

Innovative Interaction Using WiiMotes and Python

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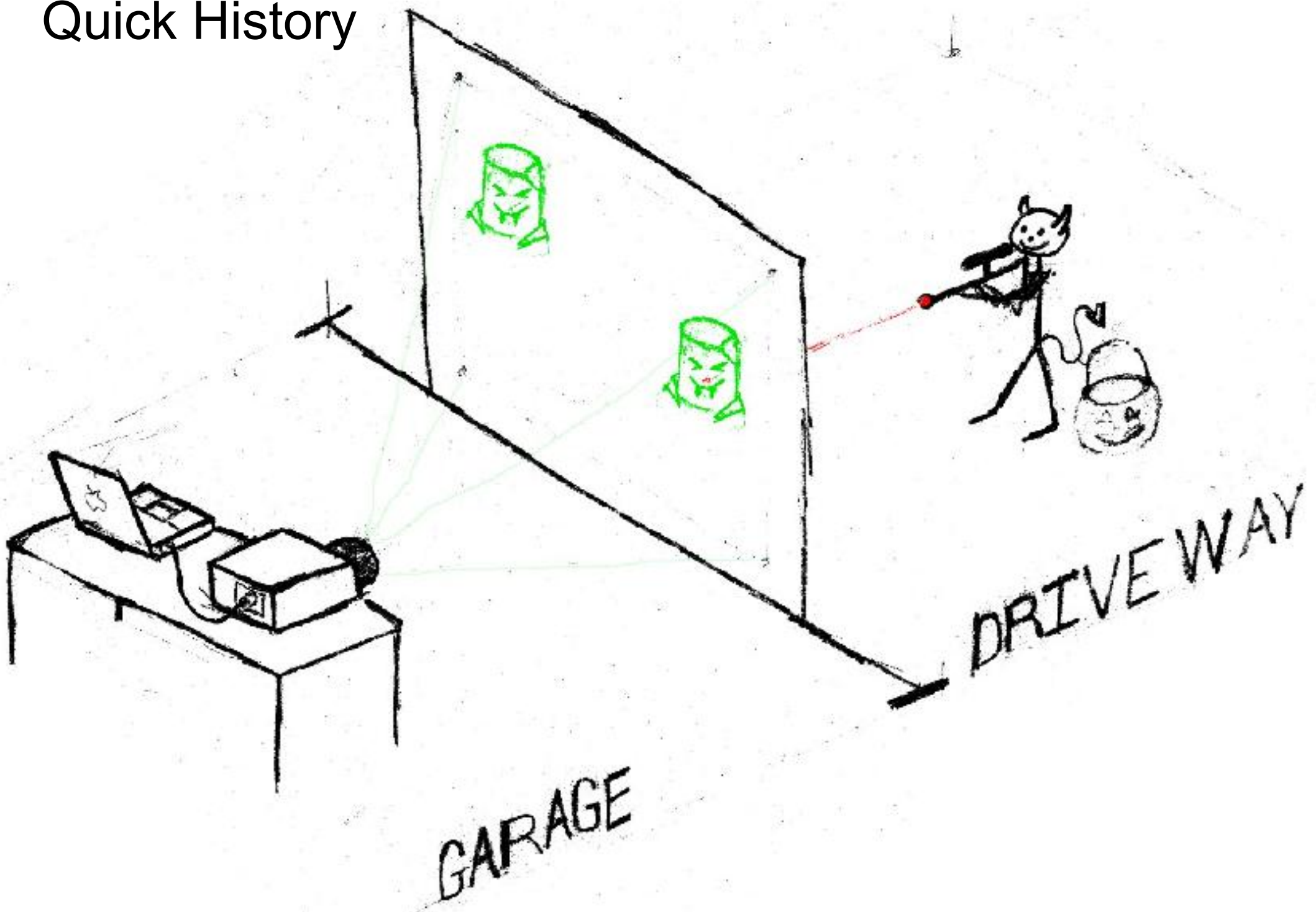
Projects at:
blog.insightvr.com

Agenda

More Concept than Code

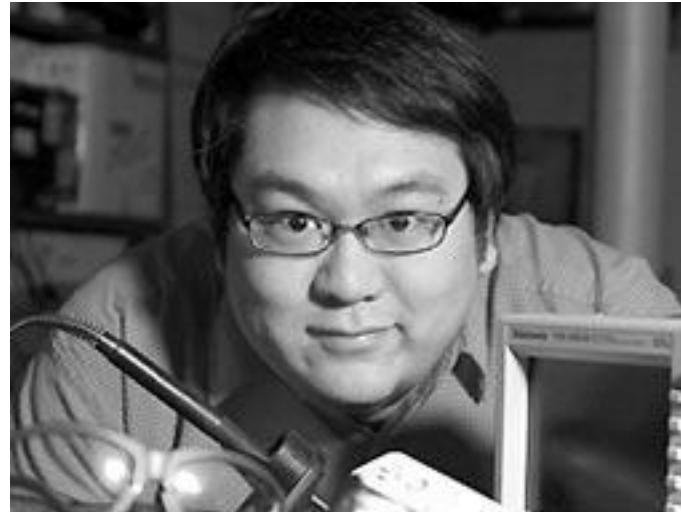
- Intro to wiiMote
- Building a Sensor Bar - Pointing Demo
- Building IR Glasses - Point of View Demo
- Headtracking Concepts
- Combined Demo
- Wand Demo
- Proposal
- Resources

Quick History



How To Get More Interaction?

- Johnny Lee wiiMote hacks
- <http://johnnylee.net/projects/wii/>
- <http://youtube.com/watch?v=Jd3-eiid-Uw>
- Note the power of putting your research on YouTube...



wiiMote

- Traditional controls:
 - thumbpad
 - buttons
 - trigger
- Bluetooth
- Accelerometers
- IR Webcam w/
hardware tracking of
up to 4 infrared points



“Sensor” bar



- Bar doesn't sense anything
- Just a couple of IR LEDs that the wiiMote “sees”

Confession

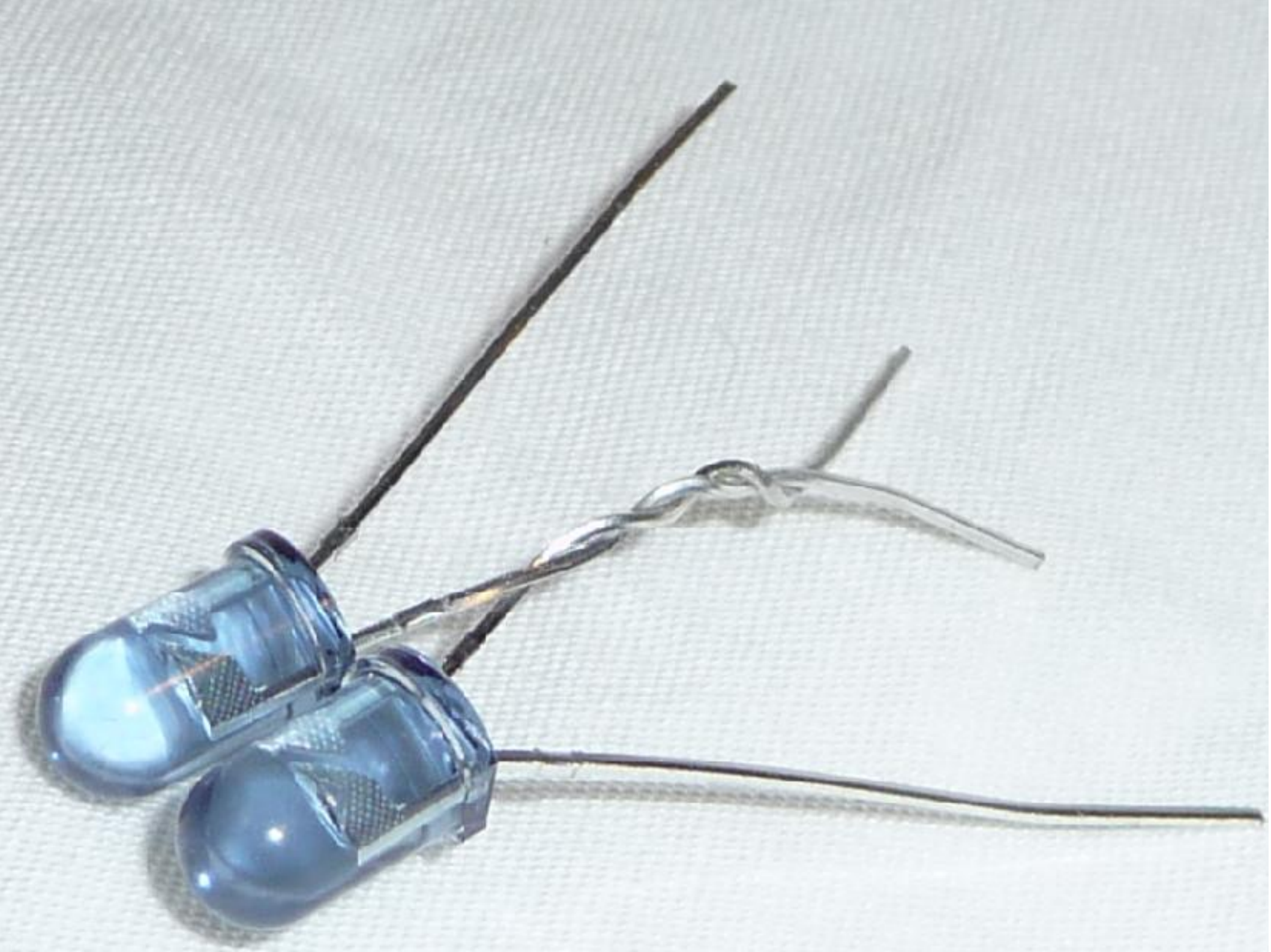
- I don't own a wii.
- Therefore I don't own a sensor bar.

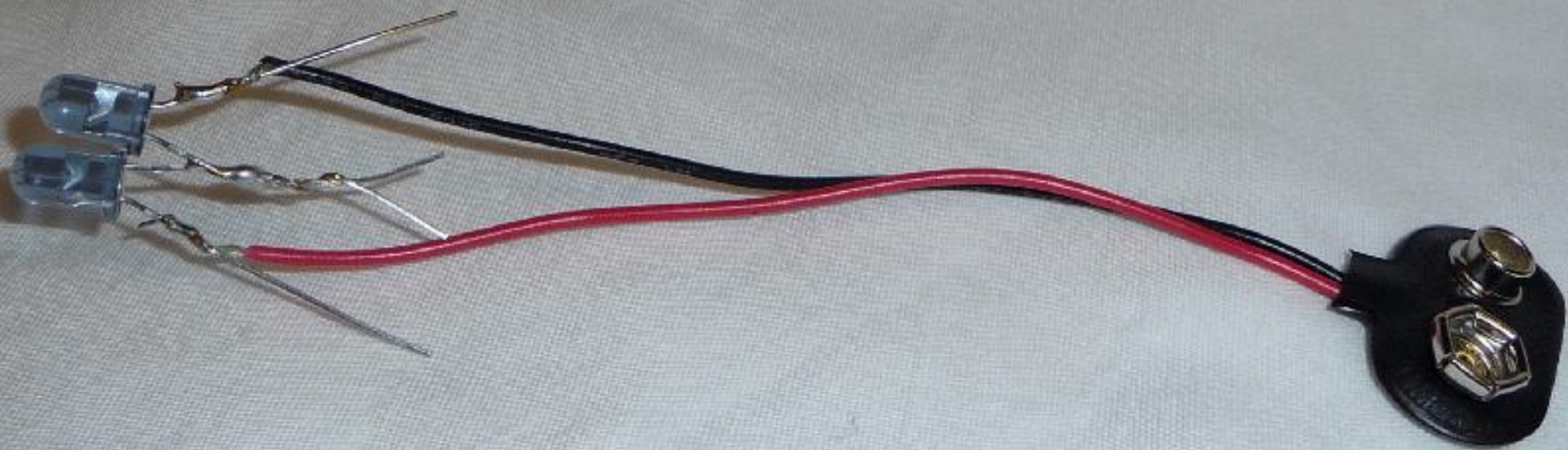
Build Your Own Sensor Bar



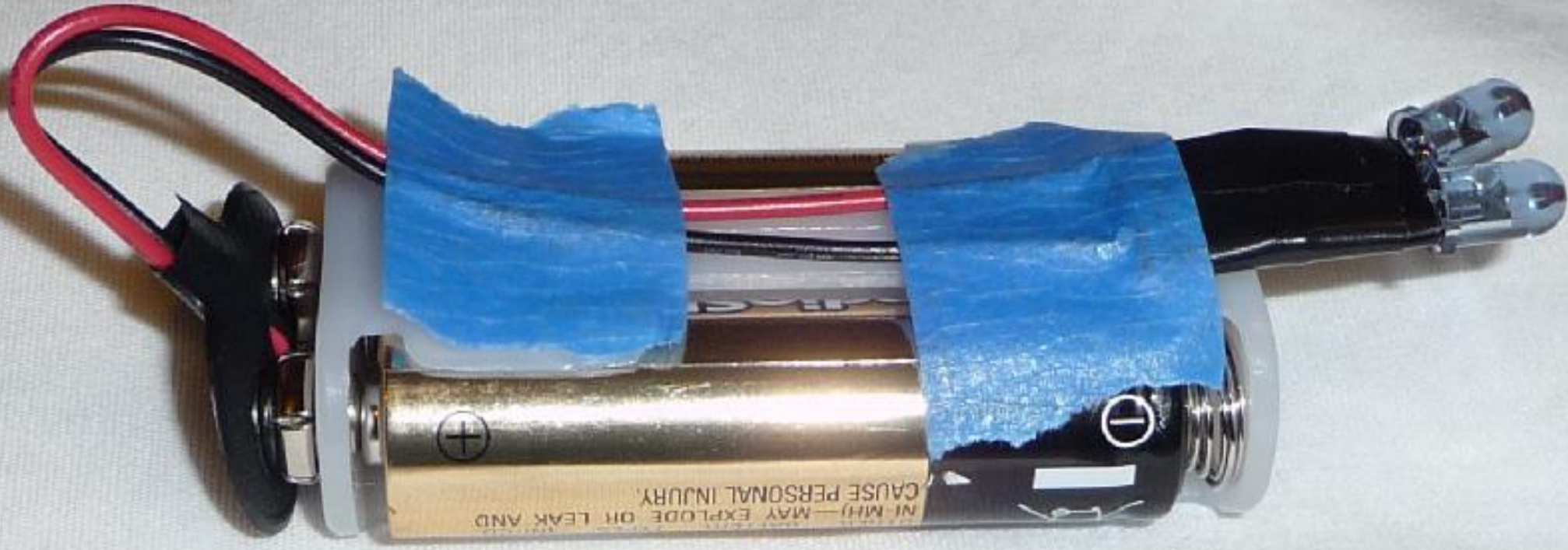


Flat side
goes to black
wire.









NI-MH—MAY EXPLODE OR LEAK AND
CAUSE PERSONAL INJURY.

+

-

Does My Sensor Bar Work?

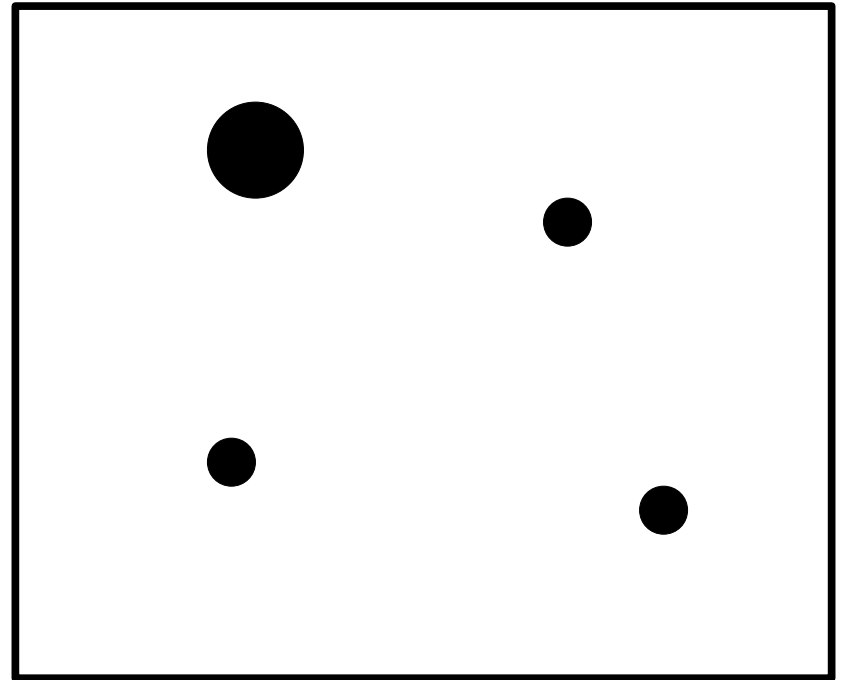
- Hard to tell since you can't see IR light.
- Point a web cam or cell phone camera at it.
- Or use something like DarwiinRemote.





Infrared Web Cam

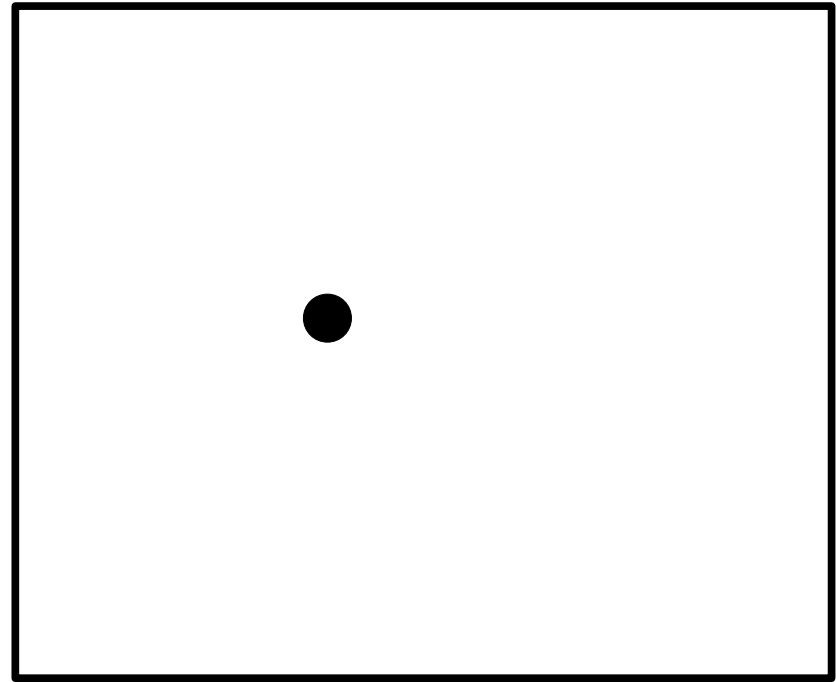
- Doesn't send images
- Gives coordinates and intensity of up to four points
- 100 fps – limited by Bluetooth
- 1024 x 768 resolution
- IR only is due to filter which can be removed
- 940nm LEDs work best



What it “sees”

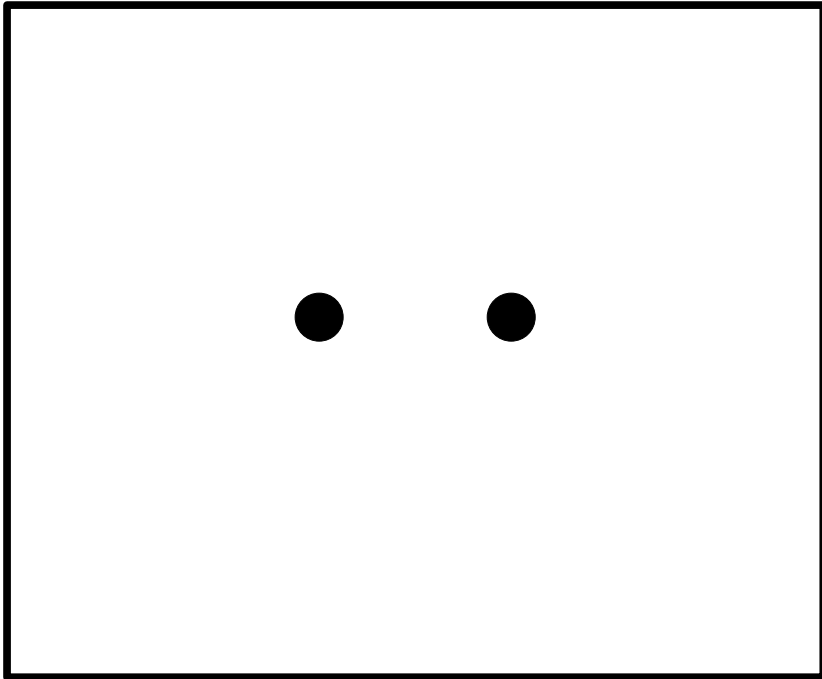
WiiMote as a Pointer

- The wiiMote can be a rough substitute for a mouse.
- Not hyper accurate, but onscreen feedback makes it good enough.

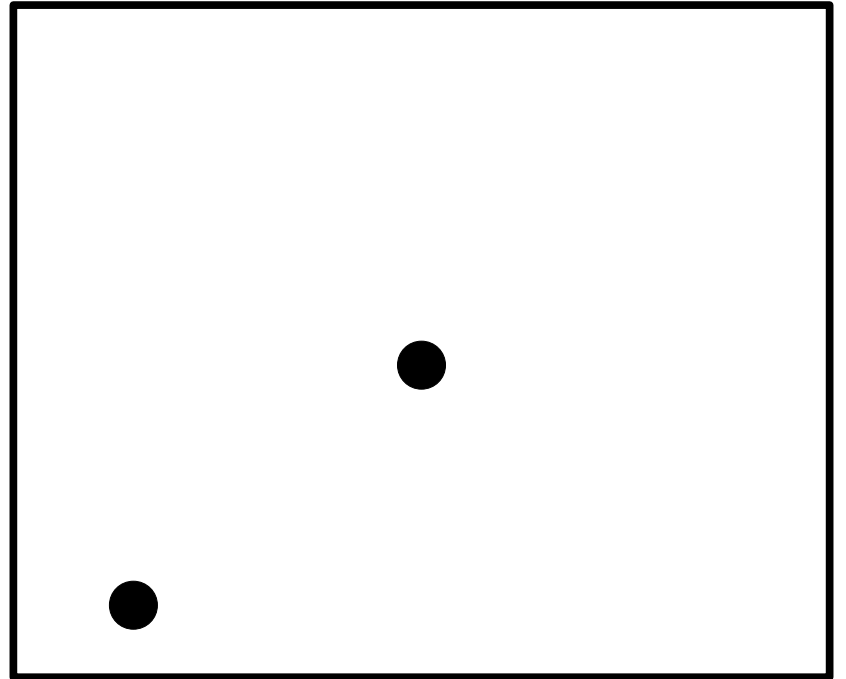


1 LED = simple

2 LEDs



easy



harder

Pointer Demo

IR Glasses



- Easiest way is to order LED safety glasses from Amazon:
 - AO Safety LED Light Vision includes glasses
 - Radians Radlight if you already wear glasses
- Replace the LEDs with IR LEDs.
- I used to build my own but...
 - Switches are good.
 - Wires in the eyes are bad.

CLIP-ON LED LIGHT

• Sturdy clip allows easy attachment to eyewear
• 360° rotating lens that projects light
• 380 lumens

RADIANS

Rad-Light™
CLIP-ON LED LIGHT



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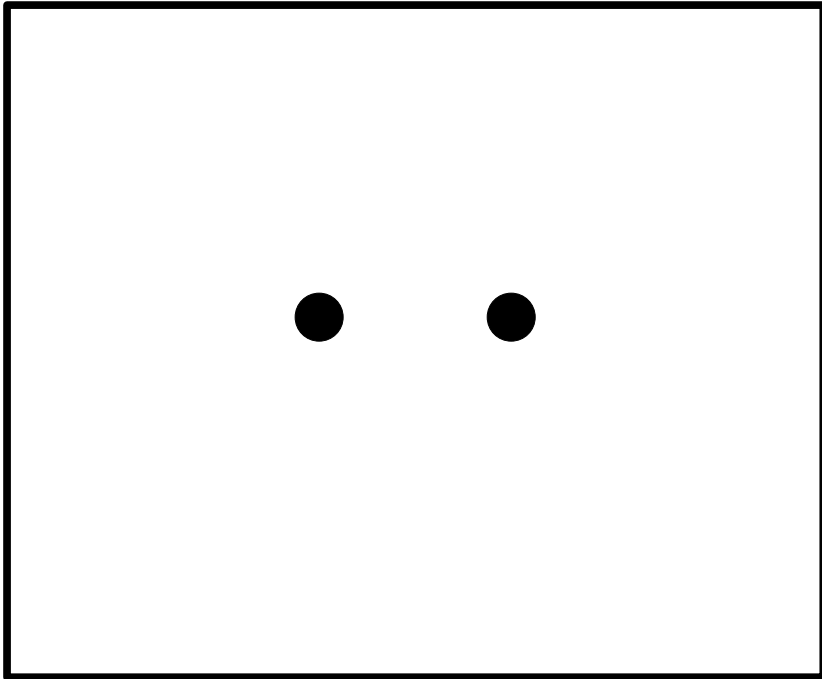




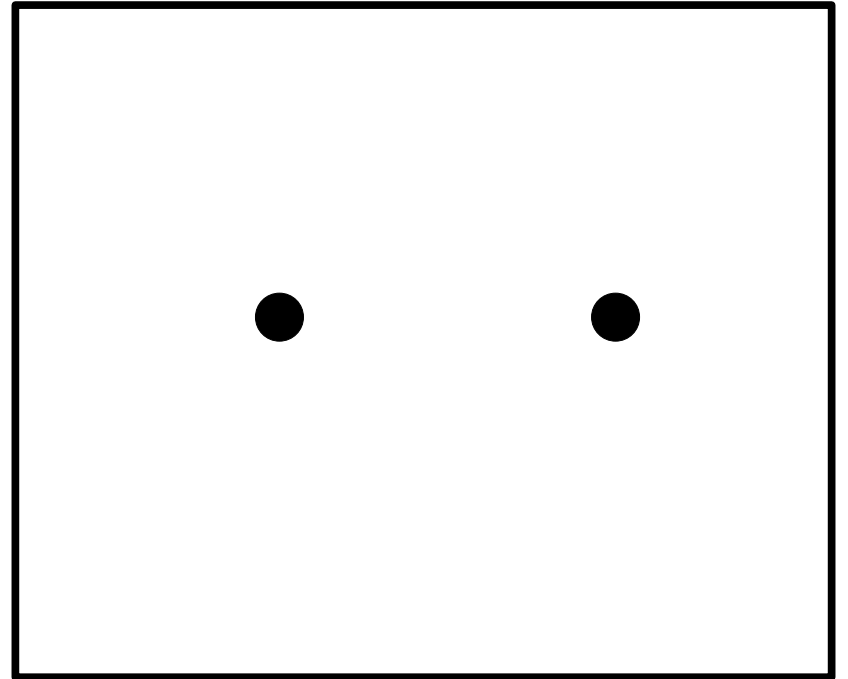
POV Demo

- Your point of view of a 3D scene changes as you move your head.

Headtracking Made Simple

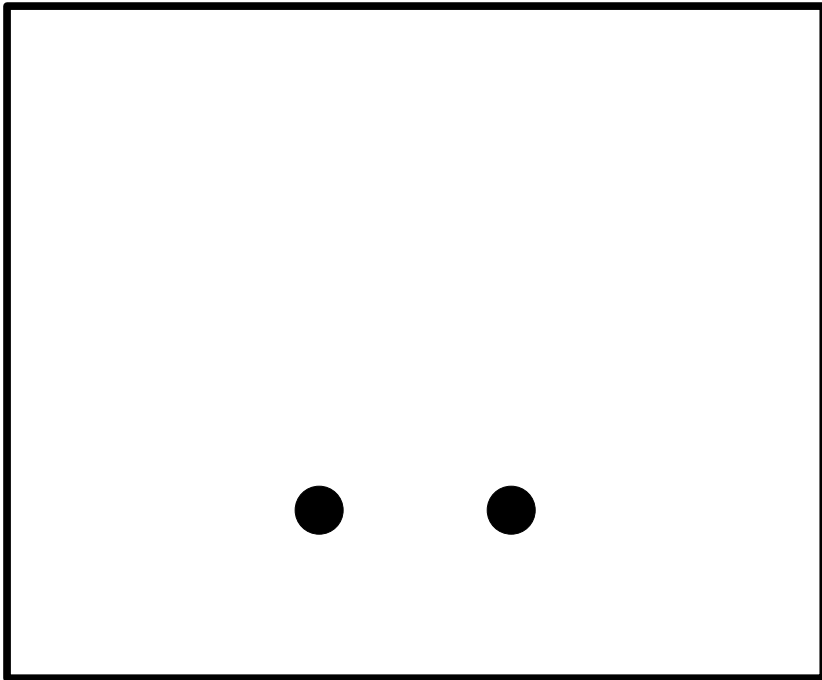


neutral

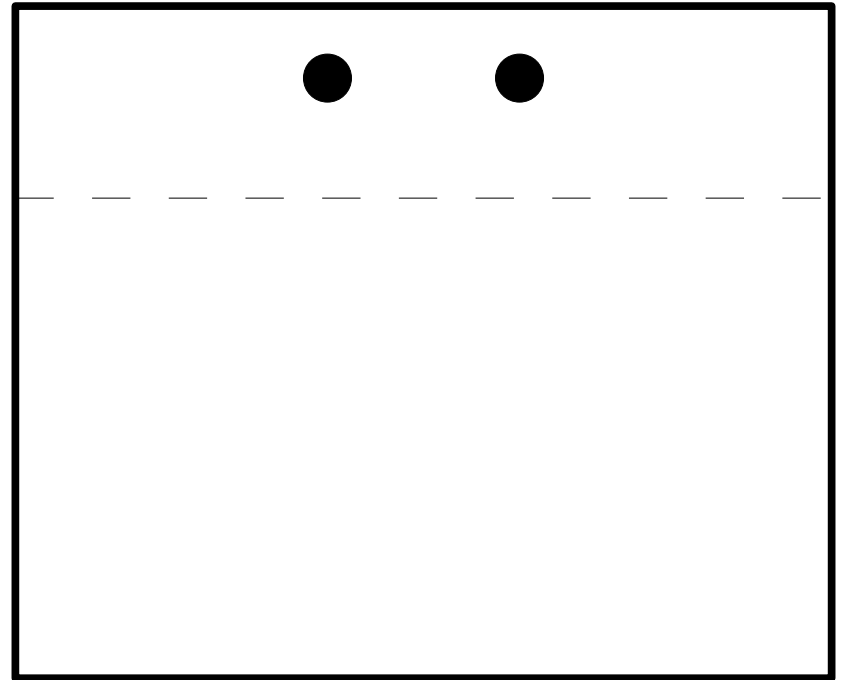


closer

Headtracking Made Simple

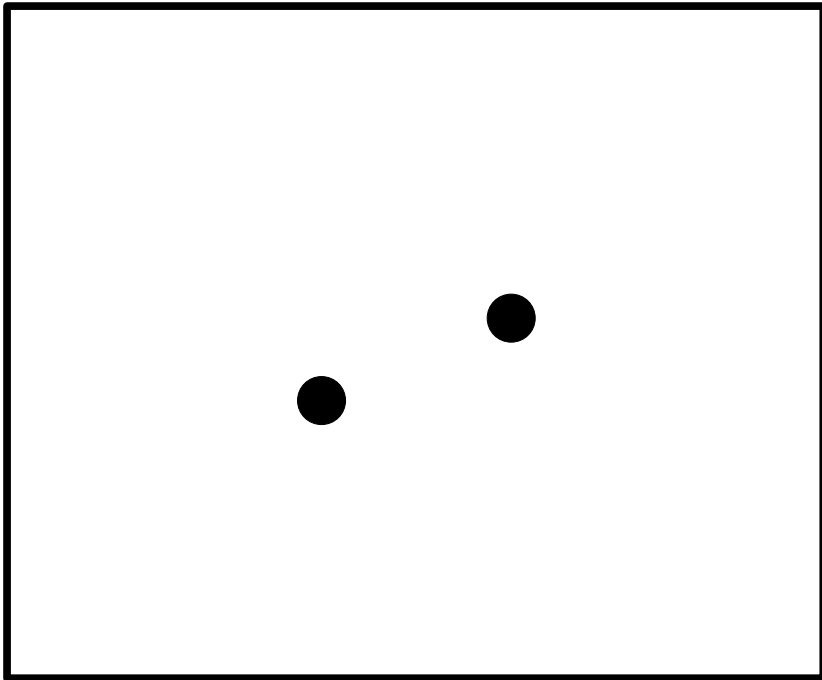


crouch

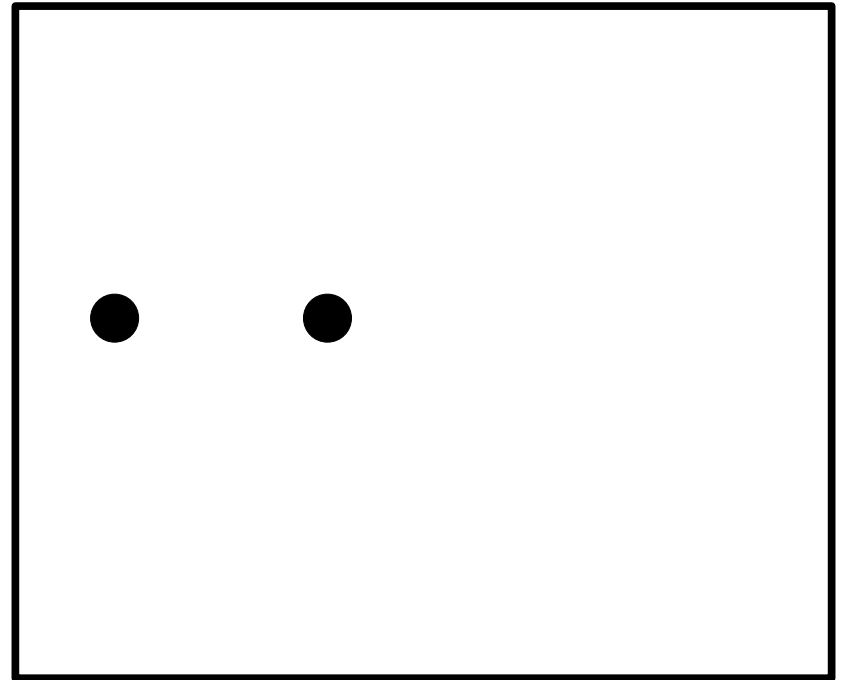


jump

Headtracking Made Simple

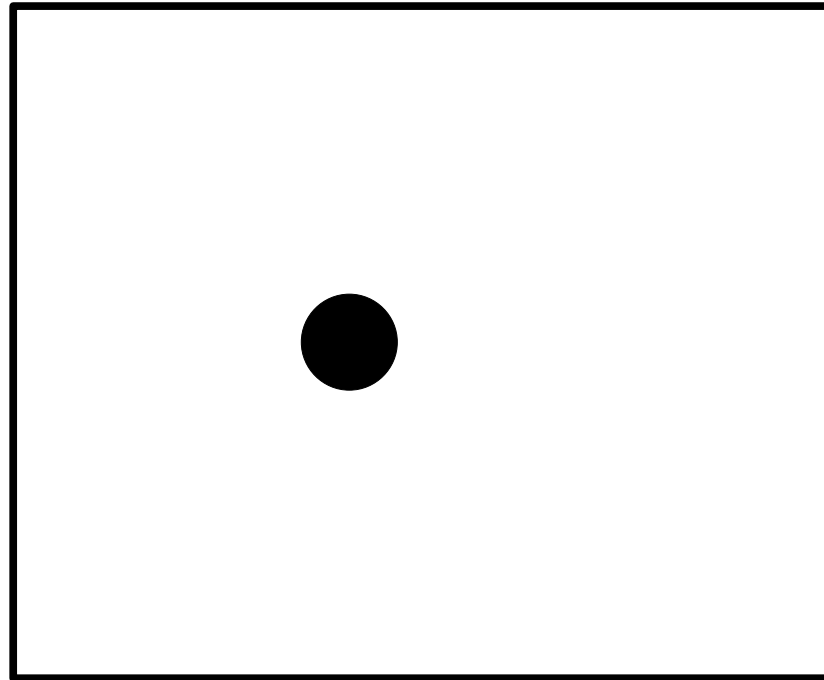


tilt to turn



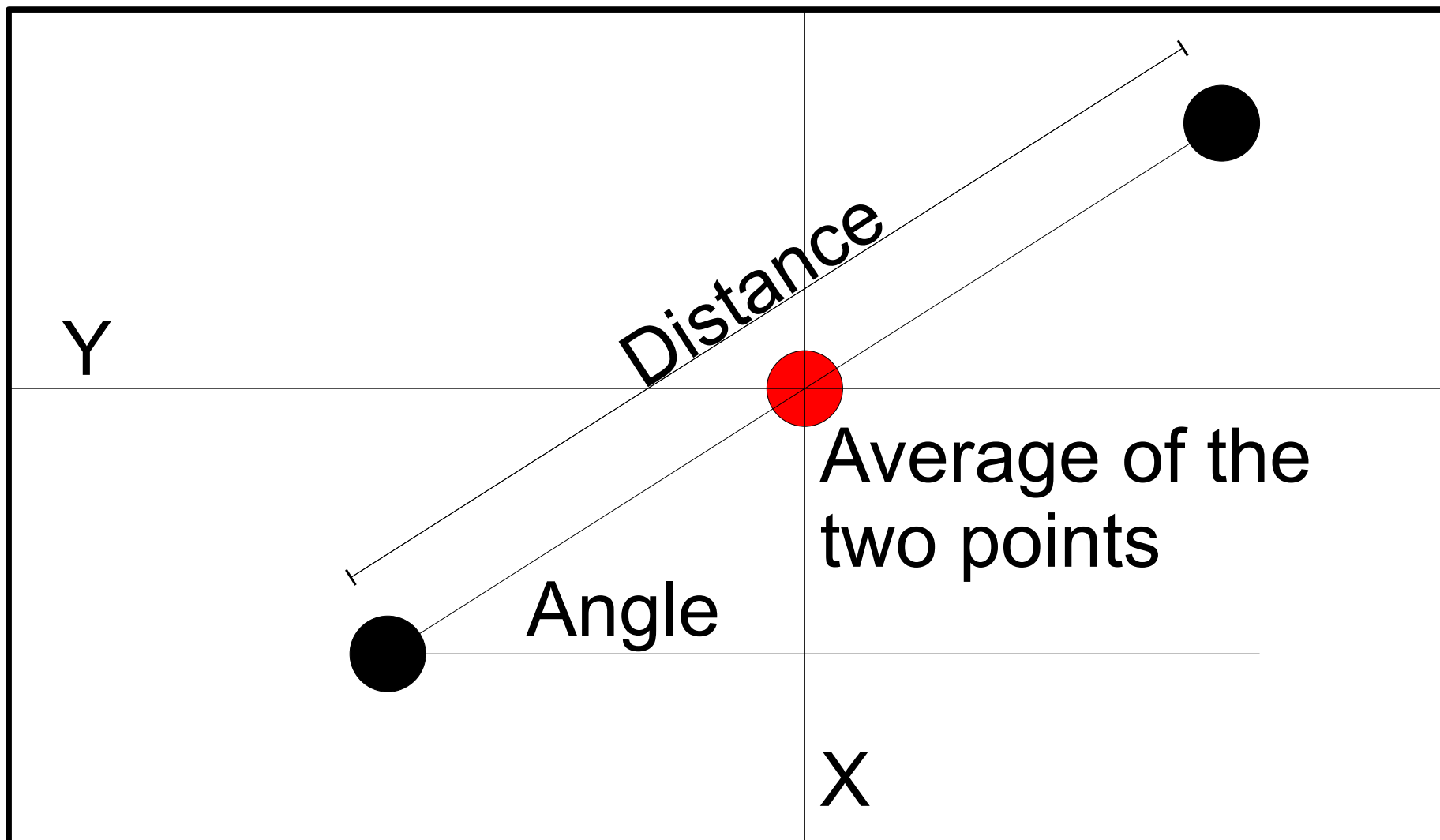
side step

Oh Noes!



u turnd ur head

Things to Measure



Headtracking Code

```
def set_points(x1, y1, x2, y2):
    global DIST
    global SLOPE
    global X
    global Y
    if (x1 < 1023 and y1 < 1023 and x2 < 1023 and y2 < 1023):
        DIST = math.sqrt((x1-x2)*(x1-x2)+(y1-y2)*(y1-y2))
        if (x2-x1==0):
            SLOPE = 100
        else:
            SLOPE = (y2-y1)/float(x2-x1)
        X = (x1+x2)/2
        Y = (y1+y2)/2

def get_vals():
    return (DIST,SLOPE,X,Y)
```

3D Navigation w/ Headtracking

- Player stands in neutral position to stand still
- Take a step forward to walk forward
- Tilt head to turn
- Sidestepping
- Jumping, crouching
- Combos: player can run, turn, crouch at once
- Return to neutral position to stand still

Combined Demo

- 3D Game

Holding the Sensor Bar

- What could you do with the IR emitters in your hand?

Wand Demo

Other Things People Have Done

- Whiteboard
- Theremin
- 3D Tracking
- Finger tracking – multitouch in the air

Nintendo, Listen Up!

Christmas is Coming...

- Make the sensor bar actually sense:
 - Add 2 IR cameras to detect points in 3D
- Put IR emitters in each end of the wiimote
 - Blink LEDs in turn to identify them
 - Use both tracking and accelerometers
 - Detecting player position in the room could eliminate the need for the nunchuck in many games: tennis, boxing, etc
- Sell cheap IR glasses
- Keep it easy to hack – crowdsource R&D

Mac Resources

- Darwiimote & wiiRemoteFramework:
 - <http://sourceforge.net/projects/darwiin-remote/>
- EjanPen pyObjC wrapper:
 - <http://enja.org/code/enjapen/>

Linux Resources

- [wiimote.py](#)
- homepage.mac.com/wgwoods/wii/wiimote.py

wiiMote Resources

- <http://www.wiimoteproject.com/>
- http://wiibrew.org/wiki/Main_Page
- http://en.wikipedia.org/wiki/Wii_Remote
- <http://www.wiili.com/>

Questions?

- Contact:
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 - <http://blog.insightvr.com>