Computer Vision
ICP, EGC, SFM

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June 2014

***Abstract*- In this technical report implementation details along with experimental results we obtained for two separate classes of algorithms are presented. We will discuss the Iterative Closest Point (ICP) algorithm and how variations in different elements of the implementation affect its performance. Another algorithm that this report addresses is Structure from Motion. We will show how 3d structure of a scene can be obtained from 2d images depicting multiple views of the same scene.**

1 Introduction

In this technical report we present the implementation details along with experimental results we obtained for two separate classes of algorithms. Section 1 introduces each one of these algorithms, discussing their basic structure and applications. In Section 2 the three dimensional point cloud registration technique called Iterative Closest Point[1] (ICP) algorithm is analyzed, in terms of various aspects such as speed, accuracy, stability and tolerance to noise, by modifying the point selection technique. Section 3 and 4 describes the process of estimating shape and motion parameters of a 3d scene from 2d images depicting the scene from multiple views. In particular Section 3 addresses the task of computing the intrinsic projective (epipolar) geometry between two views and obtaining the global camera poses by chaining pairwise these geometries, while in Section 4 the method for extracting the 3d structure of the scene is described.

2 Iterative Closest Point

3 Epipolar Geometry and Chaining

4 Structure from Motion

5 Conclusion

References

[1] Besl, Paul J., and Neil D. McKay. “Method for registration of 3-D shapes.” In Robotics-

DL tentative, pp. 586-606. International Society for Optics and Photonics, 1992.

[2] Rothganger, Fred, Svetlana Lazebnik, Cordelia Schmid, and Jean Ponce. "3d object modeling and recognition using local affine-invariant image descriptors and multi-view spatial constraints." International Journal of Computer Vision 66, no. 3 (2006): 231-259.