Title of Project
Field portable colorimeter

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Summary

Summarise in one paragraph (~150 words) what you aim to do in the project.

This field portable kit will allow you to make a simple, lightweight colorimeter that can measure the colour of any object against which it is placed. It works by emitting light with known properties and measuring what is reflected back into the sensor in three wavebands, corresponding to blue, green and red light. An infrared channel to the device so that a four-band reflectance spectrum can be measured and NDVI calculated.

Proposal

Include i) the problem you are addressing, ii) the biological systems you are using, iii) the design goals for the hardware, iv) how you plan to implement the project, v) the proposed outcomes and benefits.

Field-portable colorimeter

The colour of an object (provided that it does not emit light) depends on its ability to reflect light of different wavelengths in different amounts, and the possibility of measuring this ‘spectral reflectance’ is of enormous value in a wide range of disciplines. Diverse examples could include identifying different pigments used in painting, recognising the health or otherwise of an agricultural crop by the colour of its leaves, identifying soils, minerals etc, and deducing when chicks hatch in a colony of penguins through the colour of the guano excreted by the chicks. If we extend the concept of colour to include not just the visible part of the electromagnetic spectrum but also the near-infrared, measurements of colour become especially valuable for studying the vigour

of vegetation. The use of this kind of ‘multispectral reflectance’ data is particularly important in satellite remote sensing and is used in many areas of polar science.

It works by emitting light with known properties and measuring what is reflected back into the sensor in three wavebands, corresponding to blue, green and red light. If possible, we will also add an infrared channel to the device so that a four-band reflectance spectrum can be measured.

To date, measuring reflectance accurately in the field has involved the use of expensive equipment. Developing a low cost, user friendly kit will allow anyone to make a simple, lightweight colorimeter from simple components that can accurately measure the colour of any object against which it is placed.

We would like to refine NDVI image generation from NOIR camera mounted on RPI3. By using two cameras, one visible camera and one NOIR camera, we can extract and mess together blue and IR channels respectively, to generate more accurate NDVI image.

Estimate the components and budget that you need to complete the project

Item name	Link	Quantity	Price	total
RASPBERRY PI3 starter kit		2	55	110
TSL2561 LUX SENSOR		6	5	30
SHEET EACH OF RED, GREEN AND BLUE FILTER FILM		1	10	10
BREADBOARD		2	10	20
40-PIN GPIO JUMPER RIBBON CABLE		2	10	20
CROCODILE CABLES		20	1	20
RPI CAMERA V2		1	25	25
RPI NOIR CAMERA		1	25	25
BOX TO HOUSE THE SYSTEM		1	20	20

HARDBOARD SHEET		1	30	30
LED WHITE		5	10	50
			Grand Total	360

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