Reaction Report XII:
Trapping Light for Time of Flight

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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

The paper proposed the idea of using a multi-mirror system called light-trap for 3D reconstruction via a single scan even for complex object, the main intuition is the shape of the trap will capture the information of light bouncing inside the trap at every possible direction. Therefore, even the shape information of occluded regions will be recovered from the path length of each light ray. I think the biggest contribution is the trap design process, because the light must visit a same location multiple time from multiple direction to assure a dense coverage of each point (espescially for occluded regions). To handle this, the authors took an emperical approach to simulate multiple shapes to find the best candidate which is the pyramid-shaped. The 3D shape recovery method is also a significant contribution as it measure the length of each light path using ToF sensors data, this solves the problem of shape estimation for complex objects (they can do that since trap's shape and its relative pose to the camera is known via calibration). I think both of these ideas are important since it provides an efficient method for reconstruct complex objects with just a single scan, so for multiple scan, it could mitigate the mentioned limitations including scan time, resolution, BRDF.

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

I wonder if it possible to make this model work for objects that are complex in the sense of light blocking. For example a vase with a very narrow neck, is that possible to reconstruct the inside part of the vase? (Assume that we want to recover a sphere ball inside the vase for example). The vase itself should be a simple object, but its structure limit the paths of the light that could reach inside. And even if light could get inside, it now become a trap and the amount of light can go out is limited. May be it is possible to design a trap shape that can somehow weights the light path, so the information from the "black hole" regions will more important than the others. I think this could be a potential approach to handle hard complex objects that are hollow for example.