Kinect and SearchLight Math Models

Thomas, Will, and Chris Bierbower

January 5th, 2012

1. Calibrating the Kinect Angle

Diagram: Room #1 Overhead

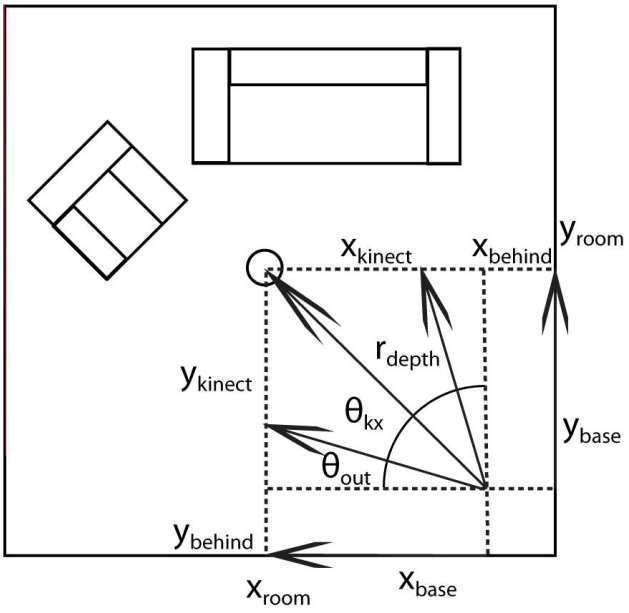
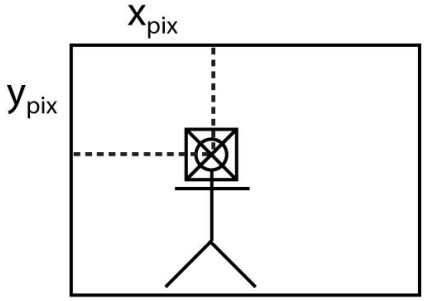


Diagram: Kinect Sensor



Equation: Converting Kinect Color Sensor Data into Kinect Viewing Angle

$$\theta_{kx} = c \cdot x_{pix}$$

Equation: Calculating Total Angle

$$\theta_{total} = \theta_{out} + \theta_{kx}$$

2. **Converting Kinect Coordinates into Cartesian Coordinates**

Equation: Converting to Cartesian Coordinates of Room

$$x_{base} = x_{behind} + r_{depth} \cos\theta_{total}$$

$$y_{base} = y_{behind} + r_{depth} \sin\theta_{total}$$

3. **Converting Cartesian Coordinates into Horizontal and Vertical Pitch for SearchLight**

Diagram: Room #2 Overhead

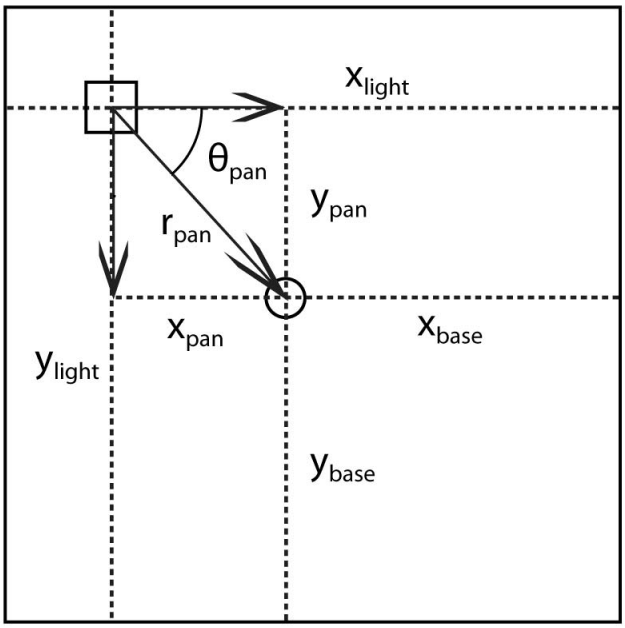
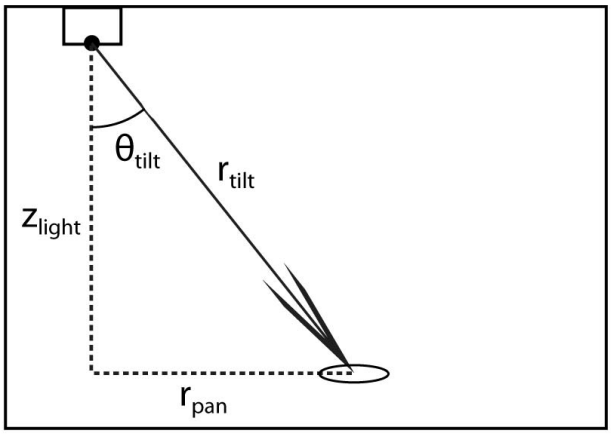


Diagram: Room #2 Bisection



Equation: Calculating Horizontal Pitch

$$\theta_{pitch} = \tan^{-1}\left(\frac{y_{light} - y_{base}}{x_{light} - x_{base}}\right)$$

Equation: Calculating Vertical Tilt

$$\theta_{tilt} = \tan^{-1}\left(\frac{\sqrt{(x_{light} - x_{base}{}^{2}) + (y_{light} - y_{base})^{2}}}{z_{light}}\right)$$