

Image Super-Resolution in Light-Field Cameras

Motivation:

Light field cameras provide a richer representation of the visual information in a scene which can greatly enhance the performance of traditional computer vision problems such as depth sensing, post-capture refocusing, segmentation, video stabilization, etc. But, currently, their usage is limited due to the trade-off between spatial, angular and temporal resolution.

Project overview:

Explore the possibilities of implementing ML techniques in hardware to remove redundancy and obtain a super-resolved image output in a light field camera.

Milestones, timeline & Goals:

Week 1. Understand the resolution trade-off between spatial, angular and temporal resolution and current strategies employed to mitigate the same to determine the optimal learning based algorithm and other processing steps

Week 2. Propose a combined hardware design for image sensing and super-resolution

Week 3. Report results using appropriate simulations

Week 4. Consider further hardware integration for compression and/ or high level tasks such object segmentation, classification etc.

References:

- Y. Yoon, H. G. Jeon, D. Yoo, J. Y. Lee and I. S. Kweon, "Light-Field Image Super-Resolution Using Convolutional Neural Network," in *IEEE Signal Processing Letters*, vol. 24, no. 6, pp. 848-852, June 2017.
- N. K. Kalantari, T.-C. Wang, and R. Ramamoorthi, "Learning-based view synthesis for light field cameras," *ACM Trans. Graph.*, vol. 35, no. 6, 2016, Art. no. 193.
- G. Wu, M. Zhao, L. Wang, Q. Dai, T. Chai, and Y. Liu, "Light field reconstruction using deep convolutional network on EPI," in *Proc. IEEE Comput. Vis. Pattern Recognit.*, 2017, pp. 6317-6327.