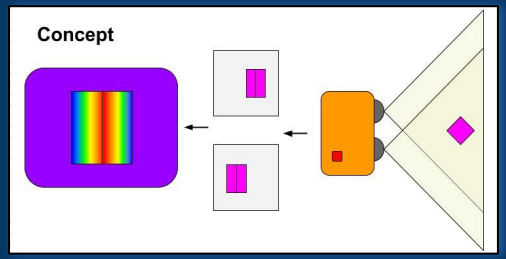
The Do-Pro: An Active Stereovision Camera

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

UCI Samueli School of Engineering

Overview

Stereo vision is the extraction of depth in a scene from two or more images. In this project, an active stereo vision camera is designed with the ability to accurately extract depth from a scene for 3D-Scene Reconstruction and Object Detection.



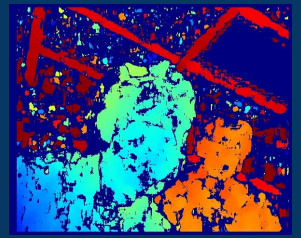
Background

Stereo vision cameras are specialized instruments designed to produce depth from at least two images. In active stereo vision, features are projected onto the scene which improves the disparity accuracy by making points in the scene more distinguishable.

Methodology

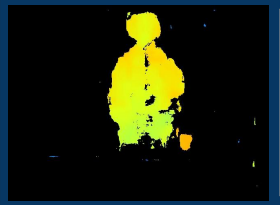
Hardware: Two embedded cameras are connected to a Raspberry Pi 4 for processing. A Custom PCB is used to connect the Pi, Buttons, LED, and LCD Touchscreen. Everything is housed within a portable 3D-printed enclosure.

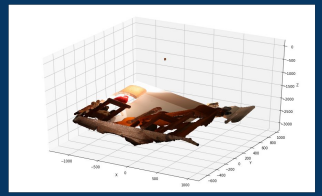
Software: Several stereo matching algorithms are implemented for computing scene disparity with changeable parameters to control the disparity mapping.



Deliverables

- Functional Stereo Vision Camera
- Active Stereo Implementation
- 3D Scene Reconstruction
- Object Detection System





References

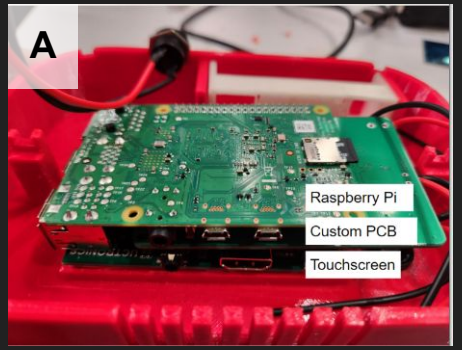
[1] D. Scharstein, R. Szeliski and R. Zabih, "A taxonomy and evaluation of dense two-frame stereo correspondence algorithms," Proceedings IEEE Workshop on Stereo and Multi-Baseline Vision (SMBV 2001), 2001, pp. 131-140, doi: 10.1109/SMBV.2001.988771.

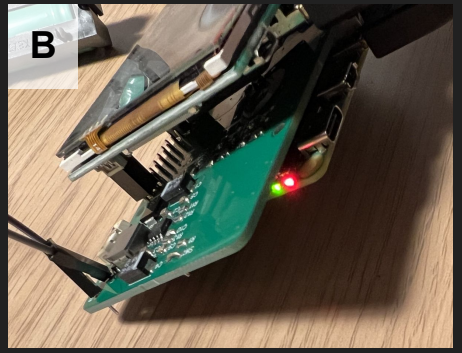
[2] Q. Chang and T. Maruyama, "Real-Time Stereo Vision System: A Multi-Block Matching on GPU," in IEEE Access, vol. 6, pp. 42030-42046, 2018, doi: 10.1109/ACCESS.2018.2859445.

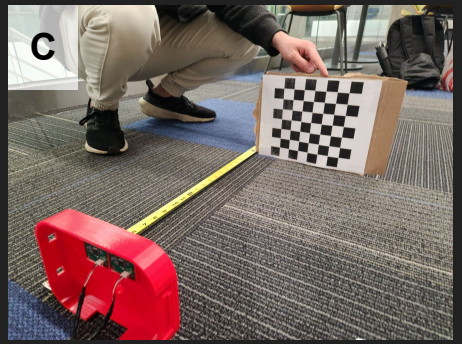
[3] F. Li (2014). Lecture 9 & 10: Stereo Vision. [Powerpoint]. Available: http://vision.stanford.edu/teaching/cs131_fall1415/lectures/lecture9_10_stereo_cs131.pdf

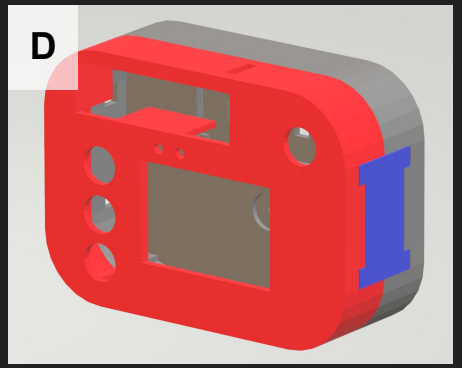
Project Progress

Hardware:









Software: