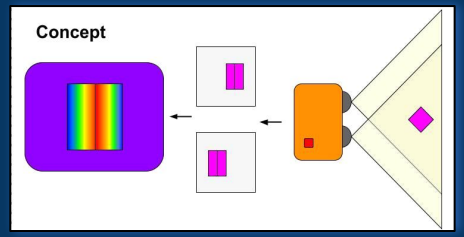
The Do-Pro: A Minimalistic Stereovision Camera

Timothy Do, Daniel Jilani, Zaya Lazar, Harrison Nguyen
Professor Glenn Healey
Department of Electrical Engineering and Computer Science

Overview

Stereo vision is the analysis of depth in a scene from two or more images. For our project, we are designing a hand-held digital camera for stereo vision.

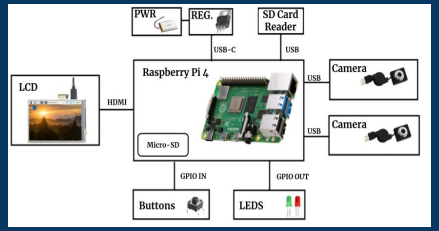


Background

Stereo vision cameras are specialized instruments designed to produce depth from at least two images. These cameras are specialized and expensive with state-of-the-art commercial cameras costing $500 and requiring a mount. In this proposal, we aim to produce a more affordable stereo vision camera designed for versatile applications.

Methodology

Hardware: The hardware implemented consists of a custom PCB, Raspberry Pi, and two cameras in a 3D-Printed enclosure.



Software: The stereo matching algorithm described in [2] is implemented and vectorized for real-time computation of a image disparity map.

Goals and Milestones

- Develop a compact stereo vision camera – as small as feasibly possible (Fall)
- Perform real-time stereo vision imaging for pictures and video (Fall)
- Utilize the camera for 3D printing and object tracking applications (Winter)

References

[1] D. Scharstein, R. Szeliski and R. Zabih, "A taxonomy and evaluation of dense two-frame stereo correspondence algorithms," Proceedings IEEE Workshop on Stereo and Multi-Baseline Vision (SMBV 2001), 2001, pp. 131-140, doi: 10.1109/SMBV.2001.988771.

[2] Q. Chang and T. Maruyama, "Real-Time Stereo Vision System: A Multi-Block Matching on GPU," in IEEE Access, vol. 6, pp. 42030-42046, 2018, doi: 10.1109/ACCESS.2018.2859445.

[3] A. Islam, M. Asikuzzaman, M. O. Khyam, M. Noor-A-Rahim and M. R. Pickering, "Stereo Vision-Based 3D Positioning and Tracking," in *IEEE Access*, vol. 8, pp. 138771-138787, 2020, doi: 10.1109/ACCESS.2020.3011360.