Using Kinect to explore NUI

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Beyond GUI
NUI--Natural User Interaction
Kinect Sensor

- Technology
  - structured IR light

- RGB camera
- infra-red camera
- infra-red projector
- Mic array
- Motor
- USB

Depth cameras

- Technology
  - structured IR light

- cheap, fast, accurate
- missing pixels, shadows

- missing pixels (non IR reflective)
How it works?

• **Structured light 3D scanner**

Depth cameras
# RGB vs depth for pose estimation

<table>
<thead>
<tr>
<th>RGB</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Only works well lit</td>
<td>Works in low light</td>
</tr>
<tr>
<td>Background clutter</td>
<td>Person ‘pops’ out from bg</td>
</tr>
<tr>
<td>Scale unknown</td>
<td>Scale known</td>
</tr>
<tr>
<td>Clothing, skin colour</td>
<td>Uniform texture</td>
</tr>
</tbody>
</table>

- much easier with depth!

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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

front view

top view

side view

3D joint hypotheses
Kinect Games

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
Tele-Immersion Booth

Tele-Immersion Booth video
Avatar Kinect

http://www.youtube.com/watch?v=eBTredGLI4c

Shahram Izadi et al., MSR Cambridge, UK

KINECT FUSION
Generating 3D model in real time

- [http://www.youtube.com/watch?v=RSh8Voanp3c](http://www.youtube.com/watch?v=RSh8Voanp3c) 3:45

- [http://www.kinecthacks.net/](http://www.kinecthacks.net/)
- [http://kinecthacks.net/](http://kinecthacks.net/)
- [http://youtu.be/ho8KVOe_y08](http://youtu.be/ho8KVOe_y08)
Creating Shared Experiences

Kinect Fail

http://youtu.be/Ux1FZpPKh20
http://youtu.be/qafmCU4LUZ8
Kinect SDK for Windows


Kinect for Windows

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)
NUI—More than just Kinect

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

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