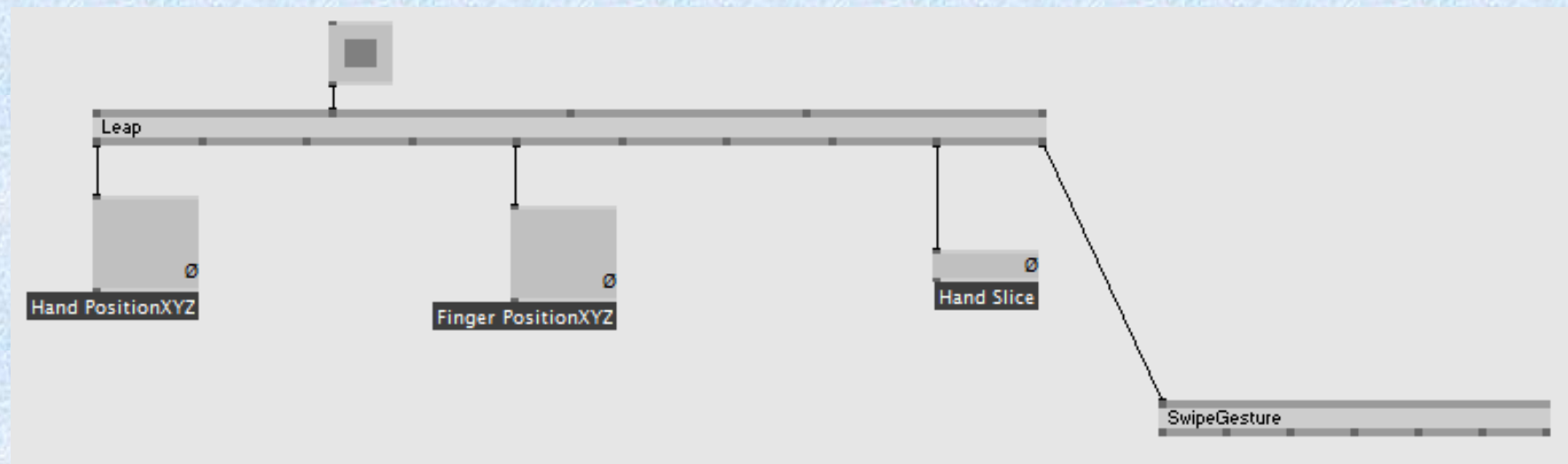
	Descriptive Name
<input type="checkbox"/>	Enable Circle Gesture
5.0000	Circle Min Radius (mm)
4.7124	Circle Min Arc (radians)
<input type="checkbox"/>	Enable Swipe Gesture
150.0000	Swipe Min Length (mm)
1000.0000	Swipe Min Velocity (mm/s)
<input type="checkbox"/>	Enable KeyTab Gesture
50.0000	KeyTab Min Down Velocity (mm/s)
0.1000	KeyTab History Seconds (s)
5.0000	KeyTab Min Distance (mm)
<input type="checkbox"/>	Enable ScreenTab Gesture
50.0000	ScreenTab Min Forward Velocity
0.1000	ScreenTab History Seconds (s)
3.0000	ScreenTab Min Distance (mm)
<input type="checkbox"/>	Reset
<input type="checkbox"/>	Hand PositionXYZ
<input type="checkbox"/>	Hand DirectionXYZ
<input type="checkbox"/>	Hand NormalXYZ
<input type="checkbox"/>	Hand Ball CenterXYZ
<input type="checkbox"/>	Hand Ball Radius
<input type="checkbox"/>	Hand VelocityXYZ
<input type="checkbox"/>	Hand ID
<input type="checkbox"/>	Finger PositionXYZ
<input type="checkbox"/>	Finger DirectionXYZ
<input type="checkbox"/>	Finger VelocityXYZ
<input type="checkbox"/>	Is Tool
<input type="checkbox"/>	Finger SizeXY
<input type="checkbox"/>	Finger ID
<input type="checkbox"/>	Hand Slice
<input type="checkbox"/>	Gestures
64	ID

- SwipeGesture Node:

SwipeGesture

		Descriptive Name
	>	Gesture List
	0	DirectionXYZ
	0	PositionXYZ
	0	Speed
	0	Start PositionXYZ
	0	ID
	0	Duration
	0	State
	66	ID

- Together:



Leap Motion demo patch

- [Demo patch leap motion](#)

Kinect vs. Leap Motion

- Kinect:
 - + Tracking of the whole body
 - + The complete body as interface
 - Not very exact measuring of single parts of the body
 - Price more than two times higher than Leap Motion , ca. 200€
- Leap M.:
 - + Very exact Tracking of the Hand
 - + Very easy to use and low price, ca. 90€
 - + A certain amount of applications are existing for free use(kind of like App store)
 - Not capable of measuring any other part of the body than the hand

- The Kinect is good if you want to use your whole body as an interface. So far it is the only system for private use that is capable of Tracking the whole body.
- The Leap Motion is very good for controlling for example the computer or the browser with hand gestures, because it has a quite exact recognition of the Hand. It also already has a good offer of different applications and games through the app store airspace.

Questions??

Sources

- Prototyping interfaces: Interaktives skizzieren mit vvvv: Hermann Schmidt Mainz Verlag 2013
- <http://www.techopedia.com/definition/618/gesture-recognition>
- http://en.wikipedia.org/wiki/Gesture_recognition
- http://www.gamingxp.com/newsview-25561-e3_2010_25_millionen_xbox_live_user_kinect_live_demo.htm
- http://en.wikipedia.org/wiki/Leap_Motion