

Sensing the World with Kinect

A Parade of 3D Applications

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www.cba-research.com

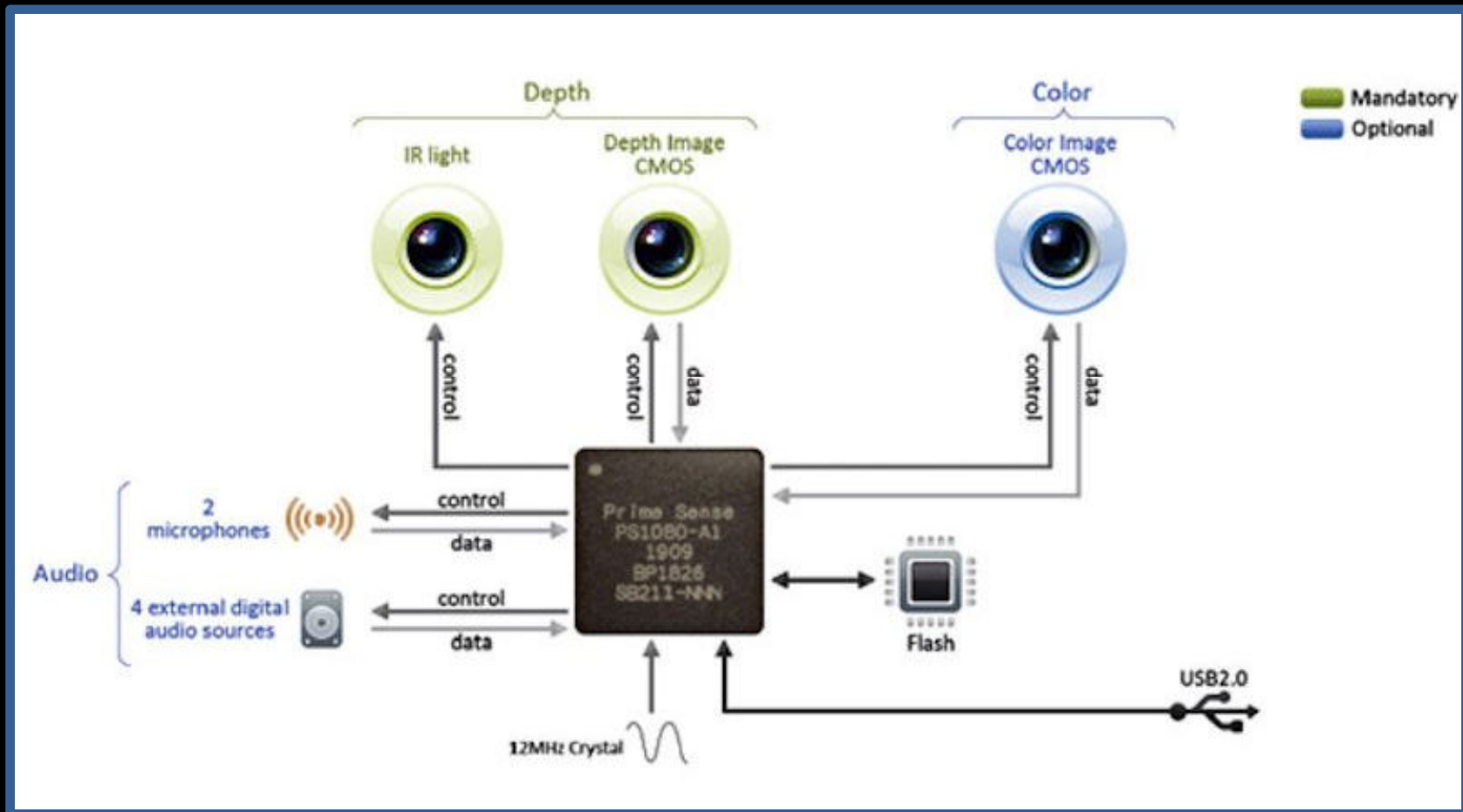


Kinect is a motion sensing device by Microsoft originally developed for the Xbox 360 video game console and Windows PCs.

It enables users to control and interact with the Xbox 360

- without the need to touch a game controller,*
- through a natural user interface using gestures and spoken commands.*

In a bit more detail...



IR Projector + IR Camera

Color Camera

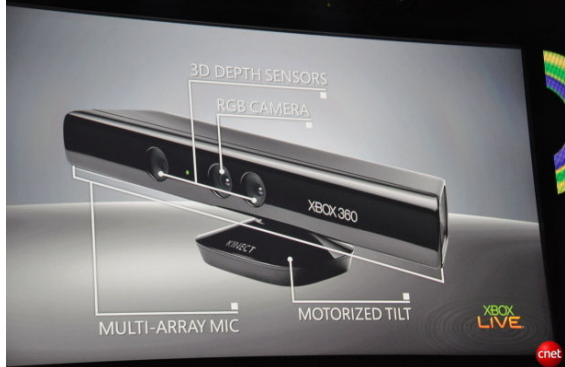


Google search with "Kinect" : 60 Million results!

Facts and Figures

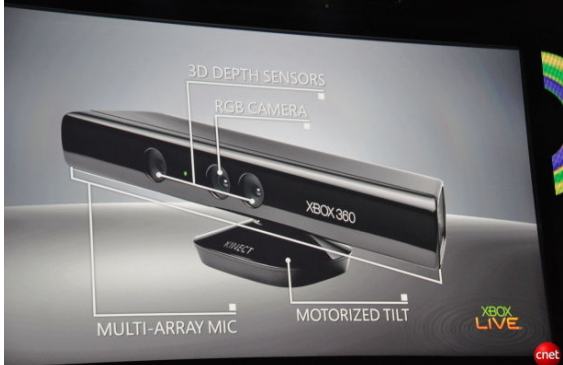
- Launched in North America on November 4, 2010
- *Fastest selling consumer electronics device* - according to Microsoft
 - 8 million units sold in its first 60 days.
 - 24 million units of the Kinect sensor shipped by February 2013
 - An advertising budget of US\$500 million for the launch
- Depth sensing technology due to Prime Sense
- "Soft" technologies due to Microsoft Research (Kinect for Windows SDK)
 - People/gesture tracking and recognition
 - Facial recognition
 - Voice recognition

What is Kinect capable of sensing?



Depth map of objects in a scene
Color image (RGB video)
Sound

What is Kinect capable of sensing?

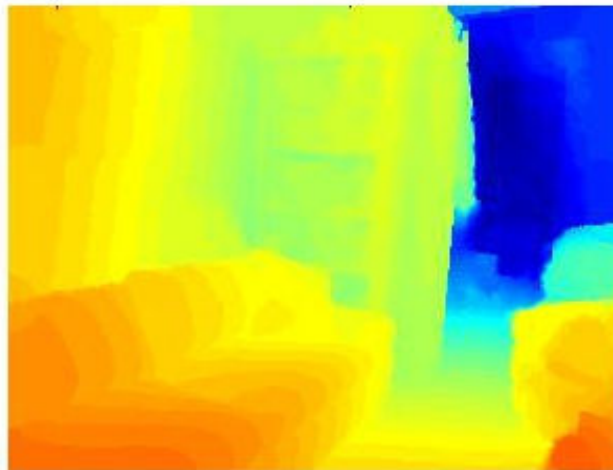


Depth map of objects in a scene
Color image (RGB video)
Sound

Color Image

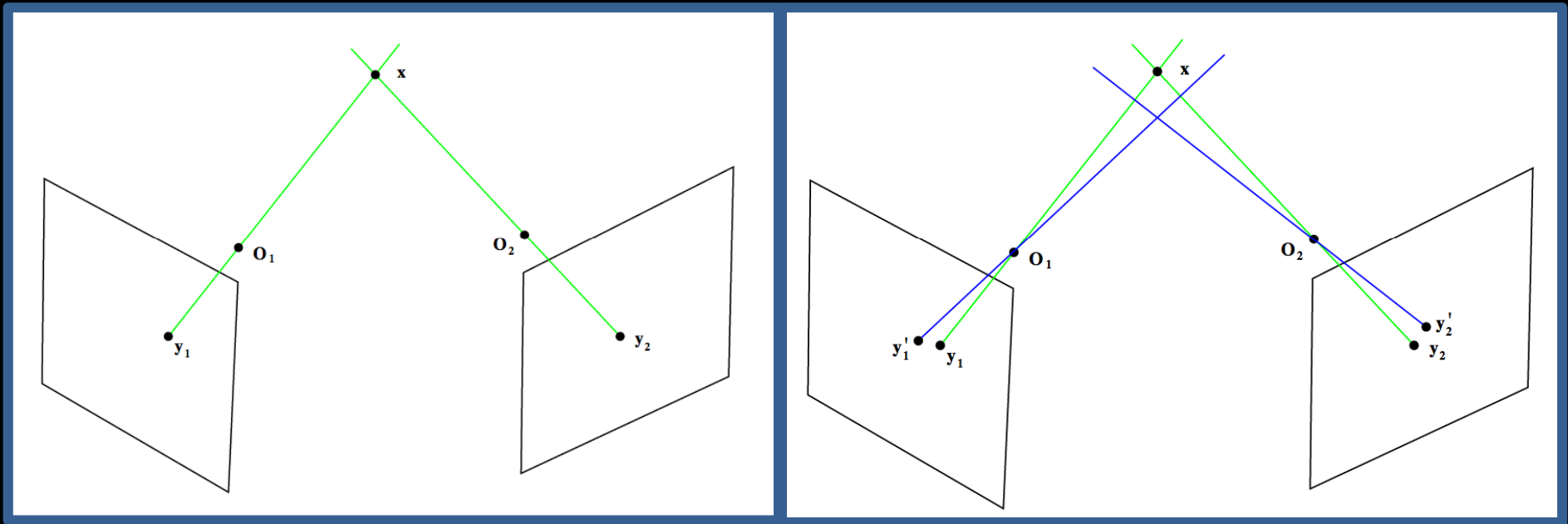
Depth Map

Segmentation Map



Depth Sensing Principle – 1/2

Stereo Reconstruction (Passive)

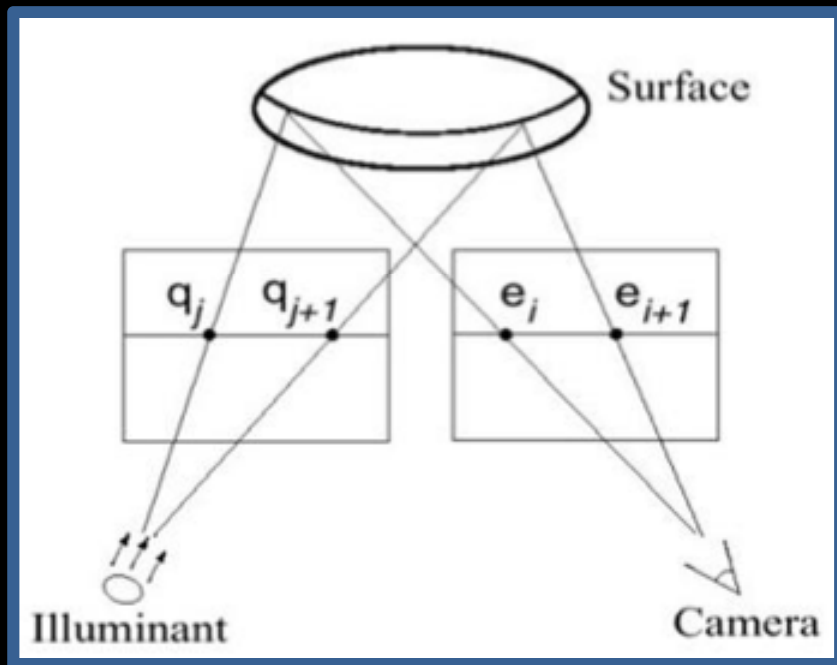


Ideal Case

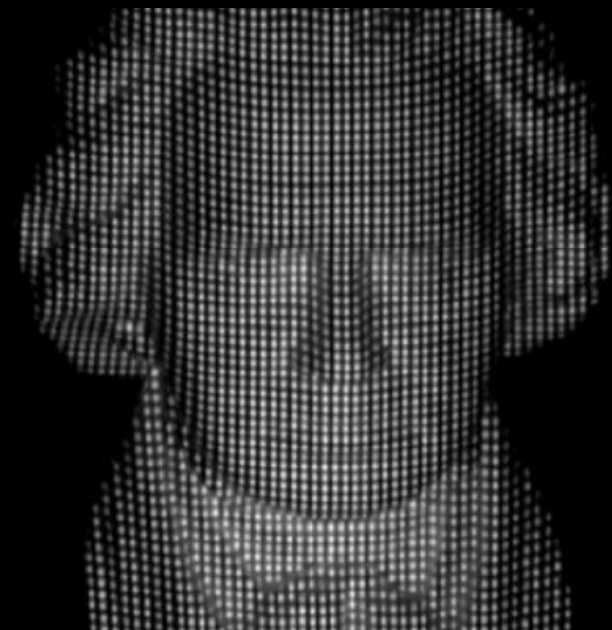
Actual Case

Depth Sensing Principle – 2/2

Reconstruction w/ Structured Light (Active)



Projector – Camera Geometry



Structured Light Pattern

Kinect Specs

Kinect 1.0

Kinect 2.0*

Field of View (FOV)	57.5 ° horizontal by 43.5 ° vertical	70 ° horizontal by 60 ° vertical
Resolvable Depth	0.8 m -> 4.0 m	0.8 m -> 4.0 m
Color Stream	640 x 480 x 24 bpp 4:3 RGB @ 30fps 640 x 480 x 16 bpp 4:3 YUV @ 15fps	1920 x 1080 x 16 bpp 16:9 YUY2 @ 30 fps
Depth Stream	320 x 240 16 bpp, 13-bit depth	512 x 424 x 16 bpp, 13-bit depth

Spatial x/y resolution = 3mm (@ 2m distance from sensor)

Depth z resolution = 1cm (@ 2m distance from sensor)

What can intelligent software do with Kinect?

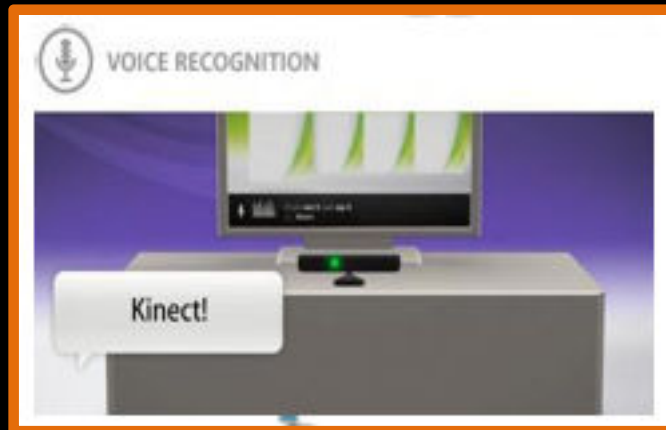
Capture and understand motion



Recognize people by their face



Recognize what people say



Xbox Features

What else can be done with Kinect?

APPLICATIONS



Depth Image Streams

Human Motion Capture

- Gesture-Based Control
- Avatar Animation
- Kinematic Evaluation
- Action Recognition

3D Structure

- 3D Scanning / Reconstruction
- Robot Guidance / SLAM
- Object Recognition

Mixed/Augmented Reality
Mouse-free Design
Semantic Scene Understanding



Control by Gesture



Control by Gesture

USC Institute for
Creative Technologies

University of Southern California

**SimSensei:
Virtual Human for Healthcare Support
& MultiSense:
Multimodal Perception and Learning**

Albert (Skip) Rizzo, PI
Louis-Philippe Morency, PI

As part of DCAPS program:
Detection & Computational Analysis of Psychological Signals
(3rd Interim Progress Video)

The work depicted here was sponsored by the U.S. Defense Advanced Research Projects Agency. Statements and opinions expressed do not necessarily reflect the position or the policy of the United States Government, and no official endorsement should be inferred.

Avatar Animation



Avatar Animation



Interactive Rehabilitation



“Avatar” Animation



Object Recognition



Robot Grasping / Guidance



3D Scanning / Reconstruction



Mouse-free Design

What's next?

Capturing 3D with a mobile?

It's already there!



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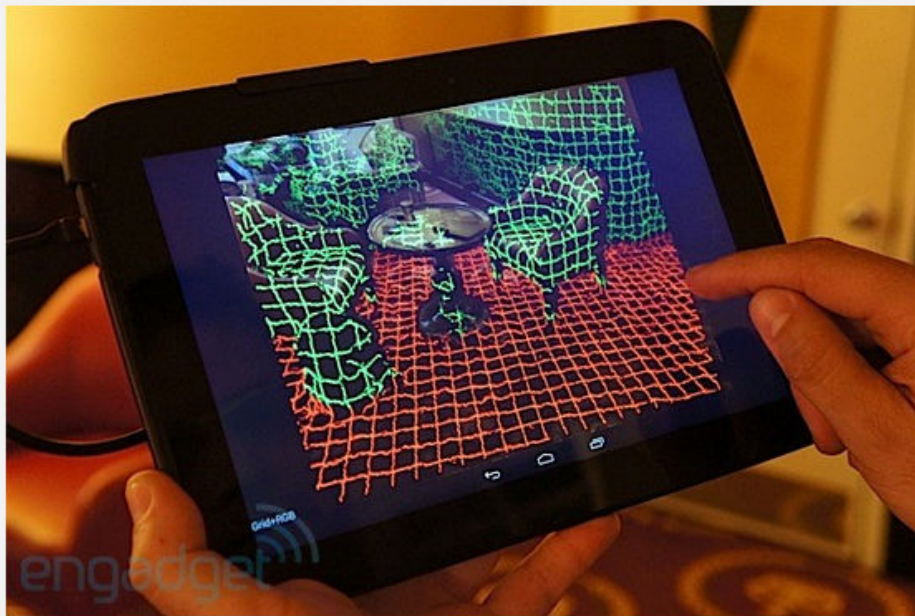
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tip us

PrimeSense demonstrates Capri 3D sensor on Nexus 10 (hands-on)

By Brad Molen posted May 15th, 2013 at 10:05 PM

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Take the 3D sensor inside the [Microsoft Kinect](#), shrink it down to a tenth of its original size and add a bunch of mobile capabilities, and you have yourself PrimeSense's latest

Dermatologists Hate Her

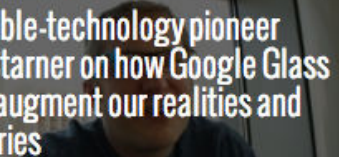


Mum reveals clever £5 wrinkle trick, that is making Botox Doctors furious! [Read more..](#)

FEATURED STORIES

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Wearable-technology pioneer Thad Starner on how Google Glass could augment our realities and memories 

What's next next?