

Laser Scan Quality 3D Mesh Using Kinect Capture

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Abstract

The aim of this project was to extend a piece of open source software developed by David Ganter M.Sc., Trinity College Dublin. The software known as Kinect Stream Record tool records a depth video, converts it into a series of sets of points (known as point clouds) and stores it in a raw format so it can be accessed by researchers. The tool also features a Mesh Creator tool that loads the video and stitches the individual frames together.

In order to do this, the point clouds need to be transformed according to the estimated position of the camera at the moment each frame was captured so that they fit correctly in the combined mesh in a process known as registration. The main aims of this project were to:

1. Extend the Mesh Creator tool so that it stored the point clouds generated from the individual video frames along with their edge data in a recognised mesh format known as .ply rather than the entire video in the unrecognised raw file format that it was previously.
2. Explore the use of a more robust algorithm to determine the required transformation of each of the frames so that they fit correctly in the combined mesh; specifically the Gaussian Mixture Model registration method.

Both of these tasks were successfully carried out. The research tool was extended to not only store the frames as ply meshes but also to fill holes present in the depth frames. It was found that the robust Gaussian Mixture Model Registration method was indeed an accurate algorithm but would be too slow to construct meshes on the fly as Kinect Fusion can, using the Iterative Closest Point method.