

Stereo Pi: DIY Digital Stereo Camera

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Motivation

Three dimensional imaging has become an increasingly popular field in research and consumer electronics over the past decade. Consumer products such as the Microsoft Kinect and Oculus Rift have made the capture and display of three dimensional information available for applications such as robotics, entertainment, and gaming. One such depth image capture method, stereoscopy, has existed as early as the 1950s. Although stereo cameras have existed for many years using film, there are very few digital stereo cameras available.

Project Overview

This project aims to build a portable digital stereo camera using popular, off the shelf electronics. Cameras controlled by Raspberry Pis will be used to capture the images, and the depth estimation will be done offline on another computer.

Milestones, Timeline and Goals

1. Build camera rig. I have access to a 3D printer and CAD software to design and print a rig. (Initial design already done, see attached pictures)
2. Build trigger circuit to have both shutters controlled by one button (~1 hour).
3. Write code to capture image from each camera, and send to network folder (~8 hours).
4. Calibrate cameras using OpenCV/MATLAB (~8 hours).
5. Code algorithm to create depth map. This includes the following steps:
 - a. Image Rectification
 - b. Stereo correspondence
 - c. Triangulation

The stereo correspondence will be a simple algorithm to complete the proof of concept. If time permits, a more complex algorithm will be tested to compare computation time and use cases (~20 hours).

6. Test camera and algorithm in various environments with different objects (~8 hours).

References

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Initial Camera Rig Design

