Literature Review 2

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1 Introduction

For this literature review I read 2 articles from ACM Transactions on graphics, both articles are related as both of them talk about Time of flight imaging. I was able to see how far this kind of technology has progressed.

2 What Are Optimal Coding Functions for Time-of-Flight Imaging?

The first article (more recent article) introduces time of flight imaging by talking about consumer products like the kinect and its advantages (low power consumption, good spatial resolution, etc.). It then lists the disadvantages of these (not being able to efficiently operate in an outdoors setting). This paper aims to establish a theoretical foundation for the analysis and design of a type of time of flight imaging known as continuous wave ToF (C-ToF). Most of their paper talks about related work regarding the topic, comparing equations of the related work. They then have mathematical preliminaries that include the image formation equation for C-ToF, mean depth errors, and effects of image noise on the depth. They compare coding schemes and simulate them to find the mean expected depth errors for various C-ToF coding schemes and confirm that their Hamiltonian Scheme outperformed the existing coding methods. [1]

3 Doppler Time-of-flight Imaging

The second article (from 2015) talks about how the doppler effect can be exploited in all kinds of time of flight (ToF) cameras. Their technique aims to help computer graphics and vision problems for motion tracking, segmentation, recognition and motion deblurring. The hardware does not need to be improved, their technique can be applied to any type of ToF cameras. They also think it would be advantageous to use this technique for self driving cars if used in combination with multiple ToF cameras. In summary, their paper talks about how Doppler Time-of-Filght (D ToF) can instantaneously give an estimate of radial velocity, they derive a framework to derive depth and color in images and

tested a range of textures and untextured surfaces (indoors and outdoors). The limitations and problems they had were limited resolution and found that the depth perception was sometimes faulty which cause blobby images. [2]

References

[1] Mohit Gupta, Andreas Velten, Shree K. Nayar, and Eric Breitbach. What are optimal coding functions for time-of-flight imaging? *ACM Trans. Graph.*, 37(2):13:1–13:18, February 2018.

[2] Felix Heide, Wolfgang Heidrich, Matthias Hullin, and Gordon Wetzstein. Doppler time-of-flight imaging. *ACM Trans. Graph.*, 34(4):36:1–36:11, July 2015.