Next Generation Natural User Interface with Kinect

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Key Takeaways

- Kinect has evolved:
  - Whether you did it -> How you did it
  - One or two people -> A room of six people
- Kinect opens up amazing opportunities for building richer and more engaging experiences
- New generation of Kinect available later this month on Xbox One and next year on Windows
- Get involved now: ID@Xbox and Kinect for Windows
Kinect is Evolving
What is NUI?

Natural User Interaction (NUI) is a completely new way to experience technology. It is a paradigm shift that allows us to go beyond only manual input to communicating with our technology in a more natural way.
Multi-Modal

- Keyboard + Mouse
- Vision
- Voice
- Gesture
- Touch
- Other Sensors
Playoke Dance

- Playoke is a dance game for professional fitness clubs - players dance along to famous songs
- 4 to 36 players can be play at the same time
- The Kinect takes a picture of the player and places the image on the screen next to others
- The dance video has been “tagged” so the Kinect can see the correct dance positions
- Movements of the all the players tracked in real time, analyzed & compared with others
Playoke System Overview
Kinect for Windows 1.8 SDK

- **Kinect Fusion Color**
  - Color pixels added for new level of realism

- **HTML5/JS App Model**
  - Expanding access to Kinect for web devs

- **Background Removal API**
  - “Green Screen” without the actual screen
Kinect Fusion
Demo

Kinect Fusion Color

Photobombr
Kinect Common Bridge

- Dead-simple Kinect integration into 3rd party libraries and graphics frameworks from MS Open Tech

- Collab with Cinder & openFrameworks communities: native OF add-on and Cinder block available now

- Apache 2.0 license

http://aka.ms/KinectCommonBridgeBlog
Demo: Kinect Common Bridge

Fireflies (openFrameworks)

Particle Man (Cinder)
A Platform That Fully Understands the People in the Room

Who they are
- Identity

What they are saying
- Speech

What they are doing
- Face Tracking
- Engagement
- Skeleton tracking
- Interactions
- Hands states
- Expression
- Controller Pairing
- Video
NUI Platform

Experiences
- Hand State
- Expression
- HD Face Tracking
- Interactions
- Skeletal Tracking
- Identity
- Speech
- Video & Registration
- Controller Pairing

Software
- NUI Service, Runtime & APIs

Hardware
- Sound
- Depth
- Active IR
- Color
  - Improved Fidelity
  - Improved MOS (×2)
  - Improved Fidelity
  - Lighting Independent
  - HD 1080p Color
Sensor Capabilities

- **Wider field of view** (horizontally and vertically) for depth and color
- 3x depth fidelity
- **1080p, HD color** camera (30fps)
- **Lighting independent, Active IR** (30 fps)
- **Improved microphone array** (zero balanced)
- **Improved range** of high quality operation .5M near, 4.5M far
Demo

Augmented Reality

NUI Evolution
Skeletal Tracking Features

- Improved reliability and accuracy
  - More reliable lock-on and more stable joints
- More anatomically correct skeleton
  - Hips in the right place, new shoulder parent
- Six players tracked at all times
  - Simplified engagement, bystander involvement
- Hand-tip and thumb joints
  - Enables subtle and more nuanced hand gestures
- Per-joint orientation
  - Great for character retargeting
Hand Tips & Thumbs

- High-precision 3D point
  - Hand tip has high precision, good for subtle motion
- Analog open/close
  - Use hand length to get analog detail in between open/close hand states
- Wrist flick gestures
  - Swiping, shooting, whipping, slapping, throwing
- New interactions
  - Thumb in/out as button press, pinch gestures
Joint Orientation

- Yaw, pitch, and roll for each joint
  - Generated primarily from skeletal-position data
  - Roll is smartly derived when possible (for example, arms use thumbs)

- Exposed as quaternions in the body frame
  - Each is the absolute orientation of the parent bone
  - Basis for each joint is defined by:
    - Bone direction (Y) - always matches skeleton
    - Normal (Z) - joint roll, perpendicular to the bone
    - Binormal (X) - perpendicular to bone and normal
Hand-State Features

- Real-time classification of open, closed, and lasso
  - Combine with motion for brand-new interactions!

- Improved quality
  - Much less “flicker” when palms are facing the sensor
  - Better with long sleeves, arms extended, hands rotated

- Visual Gesture Builder (VGB) integration
  - Add new states and improve reliability of hard poses
Xbox One Interaction Paradigm

Common ➔ Build Menu Navigation

- NEW APIs enables you to easily gesture enable your UI
- For menuing and some gameplay
- Consistent interaction with Xbox One System and other games
- Benefit from Xbox One usability tests
- Lowers your cost of developing basic interactions for your game menus
- Navigation and manipulation: targeting, selection, press & scroll

Custom ➔ Build Unique Game experience

- Game experience and gestures : throw ball, golf swing, dance,...
- Use updated Visual Gesture Builder to build unique and fun gestures
Xbox One Interaction Language + System

Engagement

Targeting/Pressing

Scrolling/Zooming

Reusable Building Blocks
cheaper to build menus/navigation, even with custom look

Consistent User Experience
your game and rest of Xbox One
Engagement

**Xbox 360**
- Wave to engage

**Xbox One**
- Look towards screen
- Put hand in PhiZ
- Open palm toward screen

**Improvements**
- Smaller, but deliberate, barrier to interaction
Targeting & Pressing

**Xbox 360**
- Hold and wait to press

**Xbox One**
- Press arm towards button, then release
- As you progress with pressing, cursor attracts towards button center

**Improvements**
- More deliberate interaction
Scrolling & Zooming

**Xbox 360**
- Swipe left/right
- No zooming

**Xbox One**
- Grip hand over scrollable area to start
- Move left/right up/down
- Release hand-grip to stop

**Improvements**
- More user control over scrolling
- Not just page-left/page-right anymore
Demo

Interactions
Building Custom Gestures

- **Record** example gestures using Xbox Studio and **Convert**

- **Preview** gestures on Xbox devkit

- **Tag** gestures using VGB

- **Build and analyze** gestures using VGB

- Rinse and repeat

- **VgbView**

- **NUIView [Record]**

- **XSConvert [Convert]**

- **Your Game**
  - DiscreteGestureResults
  - ContinuousGestureResults
Visual Gesture Builder
Visual Gesture Builder
Demo

VGB View

Steering Demo
Getting Involved

ID@Xbox
Independent Developers Publishing Program for Xbox One

http://www.xbox.com/id

http://aka.ms/k4wdev
Introducing: ID@Xbox

- [http://www.xbox.com/id](http://www.xbox.com/id)
- ID@Xbox == Independent Developers Publishing Program on Xbox One
- Enables teams of all sizes to bring new and exciting content to Xbox One
- Initial focus on developers in Xbox One regions -> longer term any retail Xbox One will be able to be used as a developer kit
Kinect for Windows

- [http://aka.ms/k4wdev](http://aka.ms/k4wdev)

- Download 1.8 SDK & toolkit now

- Build apps for Windows 7/8.1 (desktop) using C++, C#/VB, HTML5/JS

- Shipping pre-release v2 sensors to select developers this month (RTM in 2014)
In Closing

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