

# Capturing light fields using many light probes

EE 367 Winter 2016 Project Proposal

Sreenath Krishnan (ksree@stanford.edu)

## I. PROPOSAL

This project idea is motivated from the image based lighting technique presented in the class, where a single spherical mirror is used as a light probe for image based lighting. The project involves using an array of spherical mirrors arranged in a fixed pattern to capture the light field of the surrounding and possibly reconstructing some details of the 3D scene from the reflected images. There is a rich amount of literature on image based lighting techniques [1] [2], which involves using a single spherical mirror as a light probe. There have also been studies on reconstructing specular surfaces [3] [4] and 3D scenes from the reflection images in a mirror [6]

The main steps in the project would involve construction of a spherical mirror array of a fixed pattern, taking pictures using a high resolution camera and recreating the light field processing the data obtained. A rough time-line of the project would be as follows

- 1) Construction of spherical mirror array - 1 week
- 2) Taking photographs in multiple locations - 3 days
- 3) Processing data and recovering light field - 1 week
- 4) An attempt at 3D scene reconstruction - In the remaining available time

## REFERENCES

- [1] Debevec, Paul E. "Image-based modeling and lighting." *ACM SIGGRAPH Computer Graphics* 33.4 (1999): 46-50.
- [2] Unger, Jonas, Stefan Gustavson, and Anders Ynnerman. "Spatially varying image based lighting by light probe sequences." *The Visual Computer* 23.7 (2007): 453-465.
- [3] Savarese, Silvio, and Pietro Perona. "Local analysis for 3d reconstruction of specular surfaces." *Computer Vision and Pattern Recognition, 2001. CVPR 2001. Proceedings of the 2001 IEEE Computer Society Conference on*. Vol. 2. IEEE, 2001.
- [4] Savarese, Silvio, and Pietro Perona. "Local analysis for 3d reconstruction of specular surfaces—part ii." *Computer Vision—ECCV 2002*. Springer Berlin Heidelberg, 2002. 759-774.
- [5] Chen, Zhihu, et al. "Single-view reconstruction from an unknown spherical mirror." *Image Processing (ICIP), 2011 18th IEEE International Conference on*. IEEE, 2011.
- [6] Kanbara, Masayuki, et al. "3D scene reconstruction from reflection images in a spherical mirror." *Pattern Recognition, 2006. ICPR 2006. 18th International Conference on*. Vol. 4. IEEE, 2006.