

3D Computer Vision

Final Project Proposal

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1 Introduction

The main theme of the final project is reconstructing 3D face from multiple sources. The first part of the project follows a framework suggested in the ‘Face reconstruction from the wild’ [3]. The authors proposed the 3D face reconstruction method from large unstructured image collections, such as, images from google search or personal photo collections.

2 Algorithm Overview

Normalize Face Images

Since images from internet or personal collections are unstructured, we need to normalize each image to a canonical face, which is frontal view of a face. In [3], they used a fiducial-based approach to normalize faces. They first detect a face in the image by using the object detection method using the soft cascade method [1]. Fiducial points of a face, such as, corners of eyes, nostrils, tip of a nose, and etc. are extracted from the detected region by using the fiducial points detection method [2]. The matlab codes for the face detection method is provided by the matlab package and the fiducial points detection method is provided in the matlab Computer Vision package.

Let q and Q be the fiducials in 2D images and the 3D template shape. They assumed 2D points in each image are the weak perspective projection of 3D points on the template surface.

$$q = P_w Q = [sR|t]Q \quad (1)$$

To estimate P_w , they subtracted the centroid and calculate the pseudo-inverse of relative positions of 3D points.

Initial Lighting and Shape Estimation

Surface Refinement using Local Shape Estimation

Ambiguity Recovery

Integration

Update Template Surface

References

- [1] Lubomir D. Bourdev and Jonathan Brandt. Robust Object Detection via Soft Cascade. In *CVPR (2)*, pages 236–243. IEEE Computer Society, 2005.
- [2] Mark Everingham, Josef Sivic, and Andrew Zisserman. Hello! My name is... Buffy” – Automatic Naming of Characters in TV Video. In Mike J. Chantler, Robert B. Fisher, and Emanuele Trucco, editors, *BMVC*, pages 899–908. British Machine Vision Association, 2006.
- [3] Ira Kemelmacher-Shlizerman and Steven M. Seitz. Face reconstruction in the wild. In Dimitris N. Metaxas, Long Quan, Alberto Sanfeliu, and Luc J. Van Gool, editors, *ICCV*, pages 1746–1753. IEEE, 2011.