

## *Kinfu – an open source implementation of Kinect Fusion + case study: implementing a 3D scanner with PCL*

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### Introduction

With this project, we aim to explore solutions for the reconstruction of real objects by analyzing the state-of-the-art algorithm Kinect Fusion that allows real-time reconstruction and rendering of a real world scene and one implementation of it. We use the point clouds obtained from Kinect Fusion and the PCL libraries to create a 3D scanner application and show the results of our work.

This document is divided in four parts:

- Part one introduces the Kinect Fusion algorithm with a detailed explanation of its inner workings.
- Part two introduces the Point Cloud Libraries (PCL) and KinFu, the implementation of the Kinect Fusion algorithm that is contained in PCL.
- In part three, the 3D scanner algorithm implemented using PCL is explained.
- In part four, example results obtained with the 3D scanner application are shown.

### Kinect Fusion

Kinect Fusion is an algorithm developed by Microsoft Research in 2011<sup>1,2</sup>. The algorithm allows a user to reconstruct a 3D scene in real-time and robustly by moving the Microsoft Kinect sensor<sup>3</sup> around the real scene. Where SLAM techniques provide efficient camera tracking but only rudimentary reconstructions, Kinect Fusion's results possess both a high degree of robustness and detail (see Figure 1 and Figure 2). A detailed explanation of Kinect Fusion's components and algorithm follows.

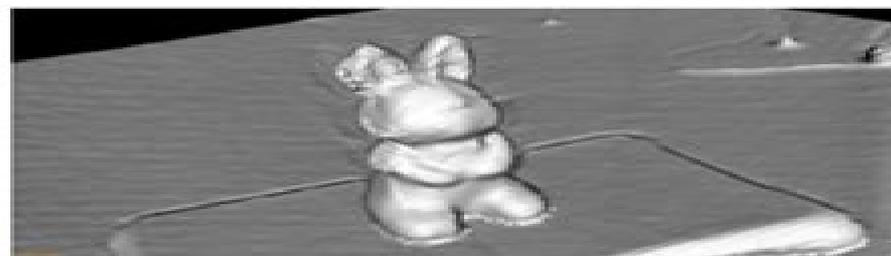


Figure 1 - A rabbit-like statue reconstructed with Kinect Fusion

<sup>1</sup> KinectFusion: Real-Time Dense Surface Mapping and Tracking

Richard A. Newcombe, Shih-ram Izadi, Otmar Hilliges, David Molyneaux, David Kim, Andrew J. Davison, Pushmeet Kohli, Jamie Shotton, Steve Hodges, and Andrew Fitzgibbon - October 2011 - IEEE ISMAR

<sup>2</sup> KinectFusion: Real-time 3D Reconstruction and Interaction Using a Moving Depth Camera

Shih-ram Izadi, David Kim, Otmar Hilliges, David Molyneaux, Richard Newcombe, Pushmeet Kohli, Jamie Shotton, Steve Hodges, Dustin Freeman, Andrew Davison, and Andrew Fitzgibbon - October 2011 - ACM Symposium on User Interface Software and Technology

<sup>3</sup> <http://en.wikipedia.org/wiki/Kinect>

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