Using Machine-learning Techniques to Increase the Efficiency of Kinect Fusion Reconstructions

Literature Review

Alan Lau

MComp Computer Science
University of Bath
October 2015

Contents

1 Introduction

This project aims to quicken the time required to create a 3-diemensional reconstruction of objects in a room with just a simple 2-dimentional scan from one angle, using a Microsoft Kinect Camera. To enable such goal, classification, a form of machine-learning, is required. There are many different statistical classification algorithms that can be used for labelling objects through training with similar objects and recognising the category and object belongs when in use.

A group of New York University researchers have created a depth dataset named the NYU Depth Dataset. A variety of objects are scanned or segmented from a scene. The large number of scans for a class of objects makes it ideal to be used as training data for the classifier. By understanding more about this dataset and how it has been used, it provides a

This Review tries to explore more about depth maps and the depth dataset, understand how these algorithm fit in with depth data and .

2 Kinect Fusion

The Kinect Camera is an RGBD Camera. It has an infrared-based depth camera on top of a conventional coloured camera. This enables extra information about how far an object is from the camera, so an accurate reconstruction is possible.

2.1 Depth Map

2.2 NYU Depth Dataset V2

3 Classifiers

3.1 Classification Algorithms

3.2 Using Classification Alogorithms for Depth Data

4 Displaying the Results

4.0.1 OpenGL

5 Summary

Bibliography

[1] Microsoft Corporation. *Kinect Fusion* [Online]. Place of publication: Microsoft Developer Network. Available from: `https://msdn.microsoft.com/en-us/library/dn188670.aspx` [Accessed 22 October 2015].

[2] Kinect for Windows Team, 2013. *Kinect Fusion demonstrated at Microsoft Research TechFest, coming soon to SDK* [Online]. Place of publication: Kinect for Windows Blog Available from: `http://blogs.msdn.com/b/kinectforwindows/archive/2013/03/06/kinect-fusion-demonstrated-at-microsoft-research-techfest-coming-soon-to-sdk.aspx` [Accessed 22 October 2015].

[3] Cameron, S., 2015. *Microsoft Research debuts another project, Semantic Paint* [Online]. Place of publication: WinBeta Blog Available from: `http://www.winbeta.org/news/microsoft-research-debuts-another-project-semantic-paint` [Accessed 23 October 2015].

[4] Newcombe, R. A. et al., 2015. DynamicFusion: Reconstruction and Tracking of Non-rigid Scenes in Real-Time. *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition*, 7-12 June 2015 Boston, Massachusetts. Seatle: University of Washington, pp.343-352.

[5] Newcombe, R A et al., 2011. KinectFusion: Real-time dense surface mapping and tracking. *Mixed and augmented reality (ISMAR), 2011 10th IEEE international symposium*, 26-29 October 2011 Basel, Switzerland. Seatle: University of Washington, pp.127-136

[6] Hambchen, N., 2014. *HouseScan: Building-scale interior 3D reconstruction with KinectFusion*. Thesis (MSc). Imperial College, London.

[7] Silberman, N. et al.. *NYU Depth Dataset V2* [Online]. Available from: `http://cs.nyu.edu/~silberman/datasets/nyu_depth_v2.html` [Accessed 23 October 2015].