Perceptual Computing

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The Plan

• Overview of Perceptual Computing and where this is going

• Review of some of our experiences with using this technology and some of the lessons learned

• Introduction to the Perceptual Computing SDK itself code samples, demos, and technical look at the various frameworks
What Is *Perceptual* Computing?

• Bringing senses to the computer
What Is *Perceptual* Computing?

- Bringing senses to the computer
- Interact w/ technology like we interact w/people
What Is *Perceptual* Computing?

- Bringing senses to the computer
- Interact w/ tech like we interact w/ people
- Perceiving is becoming aware through sensing
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- Extending our computing capabilities with sense-driven awareness
What Is *Perceptual* Computing?

- Bringing senses to the computer
- Interact w/ tech like we interact w/ people
- Perceiving is becoming aware through sensing
- Extending our computing capabilities with sense-driven awareness
- Understanding our conditions and motivations on our terms and acting accordingly
Sensing

• Isn’t new
Sensing

• Isn’t new, but it’s getting MUCH better

• People
  – Active
  – Passive
Sensing

• Isn’t new, but it’s getting MUCH better

• People
  – Active
  – Passive

• Environments
  – Local context
  – Local conditions
Making Sensed Data Meaningful

• Capture information about the world
Making Sensed Data Meaningful

• Capture information about the world
• Process that data into useful forms
Making Sensed Data Meaningful

• Capture information about the world
• Process that data into useful forms
• Combine with relevant relational data for richer context specific processing
Making Sensed Data Meaningful

• Capture information about the world
• Process that data into useful forms
• Combine with relevant relational data for richer context
• Process for automatic applications or feedback to the user
• for interactive experiences
A Look at the Future from 50,000 Feet

• Machines that sense
A Look at the Future from 50,000 Feet

• Machines that sense
• Ambient computing
  – Wearable
  – Environmental
  – Relational
  – Contextual
A Look at the Future from 50,000 Feet

- Machines that sense
- Ambient computing
- Intensification of direct interaction computing
  - High fidelity
  - Multi-dimensional
  - Multi-sensual
  - Adaptive
  - Personalized
  - Automated
  - Context-aware
A Look at the Future from 50,000 Feet

- Machines that sense
- Ambient computing
- Intensification of direct interaction computing
- Unplugged
  - Machines from peripherals
  - Machines from networks
  - Us from fixed location computing
  - Us from unnecessary data entry using antiquated, high-demand interfaces
Perceptual + Social + Contextual + Automatic

• Allowing us to be people again
  – without sacrificing convenience
Perceptual + Social + Contextual + Automatic

• Allowing us to be people again
• Making machines and software that work with us
  – specific individuals and communities in specific contexts automatically
Perceptual + Social + Contextual + Automatic

- Allowing us to be people again
- Making machines and software that work with us
- Gaining more power while doing less
  - And doing it in ways that integrate elegantly into our non-computing experiences
Some of You are Thinking

• This won’t affect my field, my colleagues, my business, my practice
Some of You are Thinking

• This won’t affect my field, my colleagues, my business, my practice

• This requires experts with skills or knowledge that I don’t have
Some of You are Thinking

• This won’t affect my field, my colleagues, my business, my practice
• This requires experts with skills or knowledge that I don’t have
• I’m not the right person to get involved with this stuff
Some of You are Thinking

• This won’t affect my field, my colleagues, my business, my practice
• This requires experts with skills or knowledge that I don’t have
• I’m not the right person to get involved with this stuff
• I can’t do any of this
So What?

• What does this mean to you?
  – We’re ALL going to be affected deeply by these developments
    – Professionally
    – Personally in our daily lives
So What?

• What does this mean to you?

• This IS happening
  – One day (sooner than we always think), you will look around you and wonder
    – when it all started to change
    – when your world became less constrained
    – more aware
    – more automatically relevant and immediately accessible
So What?

• What does this mean to you?
• This IS happening
• It’s being made for people with skills very much like your own
So What?

- What does this mean to you?
- This IS happening
- It’s being made for people with skills very much like your own
- It’s being made by people with skills very much like your own
Intel’s Part in this Puzzle

• Our first wave of perceptual devices for a broad audience go to market this summer
  – Developers already have devices and the Perceptual Computing SDK is available for download
Intel’s Part in this Puzzle

• Our first wave of perceptual devices for a broad audience go to market this summer

• Such devices will come embedded in multiple form factors of devices next year
Intel’s Part in this Puzzle

- Our first wave of perceptual devices for a broad audience go to market this summer
- Such devices will come embedded in multiple form factors of devices next year
- There is much more coming
Right Now

• Applications are being built right now
Right Now

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• Tools for your field (by your colleagues and competitors) are being imagined, designed, and constructed right now
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• Students in colleges are making this stuff right now
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- Students in colleges are making this stuff right now
- New programs to prepare creators to envision and realize tools, applications, and entertainment using these technologies are being created right now
Right Now

• Applications are being built right now
• Tools for your field (by your colleagues and competitors) are being imagined, designed, and constructed right now
• Students in colleges are making this stuff right now
• New programs to prepare creators to envision and realize tools, applications, and entertainment using these technologies are being created right now
• Ongoing research is producing new solutions and opportunities right now
Thinking And Designing Perceptually
The Changing Space

Real payoff: Branches and loops

```c++
.get
string
read( string file, string suffix ) {  
istream fi = open(file).get();  
string ret, chunk;  
while( (chunk = fi.read().get()).size() )  
   ret += chunk + suffix;  
return ret;
}
.then
.task<string>
read( string file, string suffix ) {  
return open(file)
.task[=](istream fi) {  
   auto ret = make_shared<string>();  
   auto next = make_shared<function<task<string>>>()>>([=] {  
      fi.read()  
.task[=](string chunk) {  
         if( chunk.size() ) {  
            *ret += chunk + suffix;  
            return (*next());
         }  
      return *ret;
     });  }
   return (*next());
});
```
The Changing Space
The Changing Space
Moving Forward

“Prove Something Works, Rather Than Proposing It Doesn’t”
Moving Forward

• Technology Is A Given
• Demos Are Easy
• But Neither Of These By Themselves Really Drive Awareness
• Most People Actually CAN’T “See Where We Might Go With This” (No, It’s Not Just For Games)
Moving Forward

• We All Know How To Implement Research Papers
• We Need To Get Better At Telling Stories
• What and Why > How
The Perceptual Approach: Why?

• What Is The Need Or Want?
• Is This An Actual Use Case?
• Would I Want Or Use This?
The Perceptual Approach: What?

THESE ARE NOT GOOD EXPERIENCES!!!
The Perceptual Approach: How?
The Perceptual Approach: How?

• Start Small And (Somewhat) Known
• Don’t Solve Unsolved (Not Unsolveable) Issues (Yet)
• Evaluate If Each Target Fits Your Story
The Perceptual Approach: How?

• “Take A Look Around”
• Prevent “Shoehorning” By Finding Real World Analogs
• If No Analog Exists, Is There An “<n> Percent”?
The Perceptual Approach: How?

• “Sweat The Small Stuff If It Matters”
• Presentation > Implementation
• Technology Only Matters In However It Supports The Experience
The Perceptual Computing SDK
SDK Features

• Video Capture
  – RGB (VGA and HD)
  – Depth
  – Blobs
  – IR/Confidence
SDK Features

• User Tracking
  – Hand Detection
  – Finger Detection
  – Detection
  – Gesture Detection
SDK Features

• User Tracking
  – Face Detection
    – Face Location Detection
    – Face Feature Detection
    – Face Recognition
SDK Features

• Voice and Speech
  – Dictation
  – Command/Control
  – Text-to-Speech
Programming Language and Framework Support
Programming Language and Framework Support

• C++, C#, Java

• Supported Frameworks
  – processing
  – openFrameworks
  – Unity
  – Havok
  – Total Immersion AR
Programming Language and Framework Support

• Unsupported but Verified
  – Cinder
  – OGRE
  – XNA / Monogame
  – Bullet Physics
Resources

• Perceptual Computing Forums

• Perceptual Computing IDZ Portal
  – http://intel.com/software/perceptual
  – Download SDK, Human Interface Guidelines, and Documentation

• Github
  – http://github.com/IntelPerceptual
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