Wearable Computing

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Purpose

- Wearable Computer Interface
- Real-Time Hand Gesture Recognition
- Intuitive Design
- Health Monitoring System
Agenda

- Introduction to wearable computing
- Sensor possibilities
- User Interface
- A few technical details
- Demonstration
- Future possibilities
- Budget
- Individual Assignments
Wearable Computing

- Accessibility
- Portability
- Interaction
- Physical Environment
- Personalize the Computer
Vitals sensing

- Health monitoring
  - Heart Rate Monitor
  - Accelerometer
  - Pulse Oximeter
- Allows the user constant access to sensor data
- Information can be streamed to your doctor so they have real-time health statistics
Graphical User Interface

- User Interface
  - Hardware and Software
  - Controlling a GUI with gestures
  - What gestures are intuitive?
  - Simple navigation
GUI
private void UpdateMarkerBlue(object sender, MarkerEventArgs args)
{
    if (!args.EventData.Present)
        return;
    drawRectangle();
    if (currentApp == app.home)
    {
        bool nullSpot = false;
        MarkerEventData data = args.EventData;
        _xm = (int)data.X;
        _ym = (int)data.Y;

        // Translate x & y coords to have an origin of the image center, and flip Y
        int x = (int)(data.X - _captureWidth / 2);
        int y = (int)(_captureHeight / 2 - data.Y);

        // Is the marker in our null region?
        if (_nullZone.Contains(new Point(x, y)))
        {
            //NULL CENTER
            nullSpot = true;
            reset = true;
        }
    }

    if (nullSpot)
    {
        // Get the angle of the point from the center
        // angle = E = 0, W = 180(cw)//180(cw)
        int angle = (int)(Math.Atan2(y, x) * 180 / Math.PI);

        // Compare the angle with the diagonals and change the snake direction, ignore double-backing
        if (angle < _angleSW || angle >= _angleNE)
        {
            //LEFT
            if (selected == 0 & & reset)
            {
                radioList[--selected].Selected();
                appDescription.Text = appDescriptionsList[selected];
                iconPictureBox.Image = new Bitmap(icons[selected]);
                reset = false;
            }
            else if (angle < _angleSE)
            {
                //Down
            }
            else if (angle < _angleNE)
            {
                //Right
                if (selected < 4 & & reset)
            }
            else if (angle < _angleNW)
            {
                //Up
            }
        }
    }
}
Speed Bumps

- Color Detection
- Price of Components
- Webcam Properties
- Projector Properties
- Programmatically accessing devices
Future for our project

- Adding support for four-finger gestures
  - Enables more complex hand gestures to be recognized
- Adding sensors
  - Accelerometer, heart rate monitor and pulse oximeter
- Scaling down
  - Smaller wearable design
  - Smart phone or tablet
  - More power efficient algorithms
# Budget

<table>
<thead>
<tr>
<th>Expenses</th>
<th>Purchased</th>
<th>Future</th>
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<tbody>
<tr>
<td>Web Cam</td>
<td>$80</td>
<td></td>
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<tr>
<td>Pocket Projector</td>
<td>$130</td>
<td></td>
</tr>
<tr>
<td>Heart Rate Monitor</td>
<td>$100</td>
<td></td>
</tr>
<tr>
<td>Accelerometer</td>
<td>$40</td>
<td></td>
</tr>
<tr>
<td>Pulse Oximeter</td>
<td>$50-$100</td>
<td></td>
</tr>
<tr>
<td>Wireless Interface</td>
<td>$50-$100</td>
<td></td>
</tr>
<tr>
<td>Smart Phone</td>
<td>$300</td>
<td></td>
</tr>
<tr>
<td>Tablet PC</td>
<td>$150-$200</td>
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**Total** $310 $440

## Funding

<table>
<thead>
<tr>
<th>Funding</th>
<th>Total</th>
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<tbody>
<tr>
<td>ECE Project Budget</td>
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<tr>
<td>IEEE Mini Grant</td>
<td>$500</td>
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**Total** $800
Individual Assignments

- **Nick**
  - Graphical User Interface
  - Implementing more in depth hand gesture recognition
  - Researching wireless communication techniques to move our project into the wireless world

- **Ethyn**
  - Researching which sensors to add to our system
  - Interfacing our system with these sensors as well as which algorithms to use for data collection, storage and analysis
In summary

- Wearable computer interface enables access to information “on-the-fly”
- Portable computer with the ability to track health status and activity.
- Fun and exciting way to access the digital world.
Questions?