

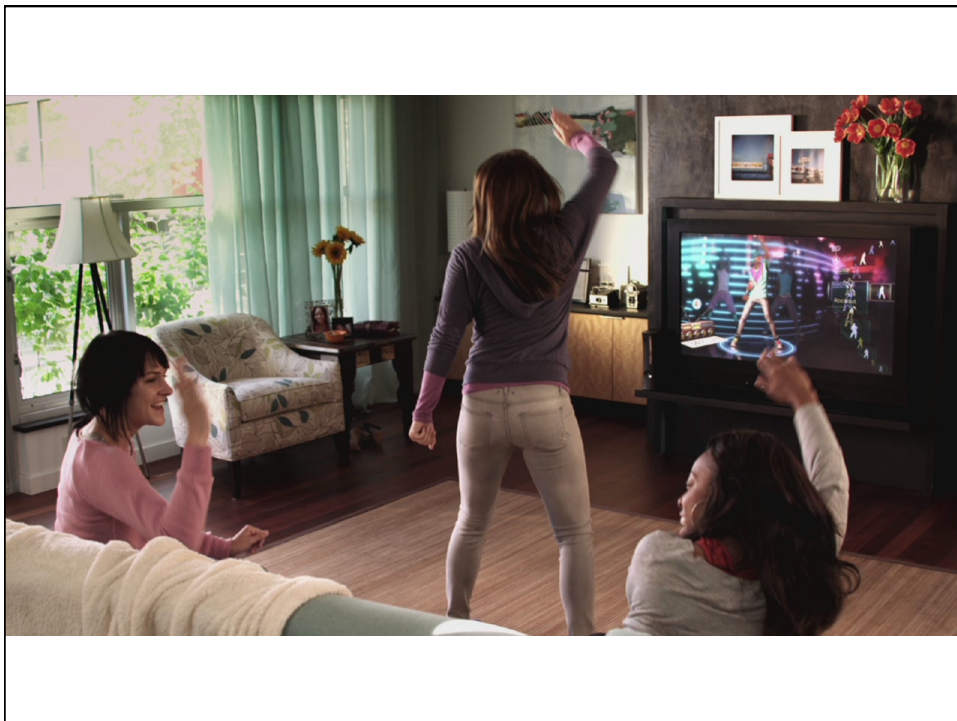
Using Kinect to explore NUI

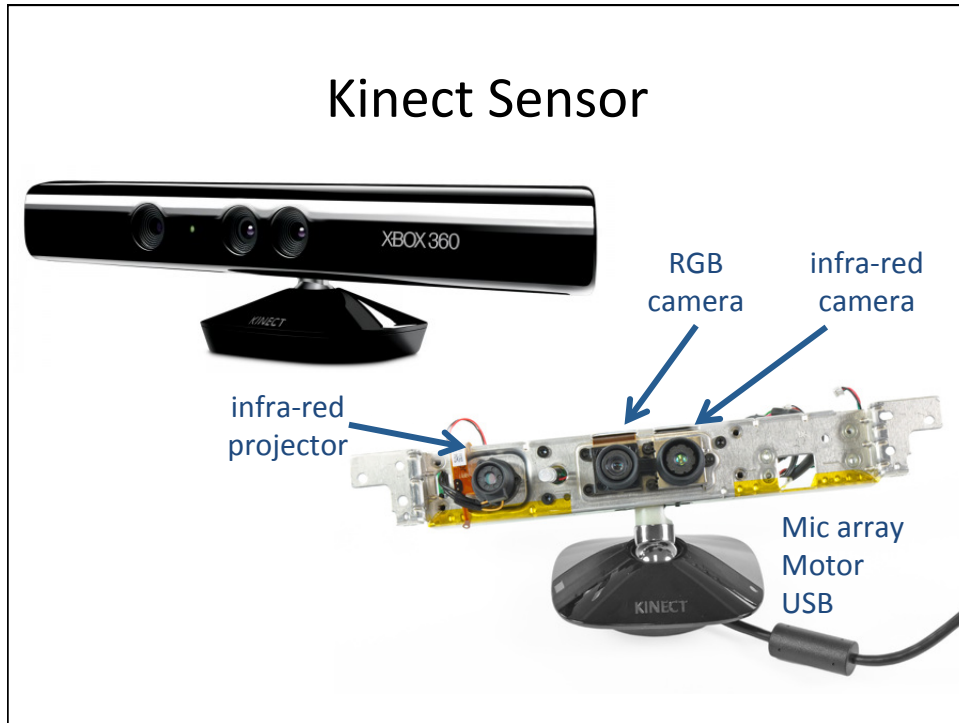
John C. Tang
Microsoft Research

Beyond GUI




NUI--Natural User Interaction






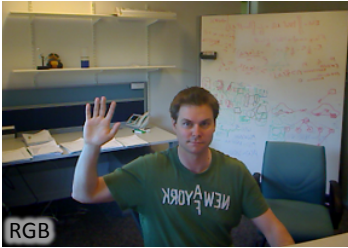
Depth cameras



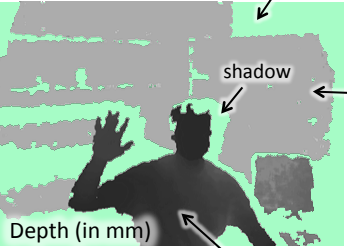
- Technology
 - structured IR light



Structured IR



RGB



Depth (in mm)

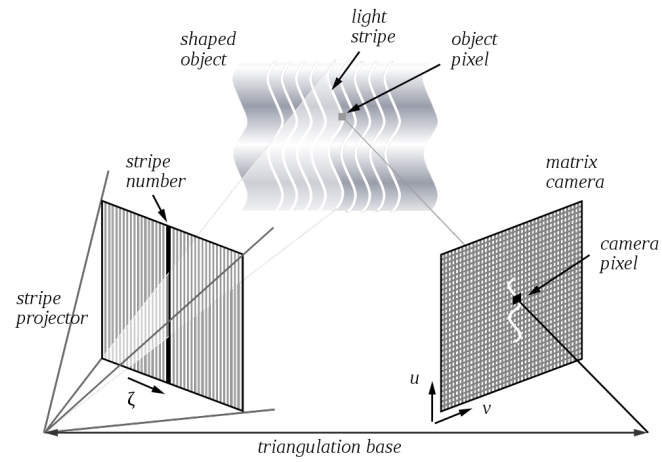
Labels: missing pixels (non IR reflective), shadow, far, near

✓ cheap, fast, accurate

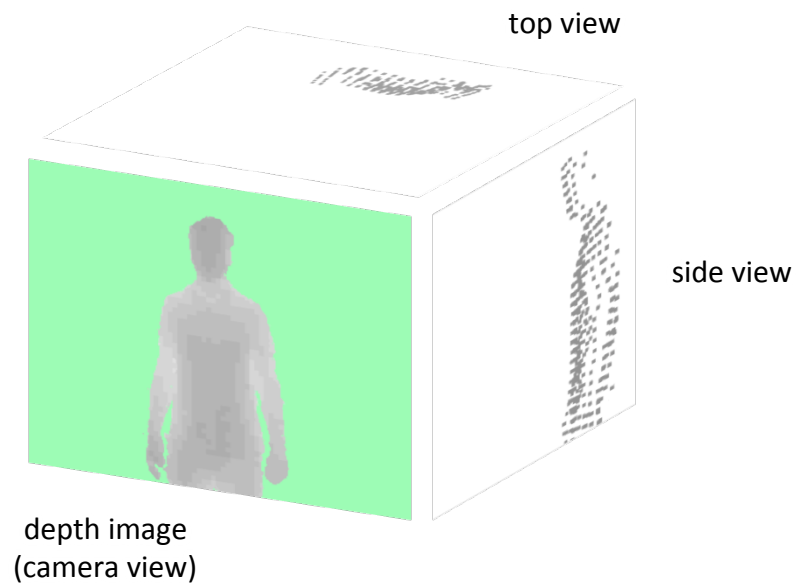
✗ missing pixels, shadows

How it works?

- **Structured light 3D scanner**



Depth cameras



RGB vs depth for pose estimation

RGB

Only works well lit

Background clutter

Scale unknown

Clothing, skin colour

much easier
with depth!



DEPTH

Works in low light

Person 'pops' out from bg

Scale known

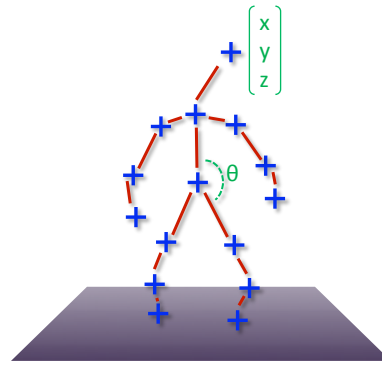
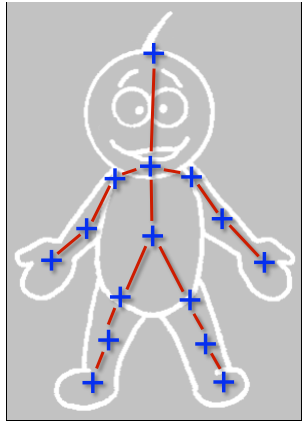
Uniform texture

Shadows, missing pixels

Jamie Shotton, Andrew Blake, Microsoft Research Cambridge, UK,
Xbox Kinect Team

SKELETAL TRACKING

Human pose estimation



Kinect tracks 20 body joints in real time.

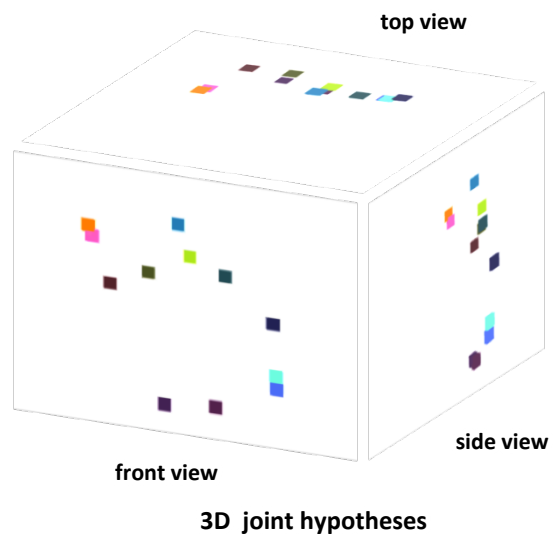
Skeletal Tracking



input depth image



inferred body parts & overlaid joint hypotheses





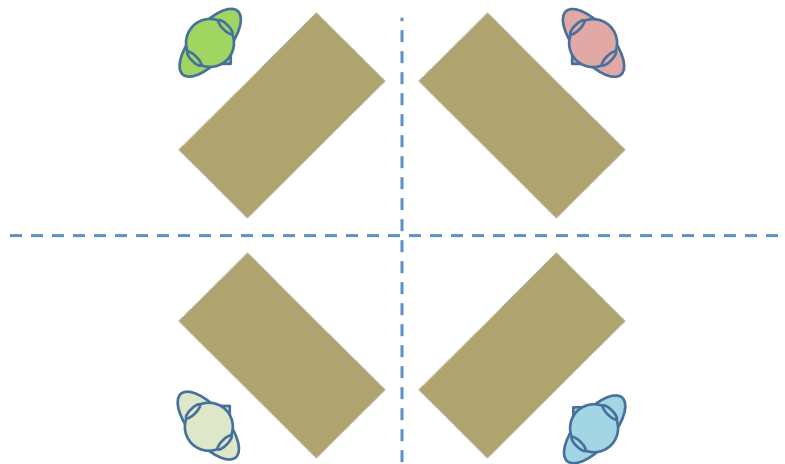
Phil Chou, Niru Chandrasekaran, Qin Cai, Cha Zhang, Zhengyou Zhang

TELE-IMMERSION

Tele-immersion

- Geographically distributed participants feel like they are in the same room
- Tele-immersion experience
 - Life size
 - Mutual gaze
 - 3D
 - Motion parallax
 - Spatial audio

Virtual (“Matrix”) approach to fully distributed meetings



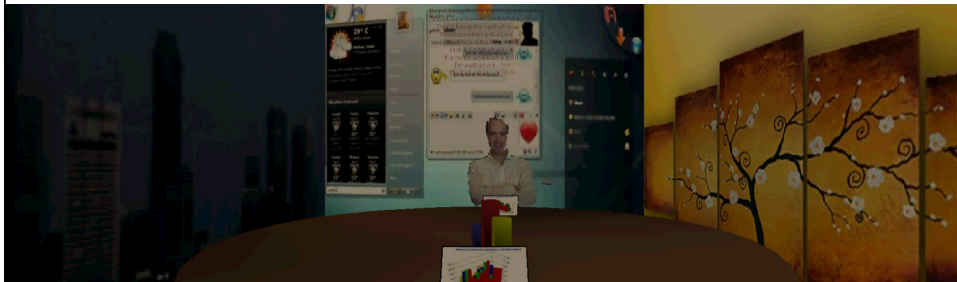
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Tele-Immersion Booth



17

Tele-Immersion Booth video



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Avatar Kinect

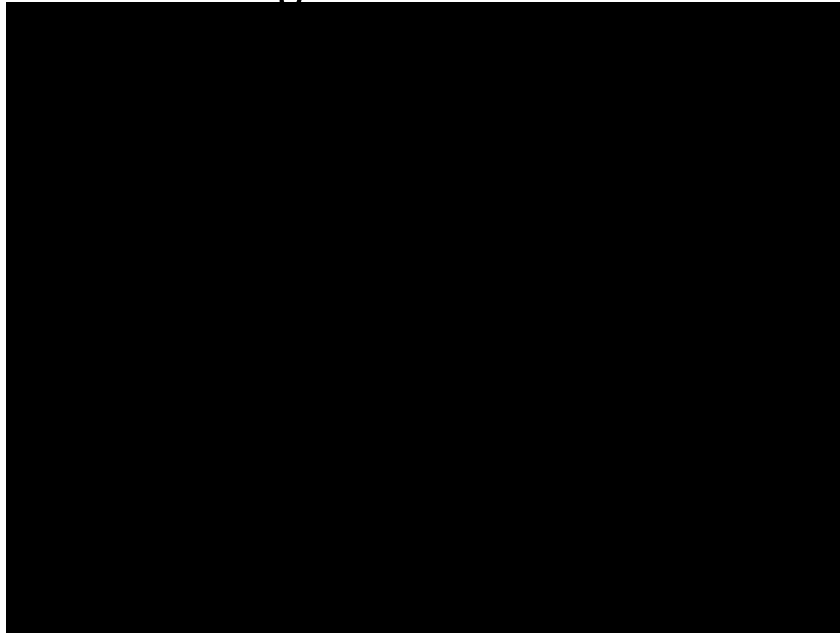


<http://www.youtube.com/watch?v=eBTredGLI4c> 4:30

Shahram Izadi et al., MSR Cambridge, UK

KINECT FUSION

Generating 3D model in real time



- <http://www.youtube.com/watch?v=RSh8Voanp3c> 3:45



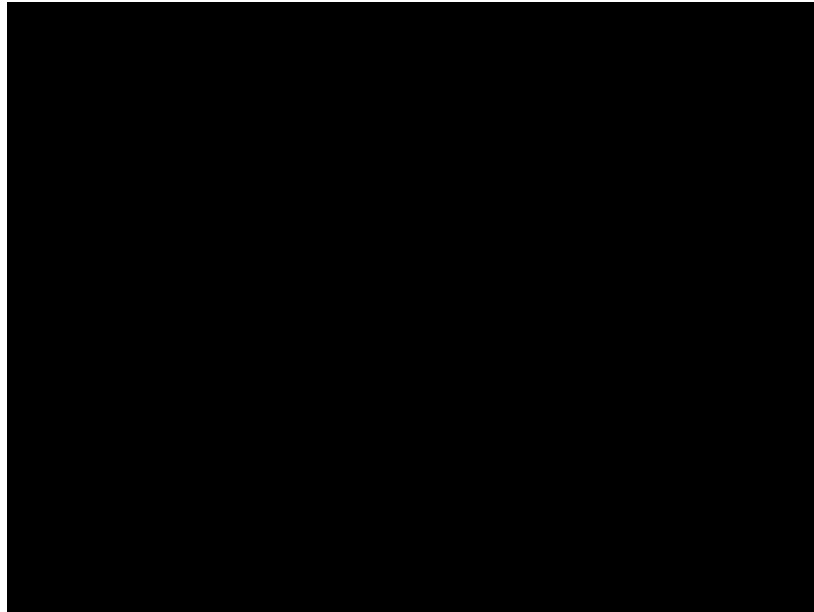
<http://kinecthacks.net/>

http://youtu.be/ho8KVOe_y08

Creating Shared Experiences



Kinect Fail



- <http://youtu.be/Ux1FzPKh20>
- <http://youtu.be/qafmCU4LUZ8>

Kinect SDK for Windows

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Kinect for Windows SDK Beta

Helping developers unleash the power of Kinect for PCs



Be part of the movement.

Download the Kinect for Windows SDK beta »

A beta version of the [Kinect for Windows Software Development Kit \(SDK\)](#) is now available, making it easier for developers to experiment with natural user interfaces (NUI). The SDK is designed to enable the community of developers, academic researchers, and enthusiasts to build compelling applications that include depth sensing, human motion tracking, and voice recognition by using Kinect technology on Windows. The non-commercial SDK can be downloaded at no cost for the development of non-commercial applications.

The Kinect for Windows SDK beta, which works with Windows 7, includes drivers, rich APIs for raw sensor streams and natural user interfaces, installation documents, and resource materials. It provides Kinect capabilities to developers who build applications with C++, C#, or Visual Basic by using Microsoft Visual Studio 2010.

[Learn more](#)

SDK Features

- **Raw Sensor Streams:** Access to raw data streams from the depth sensor, color camera sensor, and four-element microphone array allows developers to build upon the low-level streams that are generated by the Kinect sensor.
- **Skeletal Tracking:** The capability to track the skeleton image of one or two people moving within the Kinect field of view makes it easy to create gesture-driven applications.
- **Advanced Audio Capabilities:** Audio processing capabilities include sophisticated acoustic noise suppression and echo cancellation, beam formation to identify the current sound source, and integration with the Windows speech recognition API.
- **Sample Code and Documentation:** The SDK contains more than 100 pages of technical documentation. In addition to built-in help files, the documentation

Kinect for Windows SDK Beta

Download the Kinect for Windows SDK beta and get release announcements, updates, news, and more.

- [Kinect for Windows SDK beta site](#)
- [Kinect for Windows SDK beta project](#)

News

- [Natural User Interface Leaps Forward with Release of Kinect for Windows SDK](#)
- [Windows Phone, Kinect Exemplify New Usage Scenarios and Device Capabilities at MIX11](#)
- [Academics, Enthusiasts to Get Kinect SDK](#)
- [Kinect Audio: Preparedness Pays Off](#)
- [MIXing It Up: the Kinect for Windows SDK](#)
- [Virtual Reality Visionary Jaron Lanier on His Microsoft Gig: Kinect is 'Beautiful, Exciting'](#)

Related Links

- [Windows 7](#)
- [Kinect for Xbox 360](#)

<http://research.microsoft.com/en-us/collaboration/focus/nui/kinect-windows.aspx>

Kinect for Windows

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<http://www.microsoft.com/en-us/kinectforwindows/>

Kinect SDK

- Data streams
 - Color image
 - Depth
 - Player segmentation (up to 6)
- Skeletal tracking (up to 2)
- Audio (Microsoft Speech Platform)

Constraints

- Data analysis introduces lag
- 86cm to 4m range
- Not outdoors (too much IR noise)
- Not too close to other Kinects (interference)

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KINECT™ for Windows BLOG

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Near Mode: What it is (and isn't)

3 days ago by Kinect for Windows Team 6

There has been a lot of speculation on what near mode is since we announced it. As I mentioned in the original post, the Kinect for Windows device has new firmware which enables the depth camera to see objects as close as 50 centimeters in front of the device without losing accuracy or precision, with graceful degradation down to 40 centimeters.

The lenses on the Kinect for Windows sensor are the same as the Kinect for Xbox 360 sensor, so near mode does not change the field of view as some people have been speculating. As some have observed, the Kinect for Xbox 360 sensor was already technically capable of seeing down 50 centimeters – but with the caveat “as long as the light is right”.

That caveat turned out to be a pretty big caveat. The Kinect for Windows team spent many months developing a way to overcome this so the sensor would properly detect close up objects in more general lighting conditions. This resulted not only in the need for new firmware, but changes to the way the devices are tested on the manufacturing line. In addition to allowing the sensor to see objects as close as 40 centimeters, these changes make the sensor less sensitive to more distant objects: when the sensor is in near mode, it has full accuracy and precision for objects 2 meters away, with graceful degradation out to 3 meters. Here is a handy chart one of our engineers made that shows the types of depth values returned by the runtime:

In Beta 2, for an object 800-4000 millimeters from the sensor the runtime would return the depth value, and the runtime returned a 0 regardless if the detected depth was unknown, too near or too far. Our version 1.0 runtime will return depth values if an object is in the above cyan zone. If the object is in the purple, brown or

<http://blogs.msdn.com/b/kinectforwindows/>

NUI—More than just Kinect

- Gestures
- Speech
- Environment/Context
- Mobility
- Activities (not just actions)
- Multiple devices (not just Kinect)
- People (often more than one)

