

## *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.

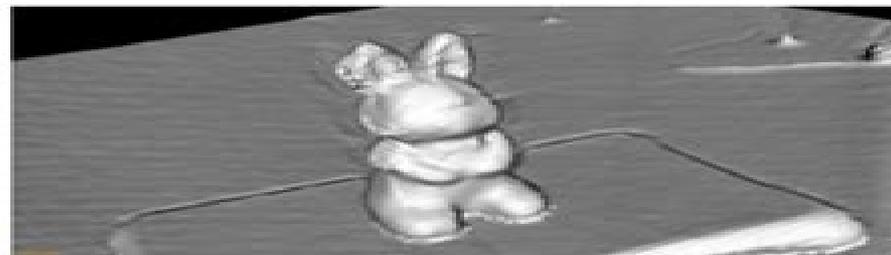


Figure 1 - A rabbit-like statue reconstructed with Kinect Fusion

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

Richard A. Newcombe, Shih-Wei Lee, Otmar Hilliges, David Moyniaux, 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-Wei Lee, David Kim, Otmar Hilliges, David Moyniaux, 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>

# Kinfu An Open Source Implementation Of Kinect Fusion

**João Manuel R. S. Tavares, Renato  
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## **Kinfu An Open Source Implementation Of Kinect Fusion:**

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**Developments in Medical Image Processing and Computational Vision** João Manuel R. S. Tavares, Renato Natal Jorge, 2015-04-07 This book presents novel and advanced topics in Medical Image Processing and Computational Vision in order to solidify knowledge in the related fields and define their key stakeholders It contains extended versions of selected papers presented in VipIMAGE 2013 IV International ECCOMAS Thematic Conference on Computational Vision and Medical Image which took place in Funchal Madeira Portugal 14 16 October 2013 The twenty two chapters were written by invited experts of international recognition and address important issues in medical image processing and computational vision including 3D vision 3D visualization colour quantisation continuum mechanics data fusion data mining face recognition GPU parallelisation image acquisition and reconstruction image and video analysis image clustering image registration image restoring image segmentation machine learning modelling and simulation object detection object recognition object tracking optical flow pattern recognition pose estimation and texture analysis Different applications are addressed and described throughout the book comprising biomechanical studies bio structure modelling and simulation bone characterization cell tracking computer aided diagnosis dental imaging face recognition hand gestures detection and recognition human motion analysis human computer interaction image and video understanding image processing image segmentation object and scene reconstruction object recognition and tracking remote robot control and surgery planning This volume is of use to researchers students practitioners and manufacturers from several multidisciplinary fields such as artificial intelligence bioengineering biology biomechanics computational mechanics computational vision computer graphics computer science computer vision human motion imagiology machine learning machine vision mathematics medical image medicine pattern recognition and physics

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