

# Low-cost Open-source Plant Multispectral Imager

Biomaker Challenge Team 22

## Idea and Challenge

Multispectral Imagery adds one or more data channels to classic RGB imagery, normally in the Near Infra-Red (NIR) region.

This extra data contains a lot of information about health of plants.

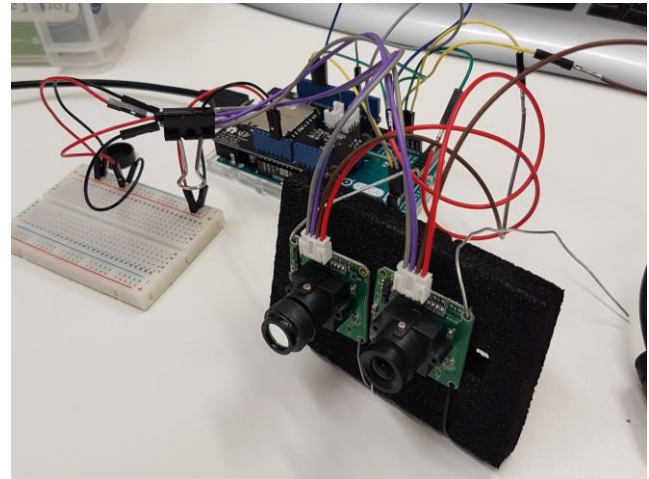
Multispectral cameras that can be mounted on Unmanned Aerial Vehicles (UAVs) for precision agriculture exist but are expensive.

Goal was to build a low-cost (under £400) open-source multispectral camera that was UAV-mountable.

Reliability and accuracy were goals, though would be big challenge.

## Design

Arduino Mega connected to two camera units. One with RGB filtering, the other with an NIR filter along with SD card to store data.



This was hoped to give better direct control over synchronous image capture than for a similar project using a Raspberry Pi

<http://www.instructables.com/id/A-Raspberry-Pi-Multispectral-Camera/>

## Example Data

Images taken of green wall in David Attenborough Building



RGB Image

NIR Image



On left is a Normalised Difference Vegetation Index (NDVI) image. This commonly used in remote sensing and generated for each pixel by:

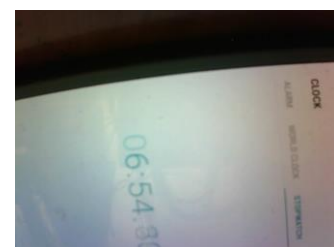
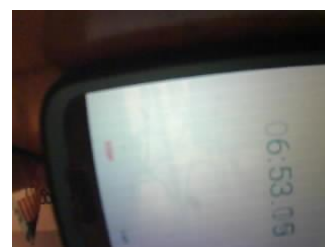
$$NDVI = \frac{NIR - RED}{NIR + RED}$$

## Issues and Conclusion

Cameras available for Arduino have limited capability and aren't very reliable.

Writing data to SD takes a long time – impractical for use on UAV.

Camera captures are not synchronous – need stationary camera.



Images from 2 cameras triggered as close as possible – still 1s delay

A fun learning experience, though practical use on UAV unlikely. Raspberry Pi project mentioned above has more promise.