Affordable and Portable Multi-Spectral Imaging based on Raspberry Pi (MSI-RPi) for Plant Phenotype Studies

User manual for building the mulit-spectral imaging setup

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Product Overview

The designed instrument is conceived to be a low-cost portable plug-n-play multi-spectral prototype based on the non-expensive open-source components & softwares that allow easy use in a variety of applications. We use Raspberry Pi, Raspberry Pi Camera, multiplexer, and specific filters for prototyping the conceptual design. The image sensors used were RGB, NoIR (RGB-IR) micro-camera controlled by a Raspberry Pi board mounted with different filters over a multiplexer. The design files, schematics, and the product images are released with the open hardware license for reuse.

Hardware Assembly

Multi-camera adapter module hardware assembly is fairly easy by connecting four cameras to the input ports A, B, C, D and connecting the output port to RPI board's camera CSI connector. Then plug the multi-camera adapter module into the RPI board pin header connector with aligning pin-1 correctly. The filters are mounted as a plug-and-play over the camera lens.

Get Started

Navigate to "MSI-RPi_Design_Files" in the provided repository below
https://github.com/ajayarunachalam/Multi-Spectral-Imaging-RaspberryPi-Design

There are two folders named "**STEP**" & "**STL**". Before we start using these, let us quickly understand what these files are & why are they needed.

What are STEP & STL files?

STEP file is a CAD file format, usually used to share 3D models between users with different CAD systems. It contains three-dimensional data in a format that can be recognized by multiple programs, such as SolidWorks, TurboCAD, and Autodesk Fusion 360. In the CAD industry, it can be difficult to share models between users with different CAD systems. The STEP format was developed as a solution to this problem. It is designed to be used similarly to how the .PDF format is used for saving documents in a widely supported format. Because of the interoperability of the format, STEP files are often shared between CAD users that use different programs to open the 3D models. While the STL files are a standard file type that interfaces between Computer Aided Design (CAD) software and 3D printers.

Why are STEP & STL needed?

STEP file is an exchange file for 3D models. It can be opened by many 3D modeling programs and then converted to the STL or OBJ (Mesh) format the 3D printers can read. So, a STEP file might be used as a preliminary format to save or share a model for 3D printing. Once they are converted to STL or OBJ mesh then these files are used for final printing of the 3D model, i.e., these are what 3D printing slicing software can read and understand to start printing the 3D model.

How to view these files?

To quickly view our open-source 3D models you can use the following free online service "ShareCAD" from here - https://beta.sharecad.org/en/ . It is a free online service, enabling the user to view drawings using web browsers available for Windows, OS X, Linux, Android, iOS and Windows Phone.

Supported Formats:-

- CAD formats: AutoCAD DWG, DXF, DWF, HPGL, PLT
- Vector formats: PDF, SVG, CGM, EMF, WMF
- 3D formats: STEP, STP, IGES, IGS, BREP, STL, SAT (ACIS), Parasolid (x_t, x_b), SolidWorks etc
- Raster formats: PNG, BMP, JPG, GIF, TIFF, TGA, CAL
- Archives: 7z, RAR, CAB, ZIP, BZIP, TAR

Contact

In case of any technical queries related to CAD files, feel free to contact Per Lindström. You can reach him at per.lindstrom@oru.se

Alternatively, you can also reach me - Ajay Arunachalam (ajay.arunachalam08@gmail.com/ ajay.arunachalam@oru.se) who has documented this user manual.

References

1) https://sharecad.org/
2) https://www.thingiverse.com/
3) https://en.wikipedia.org/wiki/ISO_10303-21
4) https://en.wikipedia.org/wiki/STL_(file_format)
5) https://fileinfo.com/extension/step