

# SfM from RGB-D data

3D Photography Project Proposal

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GROUP MEMBERS

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## I. DESCRIPTION OF THE PROJECT

This project aims to reconstruct a 3D model of an environment using structure from motion (SfM). A pipeline will be assembled which makes use of depth data taken from a Kinect [1]. Our work will be devoted to investigate whether or how depth information may simplify the scene registration and improve the global accuracy.

## II. WORK PACKAGES AND TIMELINE

First, a small base dataset will be acquired using a Kinect. A basic pipeline will be assembled where (i) SURF/SIFT features are detected (ii) then matched to find coarse estimations of camera pose (iii) then a final step where a finer estimate of the scene is found.

A challenge is the evaluation of various scene registration methods, including 2D-2D, 3D-3D and 3D-2D point registration. Furthermore a suitable global optimizer is to be found, which incorporates sensors depth information as prior.

The implementation will mainly be carried out using C++. Various libraries will be used, such as vlfeat (feature detection), PnP solvers (scene registration), and ceres (bundle adjustment).

## III. OUTCOMES AND DEMONSTRATION

The project should yield a 3D reconstruction of a room environment. This procedure can be verified by applying to an unknown scene. A visualization of the result will be shown using the Point Cloud Library (PCL) or Meshlab, with comparisons to a video feed.



Fig. 1: A 3D reconstruction of houses on a street[2]

## REFERENCES

- [1] Shawn Recker, Christiaan Gribble, Mikhail M Shashkov, Mario Yezpez, Mauricio Hess-Flores, and Kenneth I Joy. Depth data assisted structure-from-motion parameter optimization and feature track correction. In *Applied Imagery Pattern Recognition Workshop, October 2014*, 2014.
- [2] M. Varga. *Practical Image Processing and Computer Vision*. John Wiley & Sons Australia, Limited, 2008.