The Do-Pro: A Minimalistic Stereo Vision Camera

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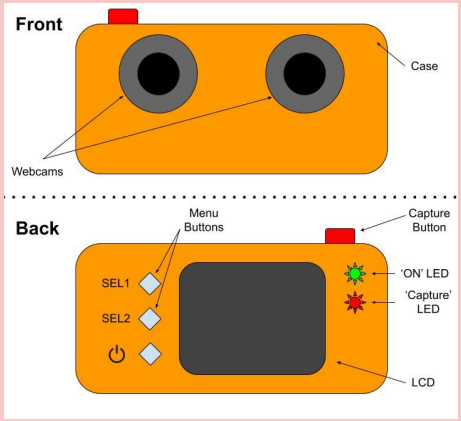
Background:

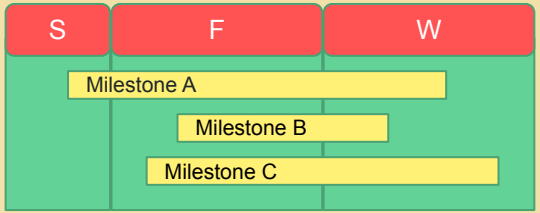
To perceive depth, two images of a scene must be observed at different points along a shared axis. Stereo vision cameras are specialized instruments designed to produce depth from at least two images. These cameras are specialized and expensive with state-of-the-art commercial cameras costing $500 and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



A conceptual illustration of the proposed stereo vision camera. The camera is similar in style to most handheld digital cameras

Milestones:

- Milestone A - Develop simple stereo camera model and achieve functionality on breadboard
- Milestone B - Calibrate stereo-vision cameras
- Milestone C - Implement stereo vision processing, camera software mechanics, and PCB functionality



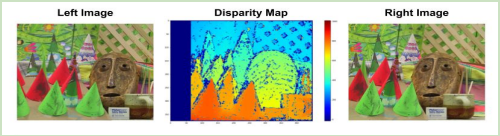
References:

[1] A. Vij, “Stereo vision: How do 'terminators' see the world?,” *Medium*, 23-Mar-2021. [Online].

[2] B.K.P. Horn,, “Robot Vision”, Cambridge, MA: MIT Press, 1986, ch. 13.

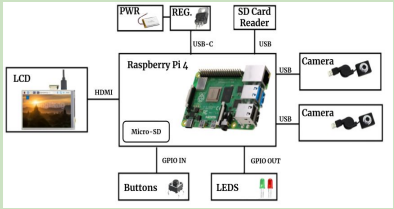
[3] D. Scharstein, R. Szeliski and R. Zabih, "A taxonomy and evaluation of dense two-frame stereo correspondence algorithms," Proceedings IEEE Workshop on Stereo and Multi-Baseline Vision (SMBV 2001), 2001, pp. 131-140, doi: 10.1109/SMBV.2001.988771.

Software Deliverable:



Example of depth estimation on stereo vision image set.

Hardware Deliverable:

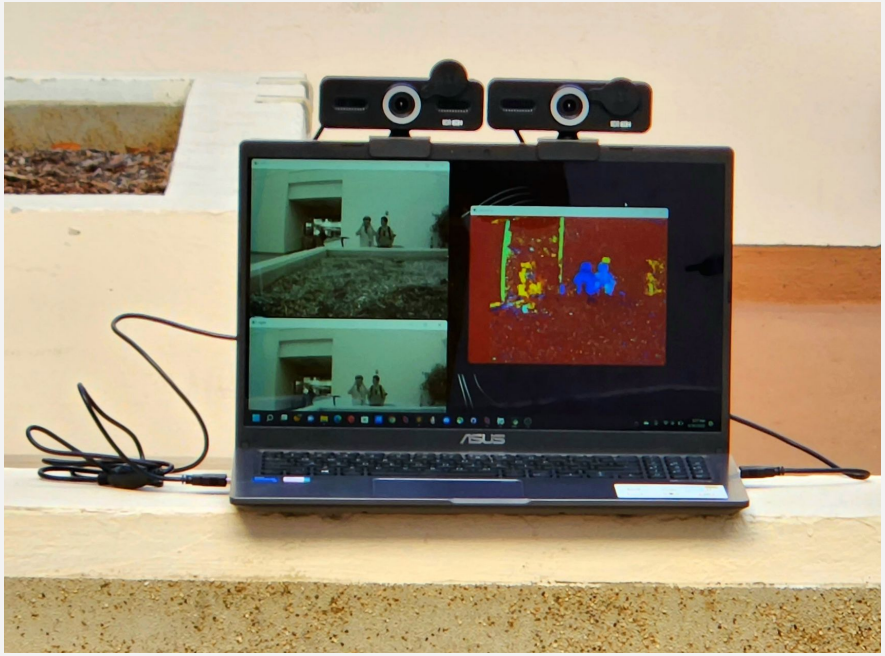


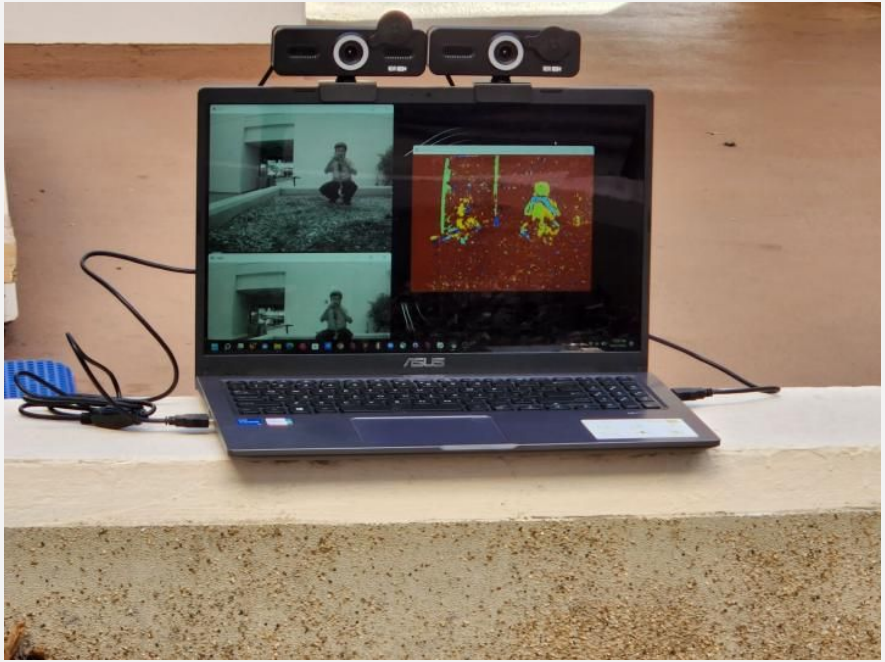
High level wiring schematic of the proposed stereo vision camera system

General Deliverables:

- Functional camera – 3D-printed chassis and manufactured PCB
- Auto-calibration
- Image & video Processing
- UI + touch screen + instruction manual
- ***Object tracking***

Stereo-Vision Demonstration





https://youtu.be/KSEhb_ojmms

Estimated Expenses

Materials Expenses (Need to buy):

- ★ Embedded Camera (x2) – $17.80
- ★ Touchscreen Display – $36.99
- ★ PCB Manufacturing – $25
- ★ Miscellaneous Components – $18.04
- ★ Vendors: Amazon, Digikey

Required Expenses: **~$100**

Requested Funding: **$175**