

# SH Project: Tracking People Using Multiple Kinects

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# Overview

1 Project Description

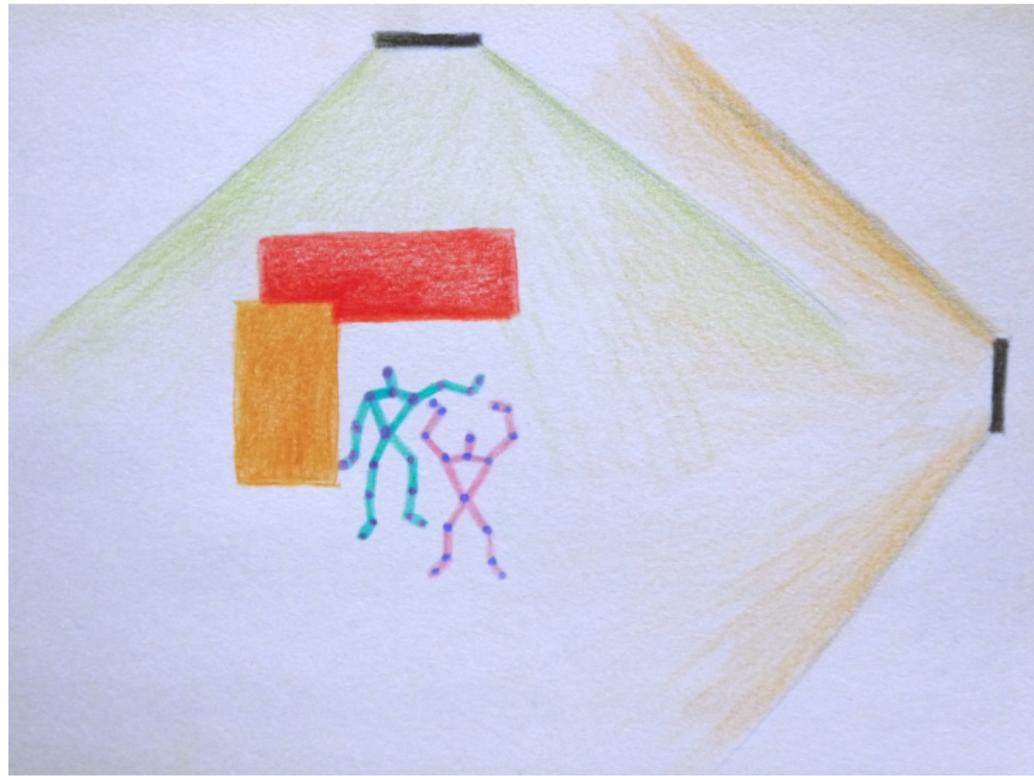
2 Related Work

3 Current Approach

# Goal

Develop and evaluate an algorithm to track people using multiple Kinects

# Problem of occlusion



# What is Kinect?

A low-cost sensor for motion capturing and tracking

- Infrared
- RGB
- Depth
- Skeleton
- Others...



# Infrared



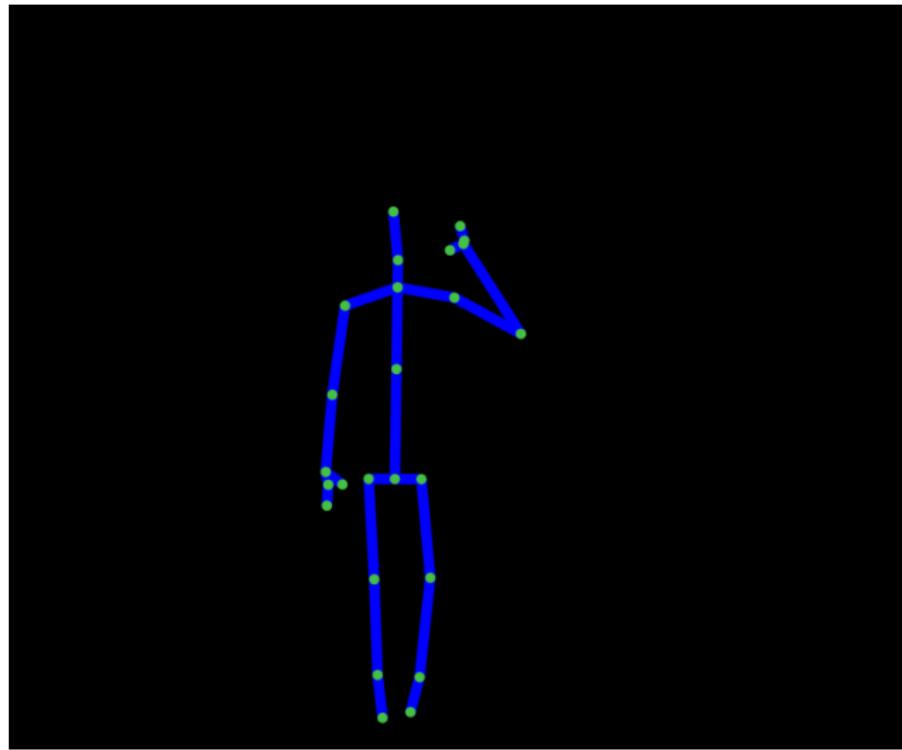
RGB



# Depth

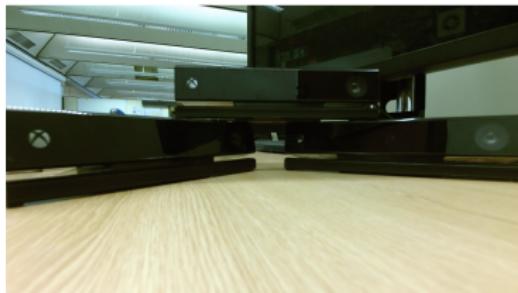


# Skeleton



# Why use multiple Kinect?

- Resolve the problem of occlusion
- Reconstruct 3D human models
- Human activity monitoring and prediction



An image of multiple Kinects taken by another Kinect.

# Things to consider...

- Calibration
- Occlusion objects
- Human interactions
- Illumination
- Simulated physical environments

# What others have done?

- Infrared
- RGB
- Depth

# RGB

## Normalization

Paper: Color transfer between images [1]

## Color histogram

Paper: A color histogram based people tracking system [2]

## Histogram of gradients (HOG)

Paper: Histograms of oriented gradients for human detection [3]

## Scale-invariant feature transform (SIFT)

Paper: Distinctive Image Features from Scale-Invariant Keypoints [4]

# Depth

Paper: Human Detection Using Depth Information by Kinect [5]

- 2D chamfer distance matching
- 3D model fitting
- Extract whole body contours
- Movement-based tracking

Paper: Tracking people within groups using RGB-D data [6]

- sub-clustering

# What am I going to do?

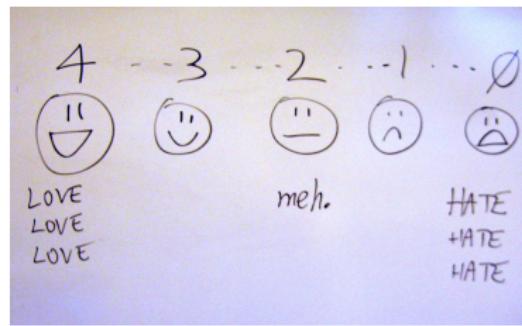
- Kinect calibration
- Gather user footage
- Track one person across different views
- Track one person with occlusion objects
- Track up to six users
- Test in various environments



AJ Cann, "Feedback checklist" August 22, 2013 via Flickr,  
Creative Commons Attribution.

# Evaluation

- Kinect footage
- Quantitative



billsoPHOTO, "Evaluation scale" December 10, 2009 via Flickr,  
Creative Commons Attribution.

# Challenges

- Kinect calibration
- Merge different views into a single view
- Reduce the noise in depth data
- Real-time tracking

# References



[1] Reinhard, E., Ashikhmin, M., Gooch, B., & Shirley, P. (2001)  
Color transfer between images  
*IEEE Computer graphics and applications* 21(5), 34-41.



[2] Lu, W., & Tan, Y.P. (2001)  
A color histogram based people tracking system  
*IEEE International Symposium on Circuits and Systems* 2, 137-140.



[3] Dalal, N., & Triggs, B. (2005)  
Histograms of oriented gradients for human detection  
*IEEE Computer Society Conference on Computer Vision and Pattern Recognition* 1, 886-893.



[4] D Lowe, D. G. (2004)  
Distinctive image features from scale-invariant keypoints  
*International journal of computer vision* 60(2), 91-110.

# References



[5] Xia, L., Chen, C. C., & Aggarwal, J. K. (2011)  
Human detection using depth information by Kinect

*IEEE Computer Society Conference on Computer Vision and Pattern Recognition*,  
15-22.



[6] Munaro, M., Basso, F., & Menegatti, E. (2012)  
Tracking people within groups with RGB-D data

*IEEE International Conference on Intelligent Robots and Systems*, 2101-2107.

# The End