

# FICTION OR REALITY

GESTURE CONTROL AND  
THE NEXT WAVE OF 3D CAMERAS



THOMAS ENDRES

JAVA ONE |

SAN FRANCISCO |

MARTIN FOERTSCH

PARROTONJAVA.COM

# Science Fiction Visions

## Minority Report (2002)



# Agenda

- History
- State of the Art
- Code & Technology
- Areas of Application
- Conclusion

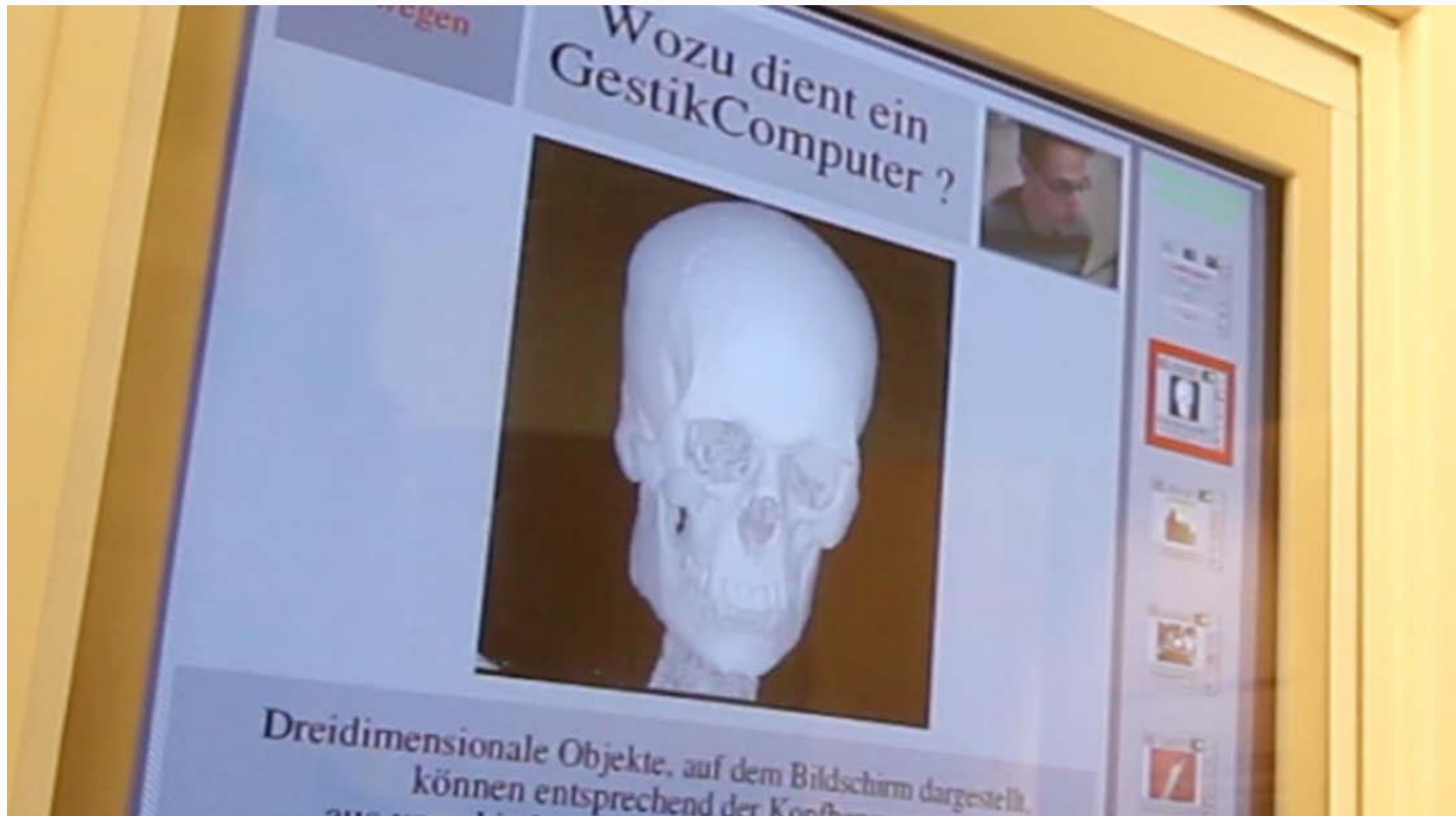
# Native Interface History

## Silicon Graphics IndyCam (1993)



# Native Interface History

Silicon Graphics IndyCam - Siemens Software (1995)



# Native Interface History

Silicon Graphics IndyCam - Siemens Software (1995)



# Native Interface History

## Wii Remote (2006)



# Native Interface History

Oblong Industries G-Speak (2008)





# Native Interface History

Kinect for Windows PC (2012)



# State of the Art

Leap Motion (2013)



LEAP  
MOTION

# State of the Art

## Leap Motion disassembled



# State of the Art

## Leap Motion - Visualizer

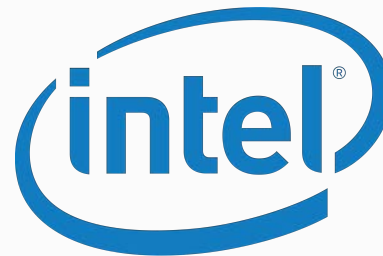


# State of the Art

Creative Gesture Camera (Senz3D) (2013)

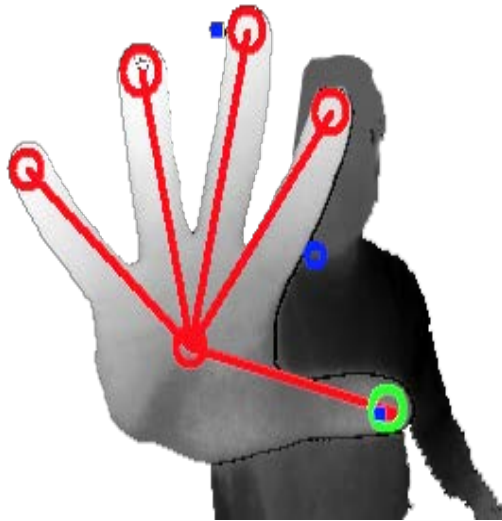


CREATIVE®



# State of the Art

RealSense - Visualizer



# Native Interface History

Thalmic Labs Myo Wearable Gesture Control (2013)



# State of the Art

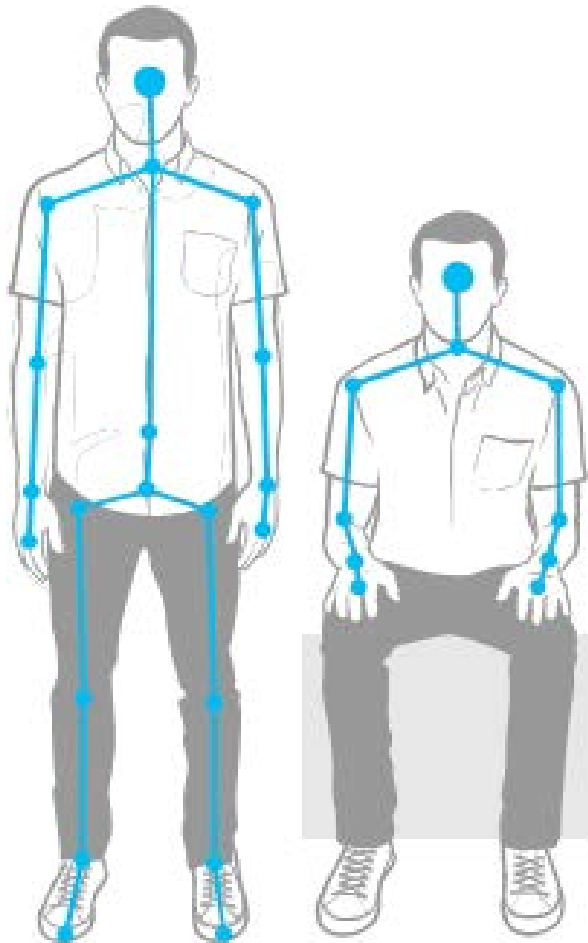
Kinect 2 (2014)





# State of the Art

## Kinect 2 - Visualizer

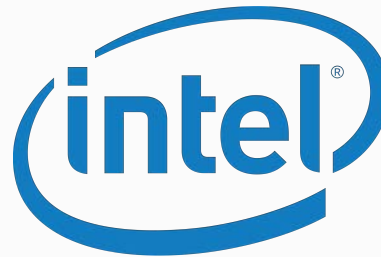


# State of the Art

## Intel RealSense Camera

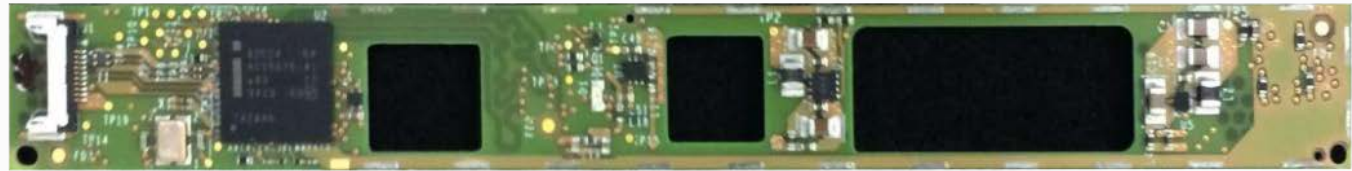


CREATIVE®



# State of the Art

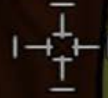
## Intel RealSense Camera



0:18

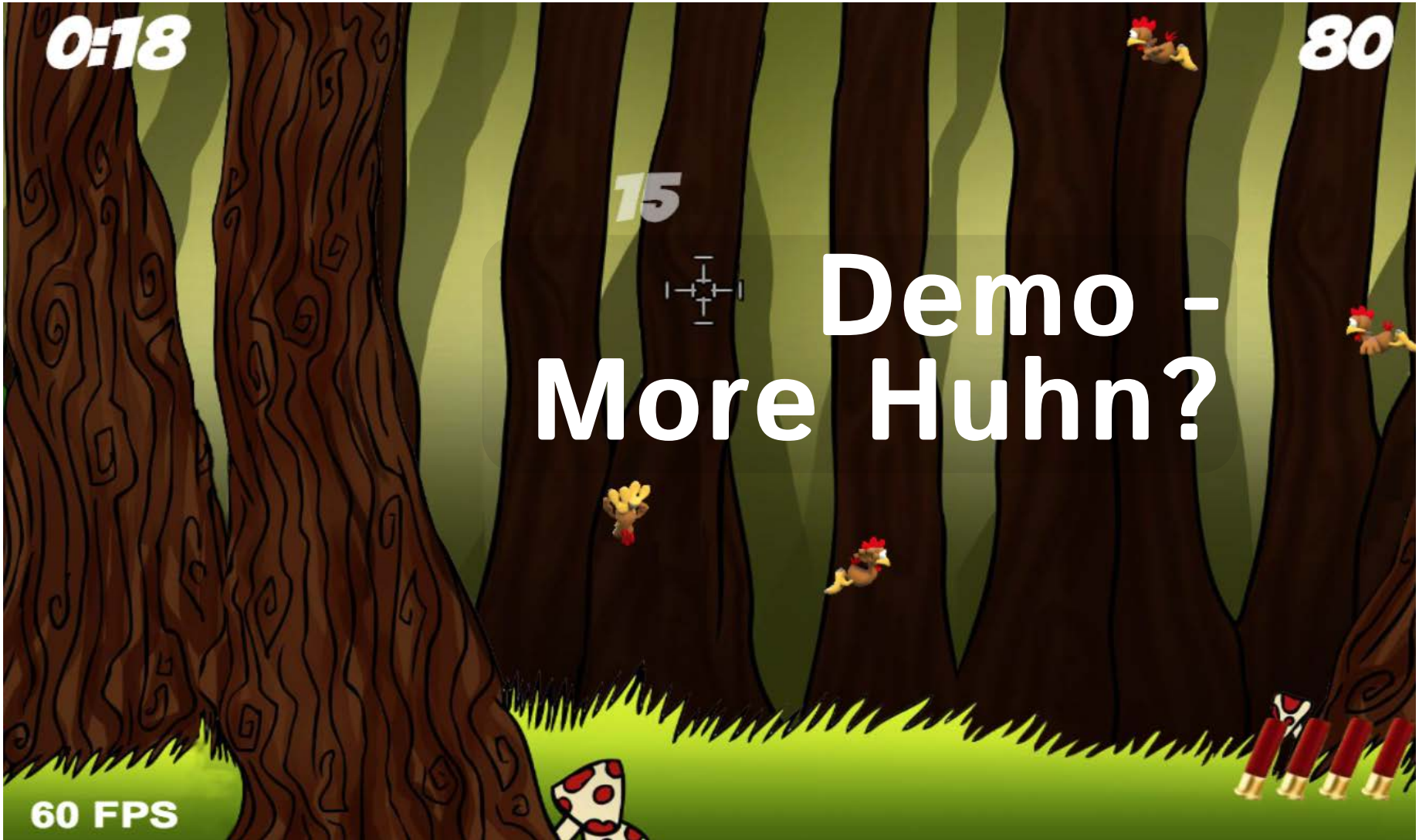
80

15



# Demo - More Huhn?

60 FPS



# Code & Technology

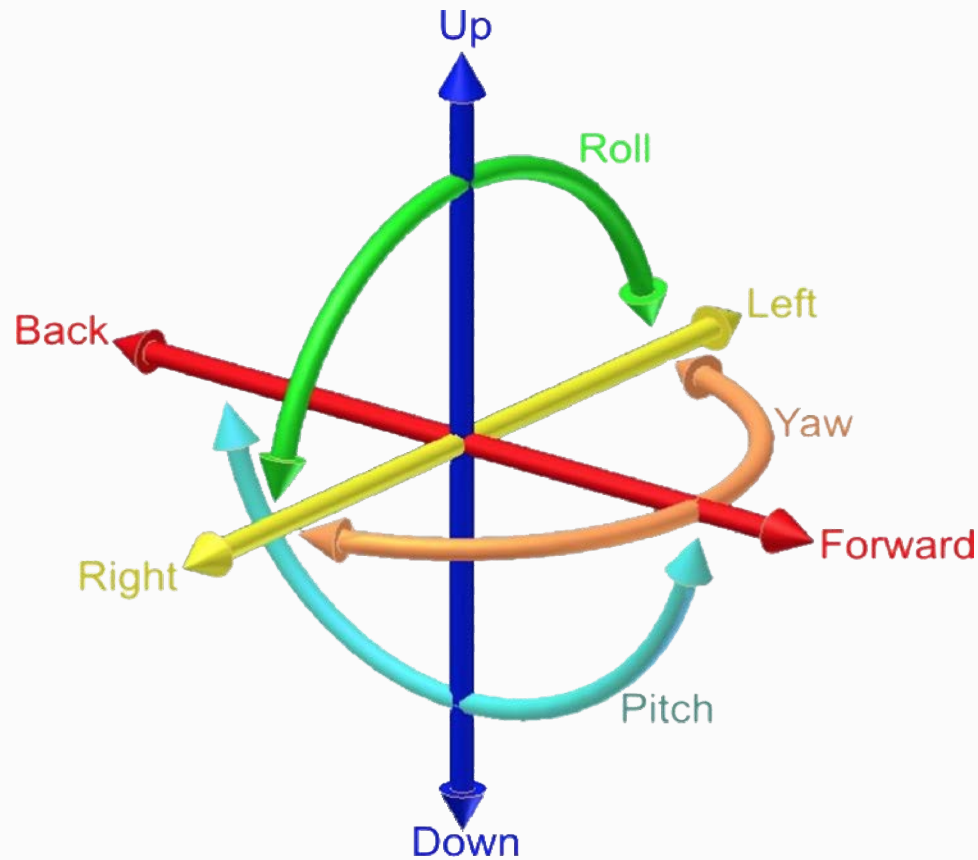
Show me some code

```
var controller = new Leap.Controller(  
    {enableGestures: true});  
  
controller.loop(function(frame) {  
    console.log(frame.gestures);  
})  
  
controller.connect();
```



# Code & Technology

## Six degrees of freedom



# Demo

## AR.Drone & RealSense



# Code & Technology

Show me some code

```
public class PerceptualPipeline extends PXCUPipelineJNI { }

public void printGesture() {
    PerceptualPipeline pipeline = new PerceptualPipeline();
    pipeline.AcquireFrame();

    PXC Gesture gesture = new PXC Gesture();
    pipeline.QueryGesture(PXC Gesture.LABEL_ANY, gesture);

    pipeline.ReleaseFrame();
    System.out.println(gesture.label);
}
```

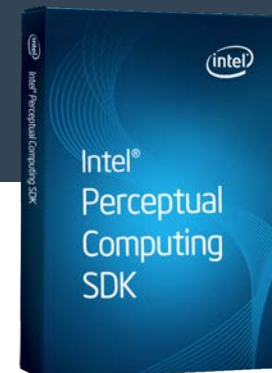




# Code & Technology

## Show me some code

```
PerceptualController controller =  
    PerceptualController.buildPerceptualController();  
controller.connect();  
  
controller.addDetectionListener(DetectionType.HANDS,  
    new DetectionListener<Hands>() {  
    public void onDetection(HandsDetectionData data) {  
        System.out.println(data.getLeftHand().getCoordinate().toString());  
    }  
});  
  
// ...  
  
controller.disconnect();
```



A Leap Motion Synthesizer is a black MIDI controller with a red base and a white keyboard. It features a central LCD screen and numerous knobs and buttons for sound manipulation. The device is shown from a three-quarter perspective, casting a soft shadow on the white surface below it.

# Demo

# Leap Motion Synthesizer



# Code & Technology

## Show me some code

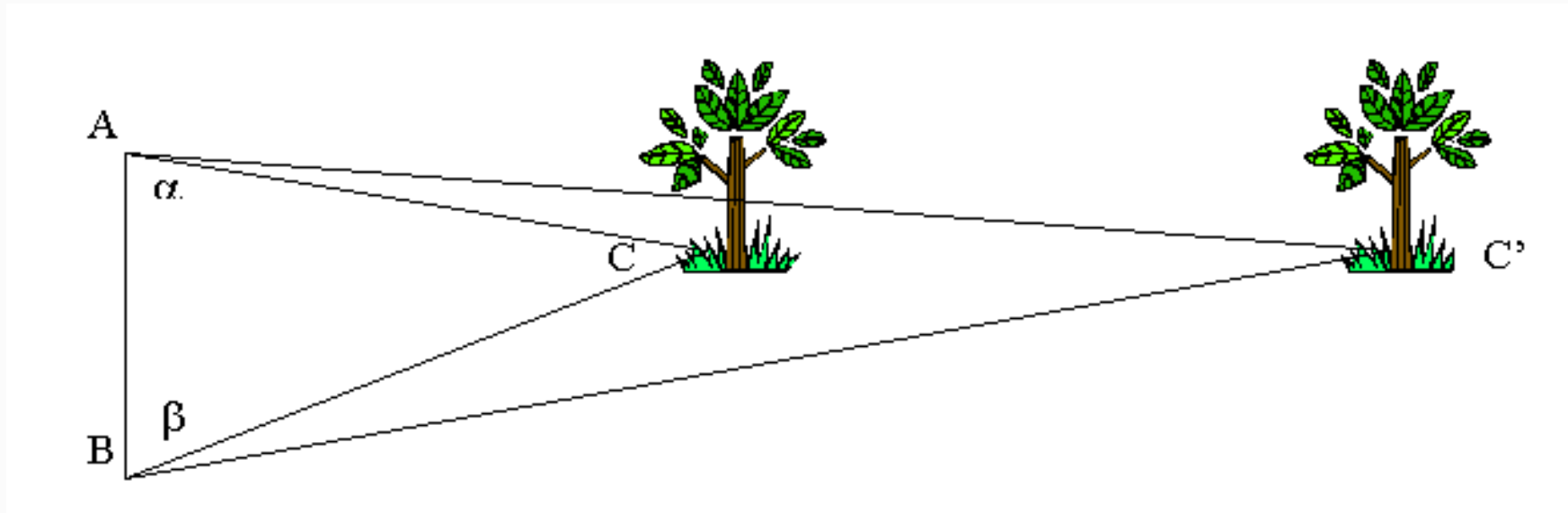
```
public class LeapMotionListener extends Listener {
    public void onFrame(Controller controller) {
        Frame frame = controller.frame();
        if (!frame.hands().isEmpty()) {
            // Get the first hand
            Hand hand = frame.hands().get(0);

            // Get the hand's normal vector and direction
            Vector normal = hand.palmNormal();
            Vector direction = hand.direction();

            float handHeight = hand.palmPosition().getY();
            float handPitch = direction.pitch();
            float handRoll = normal.roll();
        }
    }
}
```

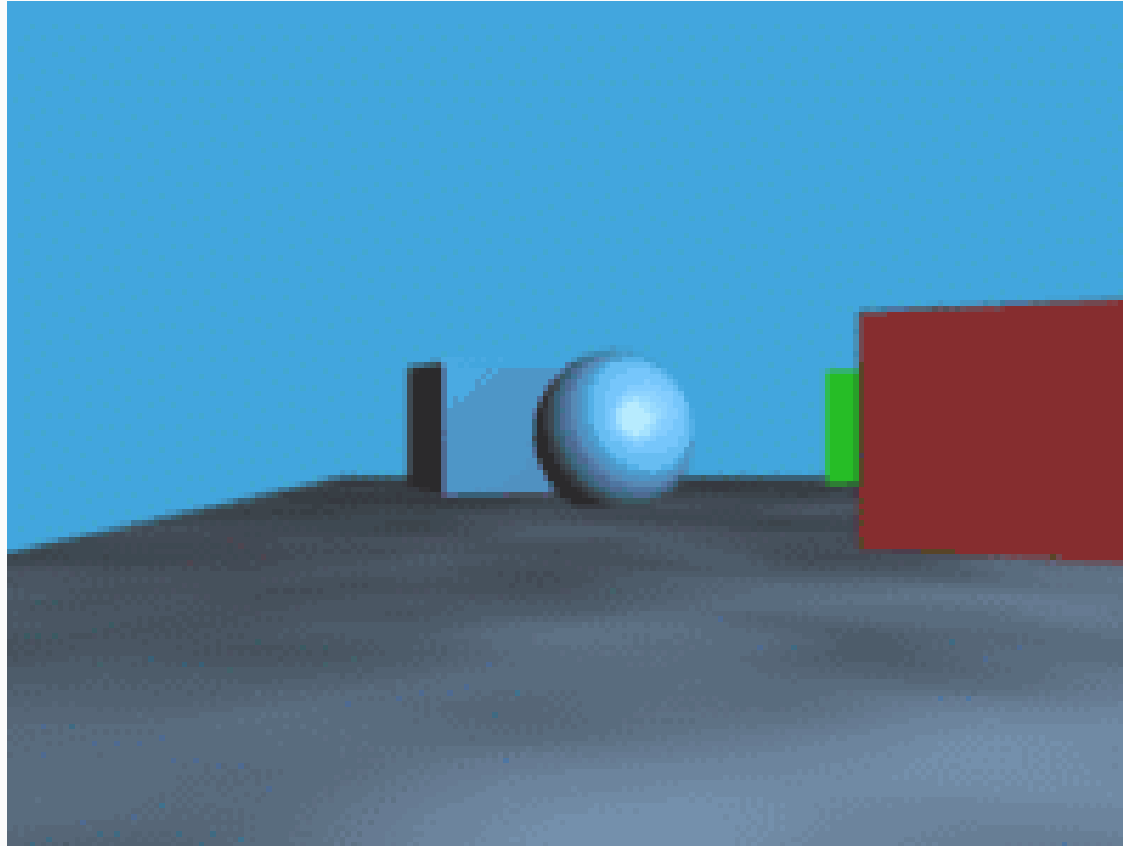
# Code & Technology

## Parallax



# Code & Technology

## Parallax Scrolling



# Code & Technology

## Speckle Pattern



1. Audrey Penven, <http://www.flickr.com/photos/audreypenven/5198633419/> (<http://audreypenven.net/portfolio/dancing-with-invisible-light/>)

A man in a blue hoodie stands in a modern, multi-level atrium, gesturing towards a mobile robot on the floor. The robot is a circular, black, three-wheeled device with a camera mounted on top. The background shows a large, open-plan space with multiple levels, glass railings, and a polished floor. The text "Demo" is overlaid in the upper right corner.

Demo

AR.Drone &  
Kinect v2

# Code & Technology

## Show me some code

```
public void Init(KinectSensor kinectSensor) {
    BodyFrameReader bodyReader = kinectSensor.BodyFrameSource.OpenReader();
    bodies = new Body[kinectSensor.BodyFrameSource.BodyCount];

    bodyReader.FrameArrived += BodyFrameArrived;
}

private void BodyFrameArrived(object sender,
                               BodyFrameArrivedEventArgs bodyFrameEvent) {
    BodyFrameReference frameReference = bodyFrameEvent.FrameReference;
    BodyFrame frame = frameReference.AcquireFrame();

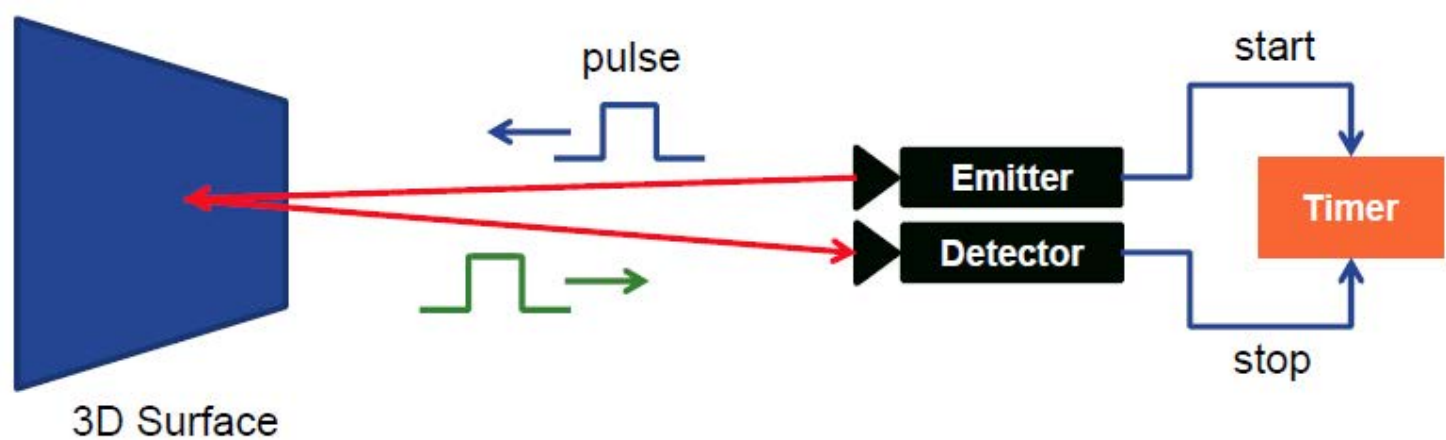
    using (frame) {
        frame.GetAndRefreshBodyData(bodies);
        // ...
    }
}
```





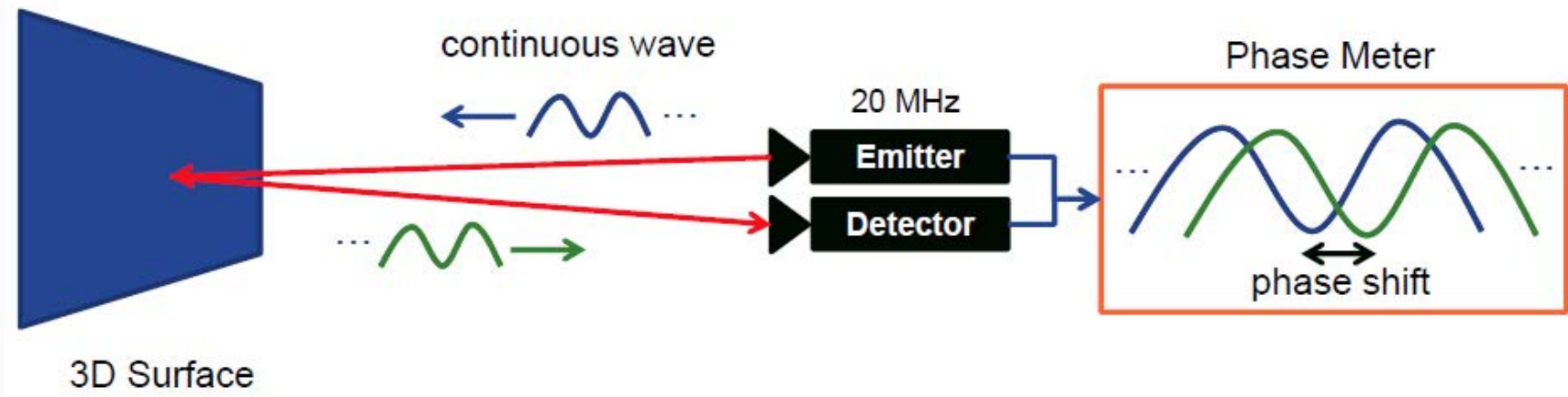
# Code & Technology

## Time of Flight (pulsed)



# Code & Technology

## Time of Flight (continuous wave)



# Areas of Application

Within consumer electronics (SmartTV)



# Areas of Application

Within consumer electronics (e.g. gaming consoles)



# Areas of Application

Within smart phones



# Areas of Application

LEAP 

## Within presentations (1)



# Areas of Application

LEAP 

## Within presentations (2)



# Areas of Application

## In medical engineering





# Areas of Application

Integrated in laptops and tablets



# Dont's

If conditions are security relevant



# Don't's

If efficiency suffers



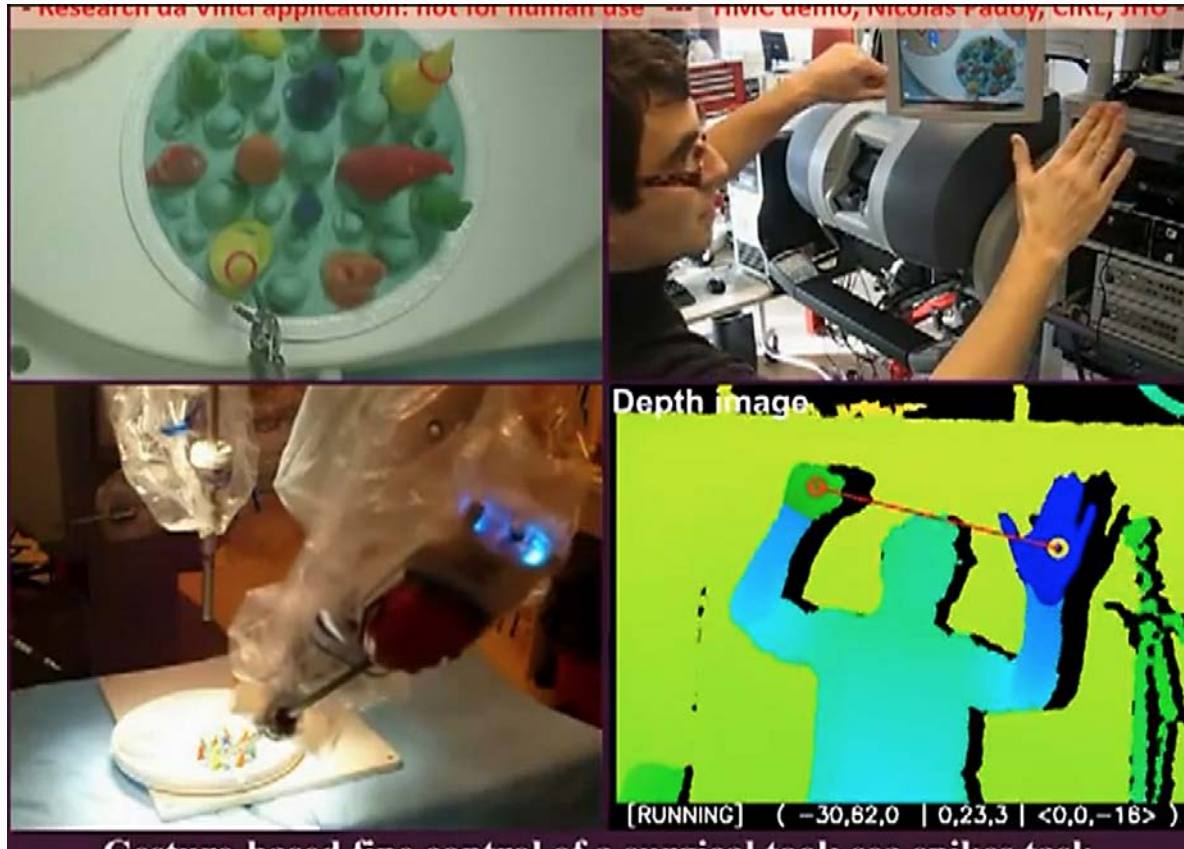
# Future and Visions

Hyundai HCD-14 Genesis Concept Interior Demo (2013)



# Future and Visions

## Remote Surgery



# Conclusion

A new trend reaching more and more users



# Conclusion

Simplicity of a button is a unsurpassed



# Conclusion

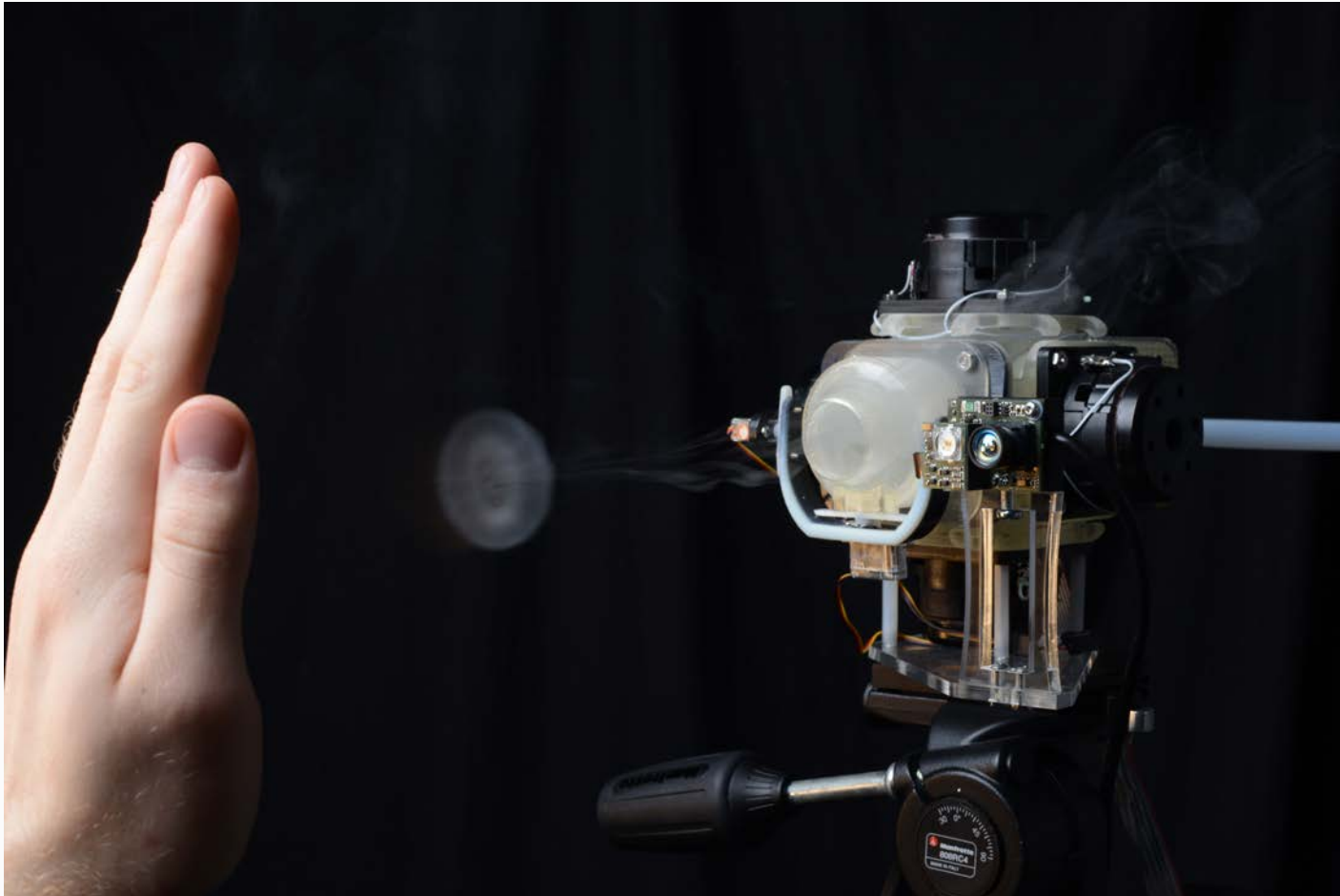
Haptic perception is missing





# Conclusion

Disney Research Aireal



# Conclusion

Keep it simple - use natural gestures



# Q&A



Dipl. Inf. (FH) Martin Förtsch

[martin.foertsch@gmail.com](mailto:martin.foertsch@gmail.com)



Dipl. Inf. (TU) Thomas Endres

[thomas-endres@gmx.de](mailto:thomas-endres@gmx.de)

<http://parrotsonjava.com/>