SH Project: Tracking People Using Multiple Kinects

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October 8, 2014

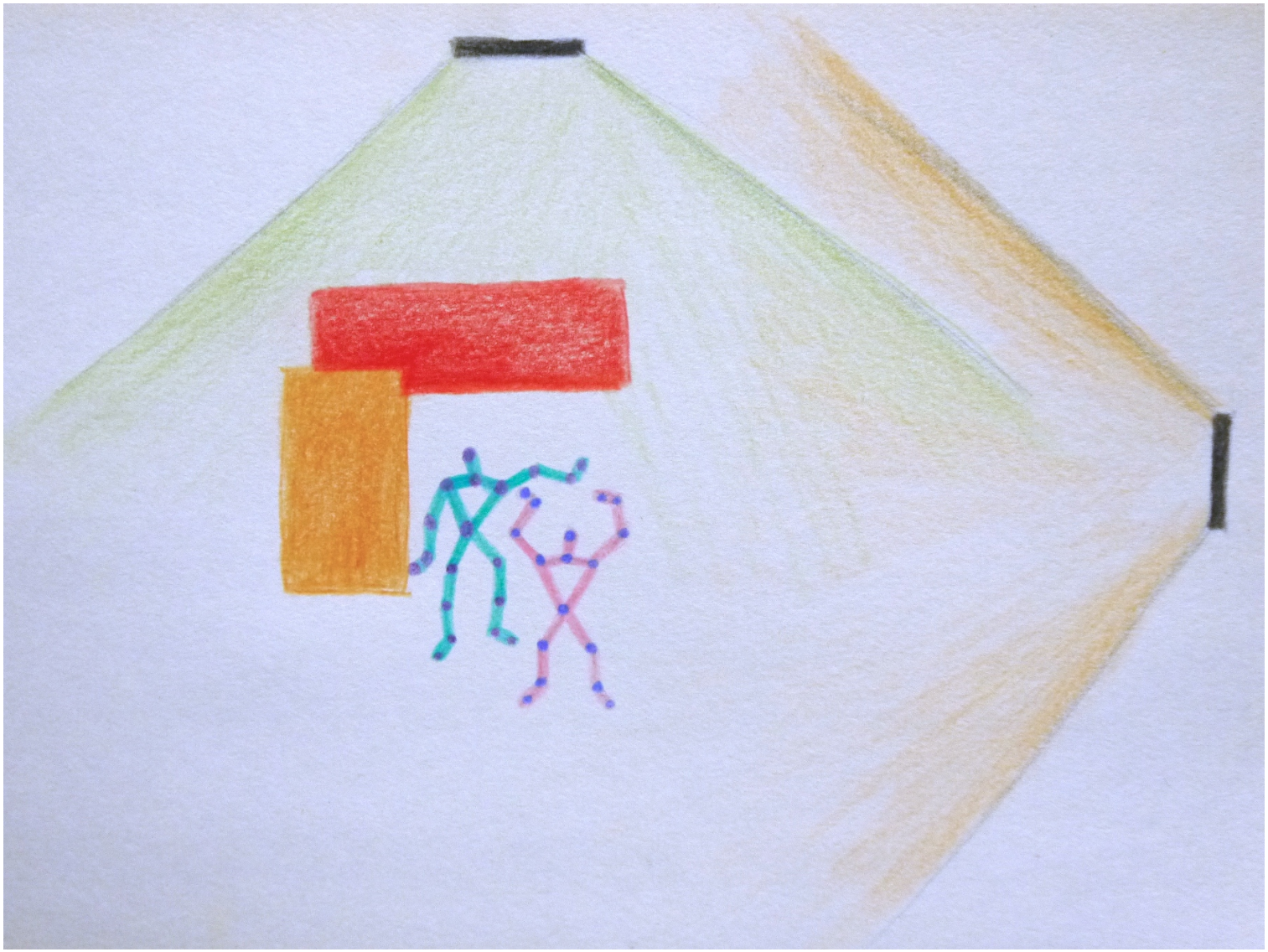
Overview

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

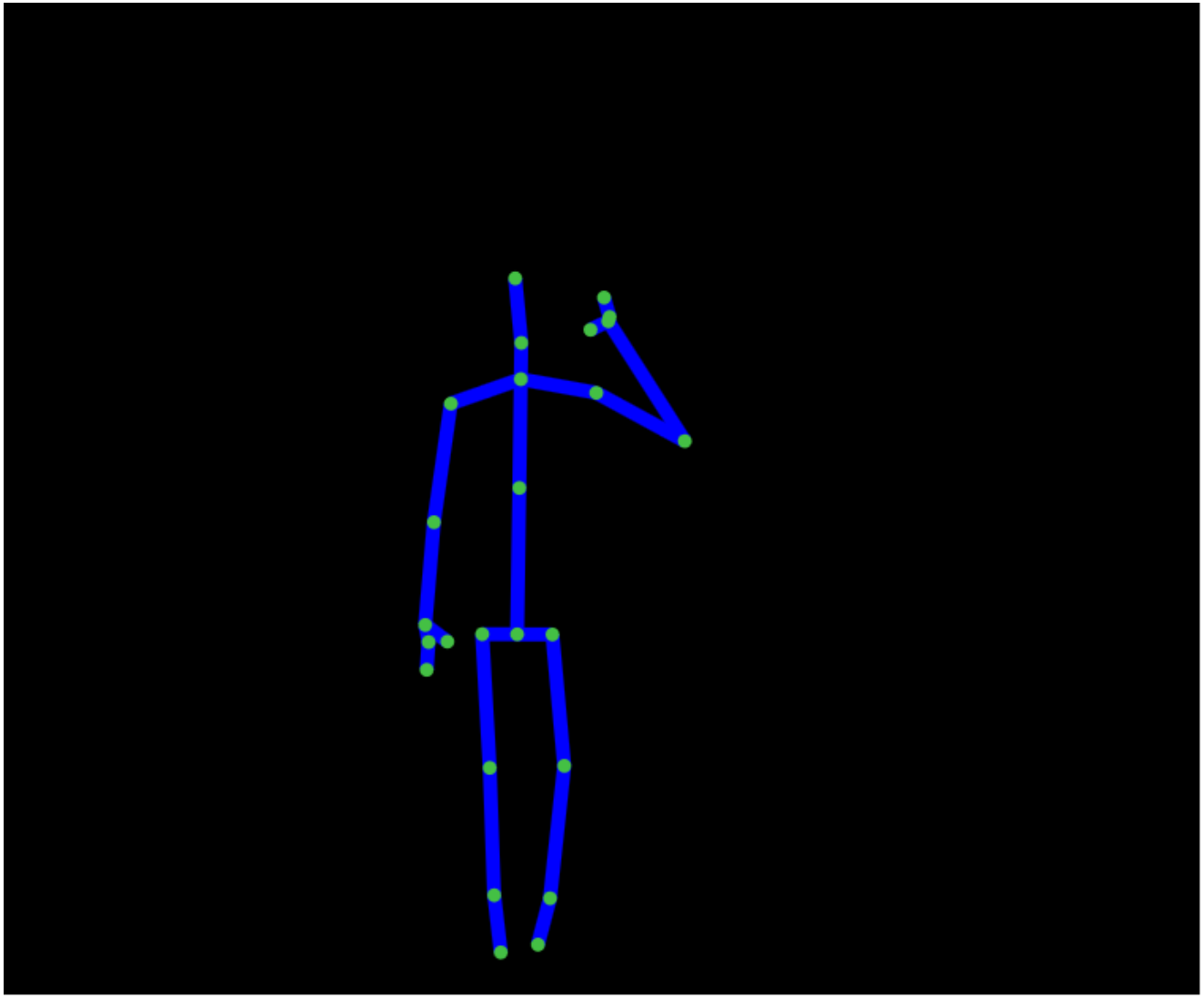
- Infrared
- RGB
- Depth
- Skeleton
- Others...

Infrared

RGB

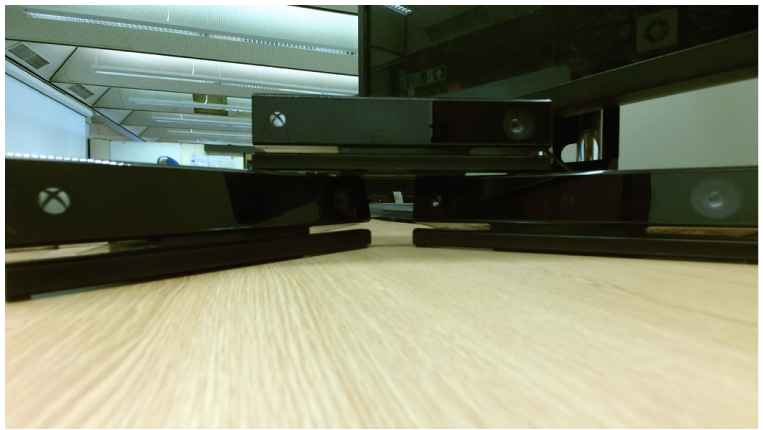
Depth

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

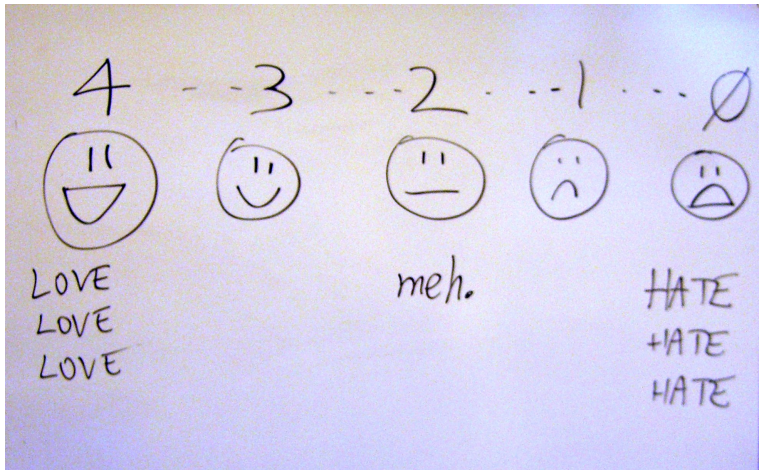
What am I going to do?

- 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 new world view
- Reduce the noise in depth data
- Real-time tracking

References

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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] DLowe, 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