Reaction Report IV:
Epipolar Time-of-Flight Imaging

Minh Tran
minht@cs.cmu.edu

March 1, 2023

Identify one idea in the paper that you feel is a major contribution or a major limitation, explain it, and discuss why it is important

There are four contributions of the new epipolar imaging method for continuous wave time-of-flight device including boosting effective range, removing global illumination effect and interference as well as mitigating the problem of camera shaking. I think all of these aspects could be combined as a main idea of setting up a time-of-flight sheet projector that always lies in epipolar planes with the time-of-flight camera, as well as a time-of-flight sensor that can capture that region of interest. All of these characteristics contributed significantly to the noise removal in different environments, which is the core benefit of this method. Moreover, this setup is quite universal and could be apply with various off-the-shelf CW devices. The only one question is the feasibility of integrating the sheet projector to the device, and also at the rows of the image were exposed one at a time, there could be another way to improve the efficiency of this operator.

Describe one idea of yours that builds on the paper and expand on that idea as much as possible

I think one direction do extend this idea is to combine LIDAR-based and CW-based to get a hybrid system that provides a better performance with lower cost. From hardware perspective, a compact and LIDAR system can provide much extra information of the environment, but it also will cause more noise for the input, this epipolar time-of-flight imaging method could mitigate the noise to some extend while choosing the "right" information. I think this could be done using a "smart" noise filter, which usually should be done using software. For known environment with light setting and geometry and shape information, I think it is possible. However for unknown conditions, learning-based methods could be a good start for post-processing.