

Microsoft
Research



Microsoft Research Asia **Faculty Summit 2012**



Kinect in the Classroom: The Creative Use of Kinect in Student Projects

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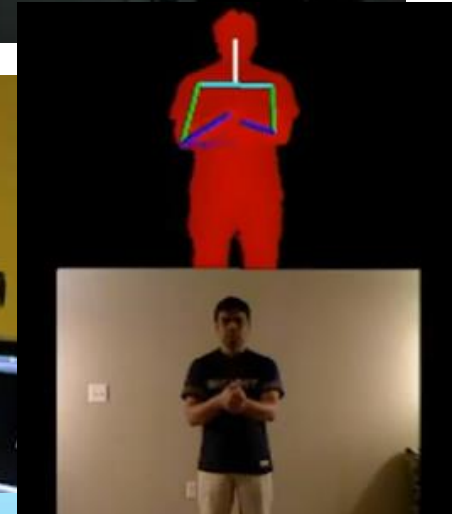
In 2010, MS Kinect took the world by storm





Within 6 months of release

Thousands of projects created using Kinect





Popular with students for projects

- WHY?
- #1 it is cool
- Enables novel interaction
- API(s) for PC available
- Low cost: USD\$149





Kinect-based Projects

All that is required
is imagination.



KINECT
for Windows*

OpenNI™

OPEN KINECT





Educators Point of View

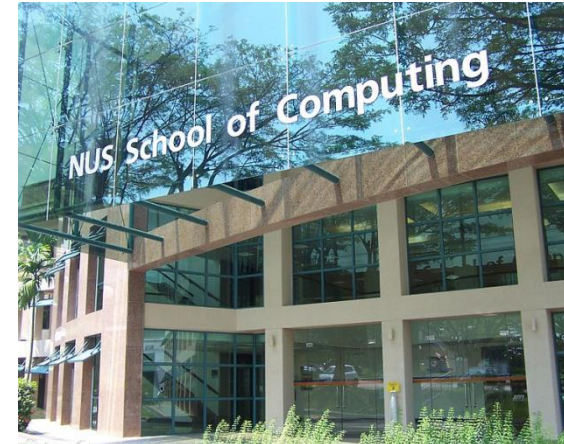
- Allows different types of projects
- Technical education
 - Data analysis, data fitting
 - Extracting high-level information
- Application/Design education
 - Exploiting novel interaction
 - Building apps based on Kinect API
 - Enable new types of interaction





School of Computing (SoC)

- Two departments
 - Computer Science
 - Information Systems
- 4-year undergraduate program
 - 400 students accepted a year
 - ~1600 students
- Many students do “final year project”
- Many students have class projects



School of Computing

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Kinect-Based Projects at SoC

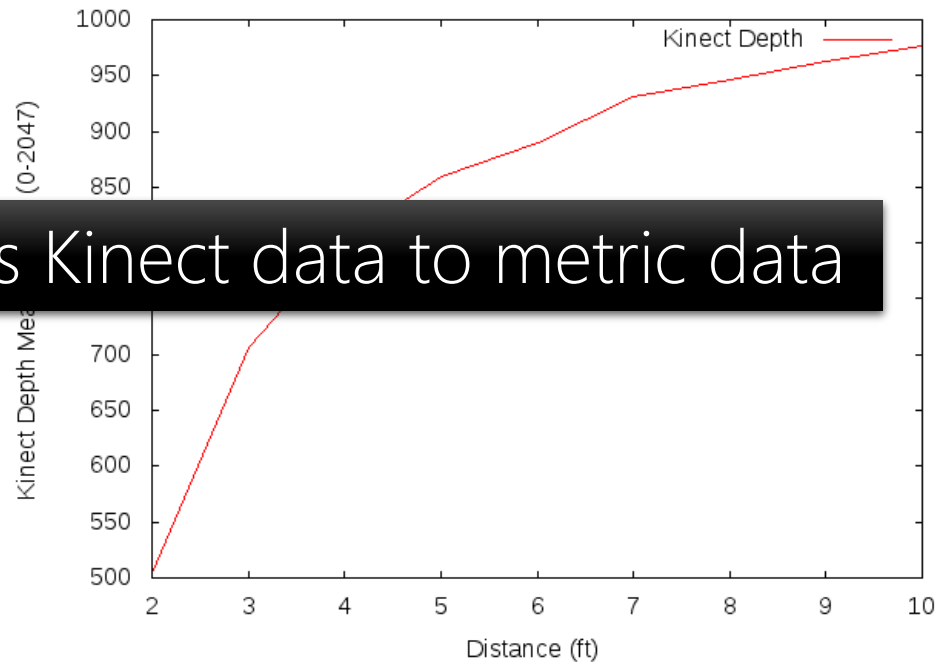
Four projects

- Two are technical
 - Data fitting
 - Gesture recognition
- Two are interactive applications
 - Learning about Bones
 - Game for "OpenHouse"

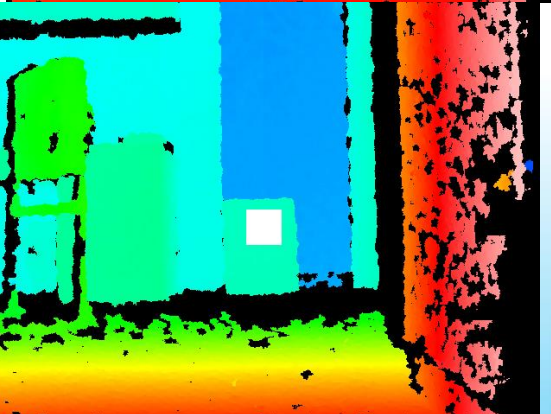
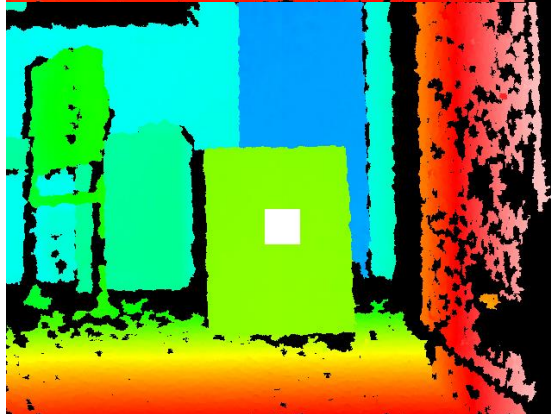
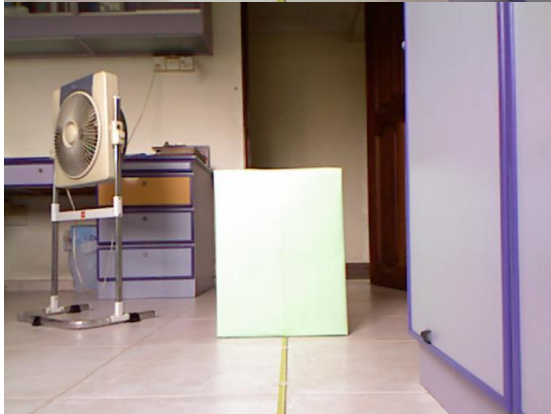
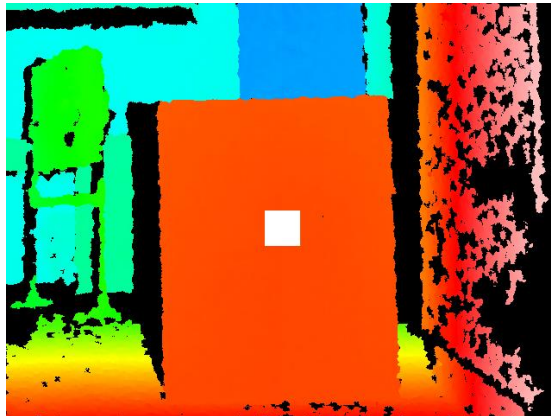
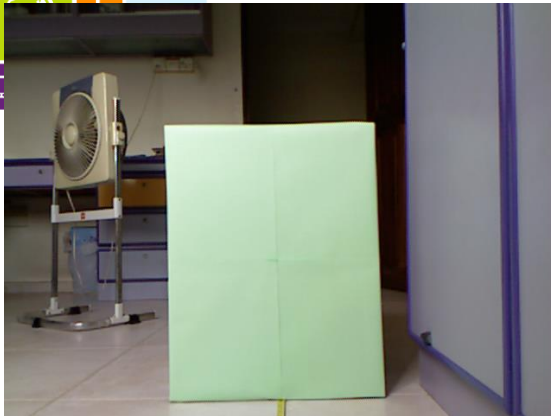


Project 1: Linearizing Kinect's Output

Kinect Depth Measurement vs. Actual Distance



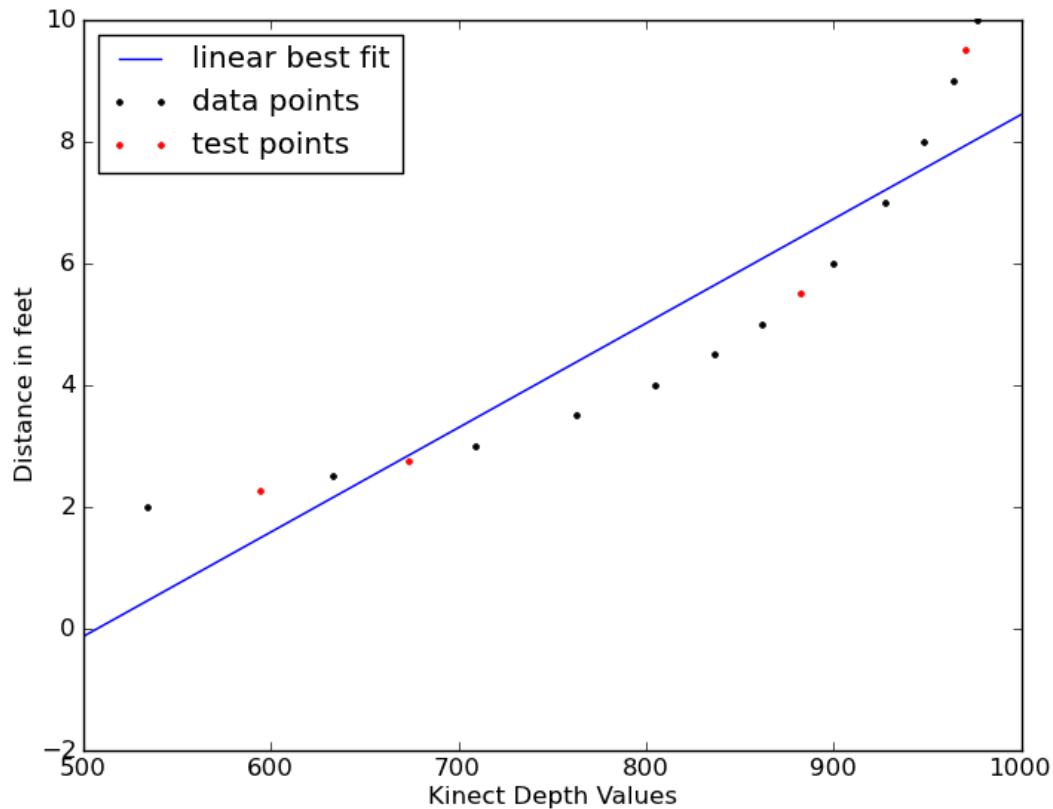
Design a function that maps Kinect data to metric data



Experiment Data Gathering

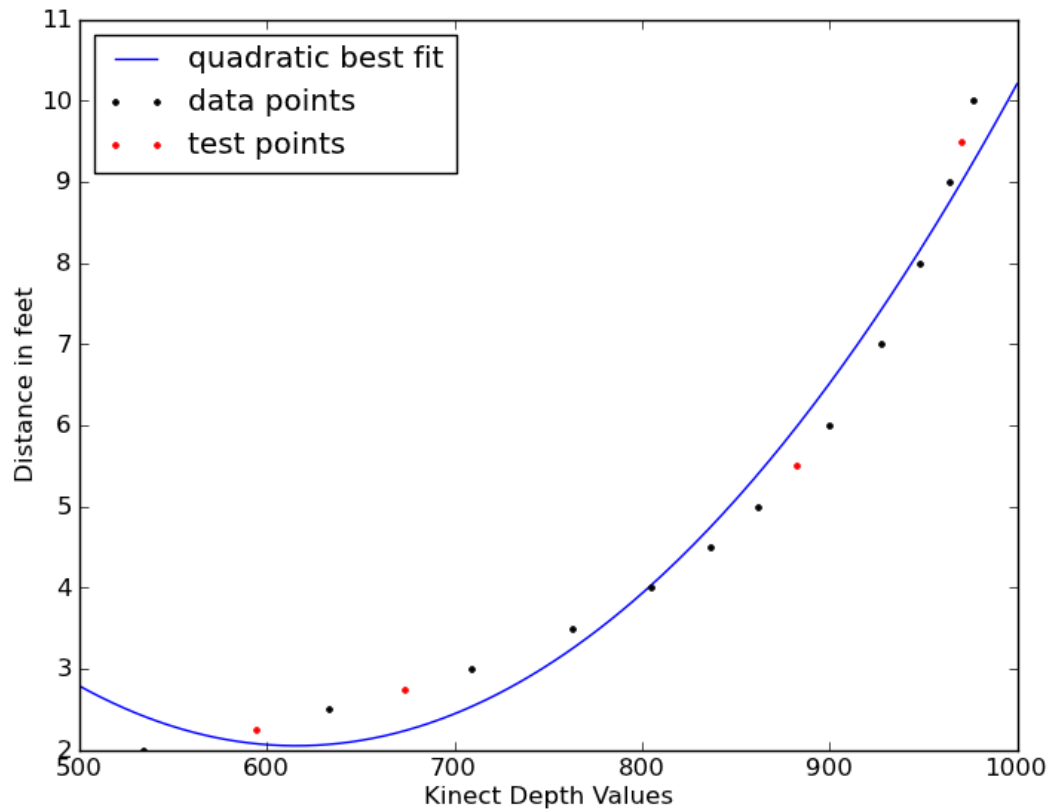


Fitting Various Functions: Linear



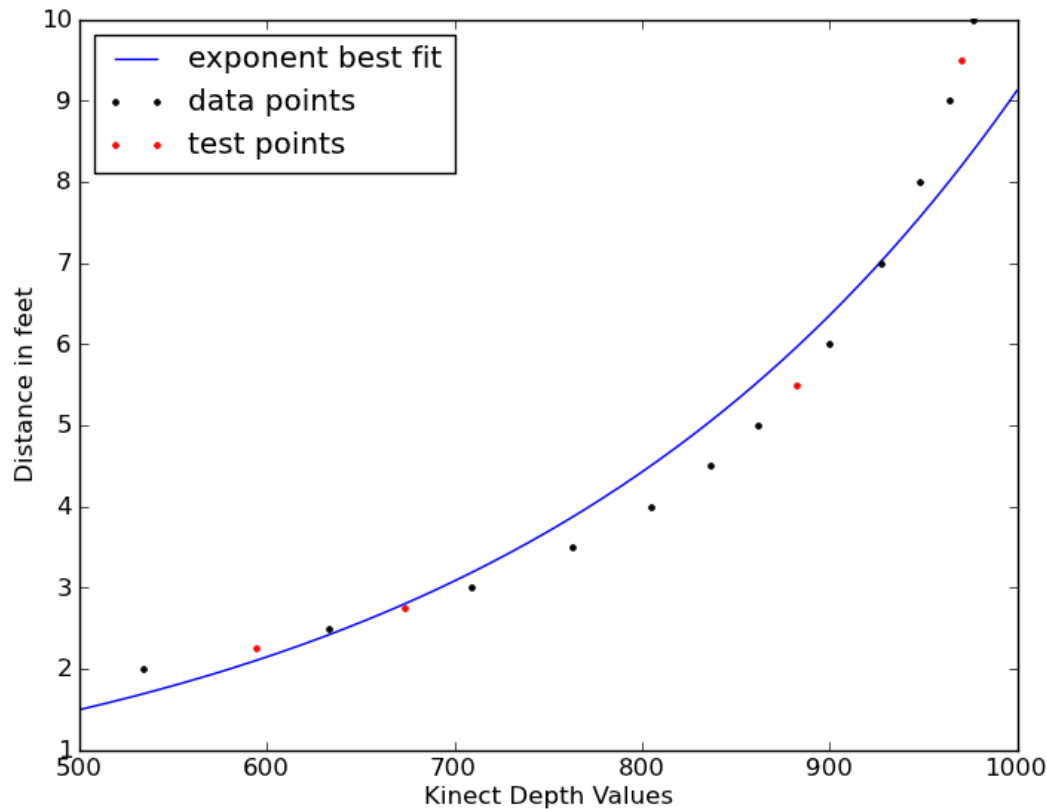


Fitting Various Functions: Quadratic



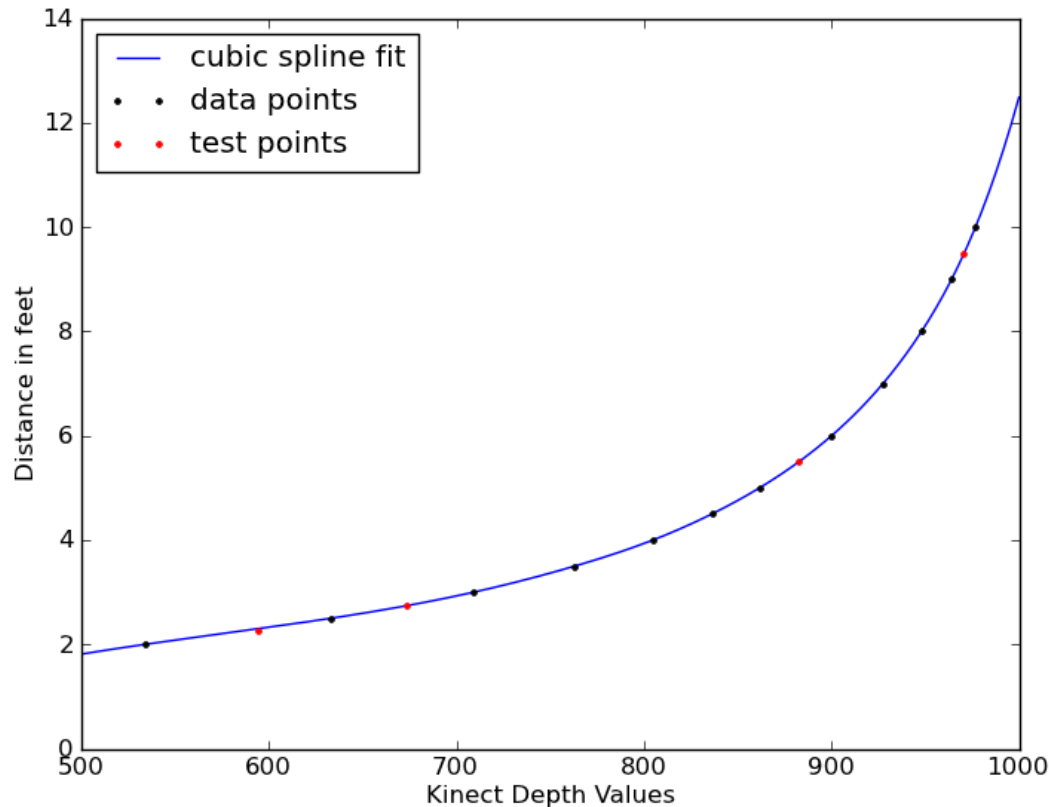


Fitting Various Functions: Exponential





Fitting Various Functions: Spline





Outcome of Project 1

- A short, one semester project
- The student was able to provide a calibration procedure + linearization function that produced better results than other APIs



Project 2: Finger Gesture Recognition

The Winect software interface displays the following components:

- Raw Camera Images:** Two video feeds showing a person making hand gestures.
- Main Hand / Secondary Hand:** Segmented hand images with colored markers (green, purple, yellow) indicating joint positions.
- Additional gestures:** A vertical list of buttons numbered 0 through 9.
- Bar Chart:** A histogram showing the frequency of gestures. The x-axis represents gesture numbers (0-10) and the y-axis represents frequency (0-0.5). The data points are: 2: 0.1, 3: 0.38, 4: 0.32, 5: 0.12, 6: 0.08, 9: 0.2.
- Training Classifier:** A section with buttons for 'Train Classifier', 'Save Classification Model', and 'Load Classification Model'. A text box shows training logs: 'Training classifier Successfully trained classifier in 0.2340004s', 'handID: 9 assigned', 'handID: 10 assigned', 'handID: 9 destroyed', 'handID: 10 destroyed', 'handID: 11 assigned', 'handID: 12 assigned'. A 'Sensitivity' slider is set to 6, and a 'Start Mouse Control' button is present.



Recognize 10 gestures



ZERO

ONE

TWO

THREE

FOUR



FIVE

SIX

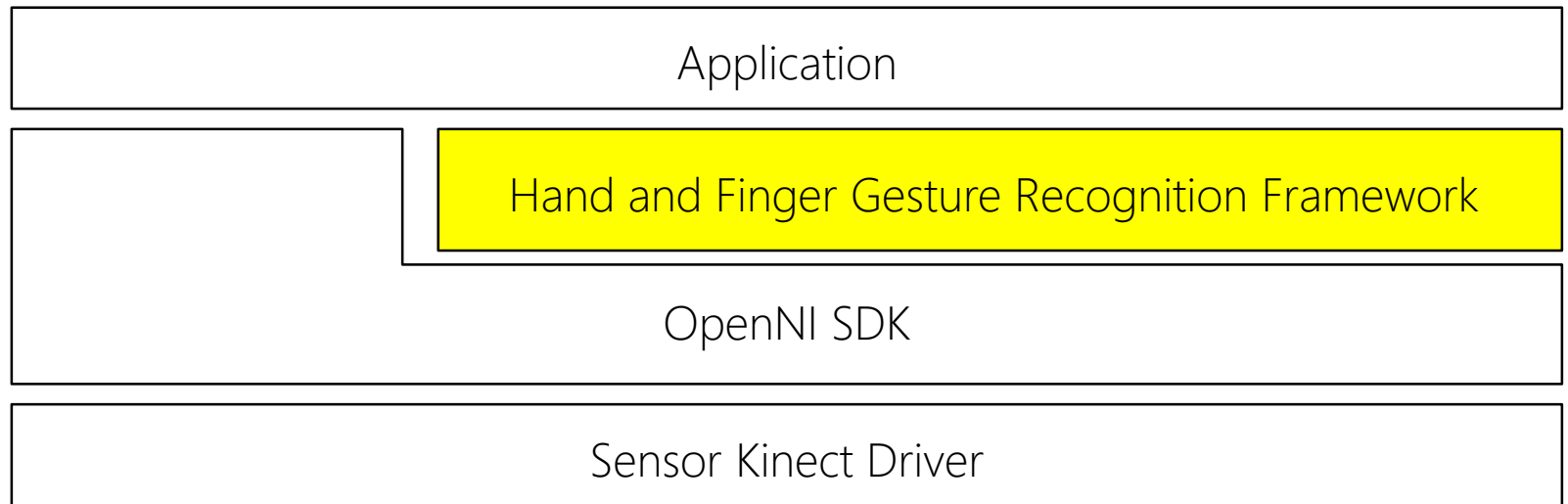
SEVEN

EIGHT

ROCK

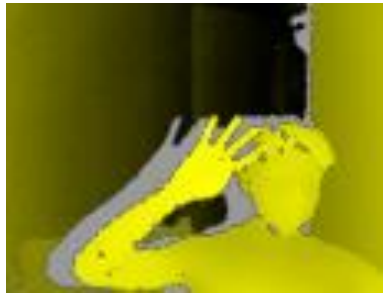


Build a "Gesture API"



- Framework complements OpenNI SDK to provide information on:
 1. Trained Gestures
 2. Finger Tips Tracking
 3. Palm Center
- Process time: 7ms

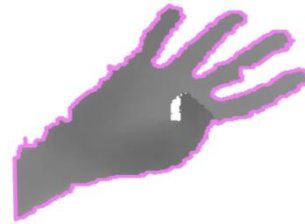
Processing Pipeline



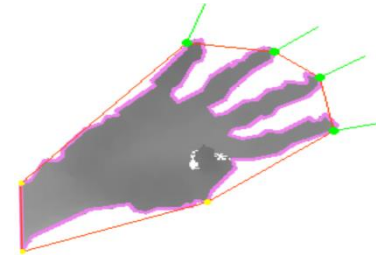
1. Hand Tracking



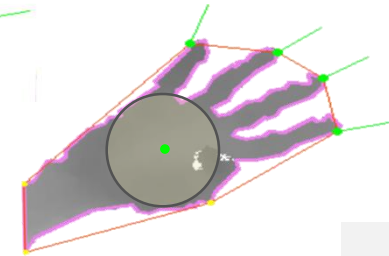
2. Hand Segmentation



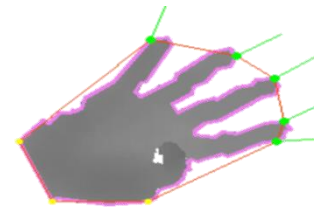
3. Contour Tracing



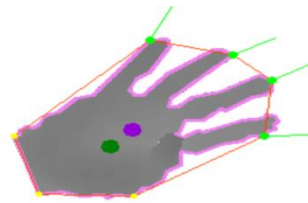
4. Fingertips Identification



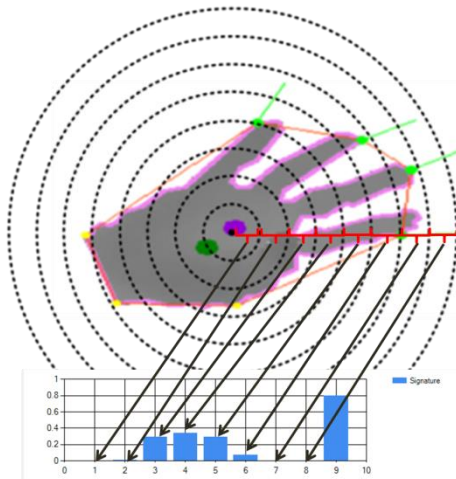
5. Identify Palm Center



6. Wrist Segmentation



7. Recalculate Centroid Position



8. Build hand signature



9. Identify signature

Time	0	1	2	3	4	5	6	7	8	9	10	11	12
Gesture	1	2	1	2	2	1	2	1	3	2	2	2	2

Sliding window: 2

10. Filter Using Sliding Window



Show Video



Outcome: API is available for download

OpenNI.org | About | News | Documentation | Download | Hardware | Sign up | Login | OpenNI.org | OpenNI Arena

OpenNI Arena
Applications | Developers | NI Apps Guidelines | Upload NI App | Contact Us

NI Apps | Developers | Upload NI App

Filters: with source code Trial/Demo NI Apps

Sort By: | Date | Popularity | Category | Rating | Developer

63 Results

App Name	Date	Developer	Category	# of downloads	Rating
SkiRangerGame	3/30/2012	OutpostStudios	Games	68	4 stars
Windows Mouse Cursor Control	3/22/2012	squirr3l	Utilities	111	4 stars
OpenNI Cocoa Sample App	2/13/2012	shain	Unclassifiable	142	4 stars

Featured Apps

- SnowBells (4 stars)
- ZenHero_v0.9.2 (4 stars)
- FuzzyPainter_v1.1 (4 stars)
- Boxing Trainer (4 stars)
- Skanelect (4 stars)

Latest Apps

- Windows Mouse Cursor Control (4 stars)
- SkiRangerGame (4 stars)
- Kinetriss (4 stars)
- OpenNI Cocoa Sample App (4 stars)

“Winect” is published on OpenNI Arena, a site for publishing depth sensing applications. Garnered 250 downloads in 2 weeks, with a 4 Stars rating.

Featured on 3rd party websites:

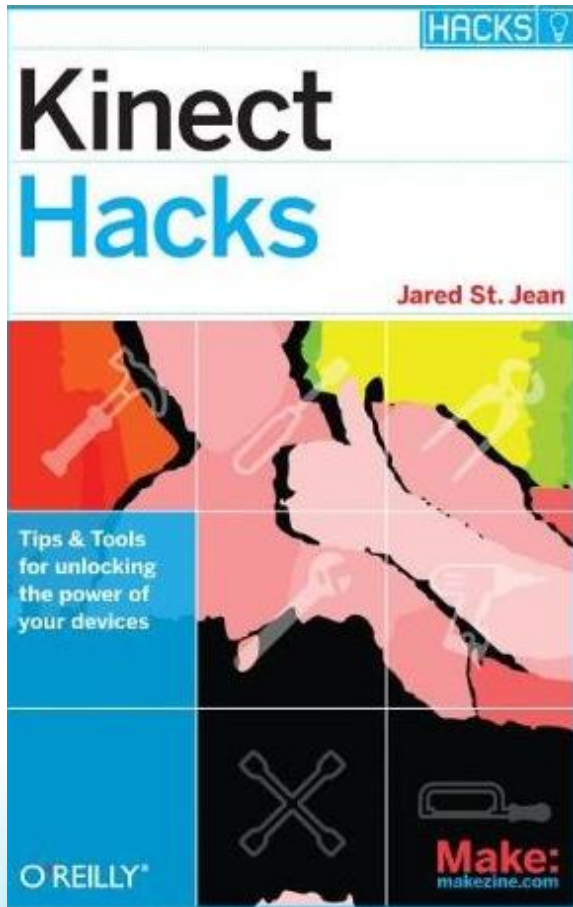
www.kinecthacks.com

www.developkinect.com

www.kinectasia.com



Outcome: API to be featured in a book



“Winect” is going to be featured in an upcoming book to be published by O'Reilly media.

The book consists of cool applications and do-it-yourself hacks for people to check out at home.

Jared St. Jean
developkinect.com



And

DemoFest

Asia Faculty Summit 2012

October 26–27, 2012 | Tianjin, China

	Microsoft Kinect technology, which enables users to fly kites inside and to help preserve, digitally, this aspect of our culture heritage that is on the verge of extinction.	University
31	A Hand Gesture API for Kinect We demonstrate “Winect,” an open-source API that uses the Kinect sensor’s depth camera to recognize a variety of hand gestures and additional low-level features, such as finger positions and hand orientation. We show several apps that use this API, including one that allows you to control the computer’s mouse cursor. Different gestures can be used to define the various mouse functions, such as right, left, and middle click. You can also use gestures to scroll through your screen. We also show how to use depth position and hand gesture together for various type of game play. The API is publically available .	Ho Kok Wei (Daniel), National University of Singapore



Come see our demo later today!
(Daniel Ho)



Project 3: Understanding “Bones”





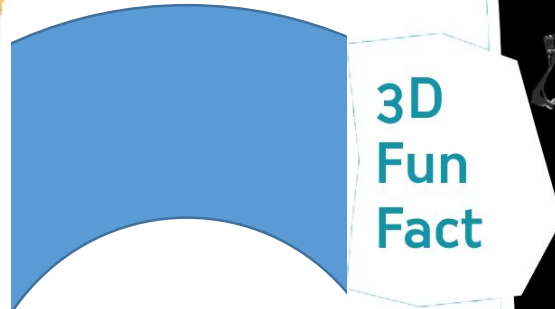
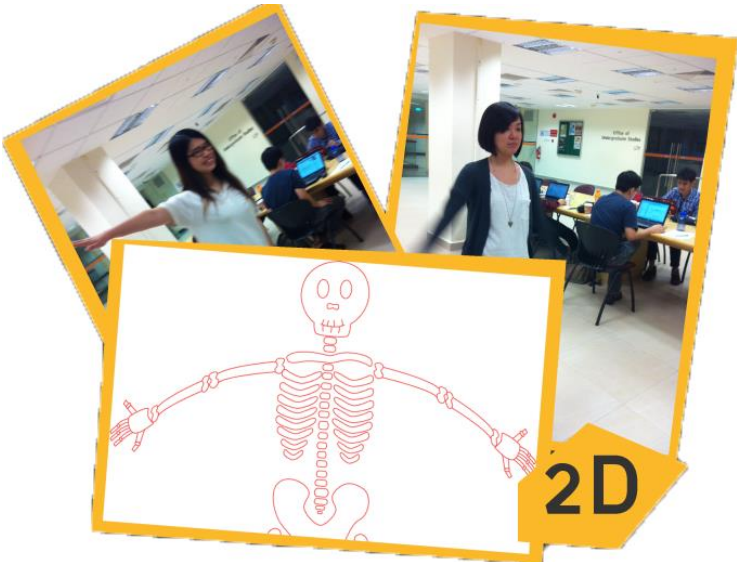
Design Project

- CS4201: Interactive Systems Project
 - Prof. Shengdong (Shen) Zhao
- “Understanding Bones” project
- Show cased at the Singapore Science Centre





Project 3: Understanding "Bones"





Show Video



Outcome of Project 3

- 492 users played the game!
 - Mostly aged 7-12
- Feedback was great!
- 83% of participants felt the exhibit was "impressive"
- 40% of the participants played multiple times



Project 4: “OpenHouse” Game

- NUS hosts an Open House to prospective students in March each year

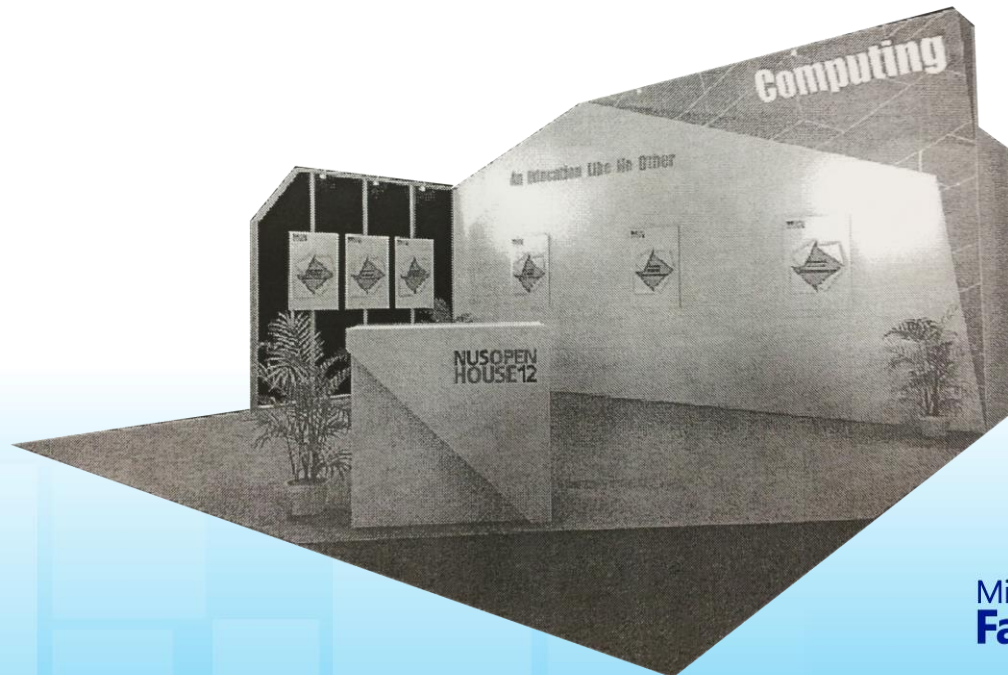
**NUS OPEN
HOUSE 12**





Project 4: “OpenHouse” Game

- SoC has a large booth that students can visit
- We wanted something to get peoples attention
- And that showed how “fun” computing can be . .





Kinect-Based Game

- Student designed a game for participants
- Items dropped and you had to catch as many as possible with your hands/feet

Stage 1:

Catch as many objects as you can
as they fall!

NUS





Installed at our OpenHouse Booth





Show Video



Outcome of Project 4

- Received a many positive comments from professors and potential students
- Project was center piece of the SoC booth
- 130+ Players, age's from 6 to 65





Concluding Remarks

- Kinect is a great resource for student projects
- Can facilitate various levels of learning
- Great for novel applications and demos



KINECT™
for Windows®

OpenNI™



OPEN KINECT



Microsoft Research Asia
Faculty Summit 2012



Recruitment using Kinect

```
BOOL CMymfc29BAuto::DisplayDialog()
{
    // TODO: Add your dispatch handler code here
    TRACE("Entering CMymfc29BAuto::DisplayDialog %p\n", this);
    BOOL bRet = TRUE;
    AfxLockTempMaps(); // See MFC Tech Note #3
    CWnd* pTopWnd = CWnd::FromHandle(::GetTopWindow(NULL));
    try
    {
        CPromptDlg dlg /*(pTopWnd)*/;
        if (m_vaTextData.vt == VT_BSTR)
        {
            // converts double-byte character to single-byte character
            dlg.m_strData = m_vaTextData.bstrVal;
        }
        dlg.m_lData = m_lData;
        if (dlg.DoModal() == IDOK)
        {
            m_vaTextData = COleVariant(dlg.m_strData).Detach();
            m_lData = dlg.m_lData;
            bRet = TRUE;
        }
        else
        {
            bRet = FALSE;
        }
    }
    catch (CException* pe)
    {
        TRACE("Exception: failure to display dialog\n");
        bRet = FALSE;
        pe->Delete();
    }
    AfxUnlockTempMaps();
}
```

Computer science is thought of as only programming. . .



Recruitment using Kinect

Kinect makes computing fun and tangible. . .





Thank You Microsoft!

