

Digital Cameras As Biological Sensors

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Introduction:

Tortula princeps

- Desiccation-tolerant moss
- Also known as the Star Moss
- Brown when dry
- Green when wet
- Photosynthetic only when wet



Cyclops Camera

- Small, light-weight, relatively inexpensive
- Poor image quality, not user-friendly
- Wireless
- Requires batteries



Sony SNC-RZ30N

- User-friendly, good quality images
- Expensive, large, heavy
- Not wireless
- Requires a connected computer or Ethernet



Problem Description:

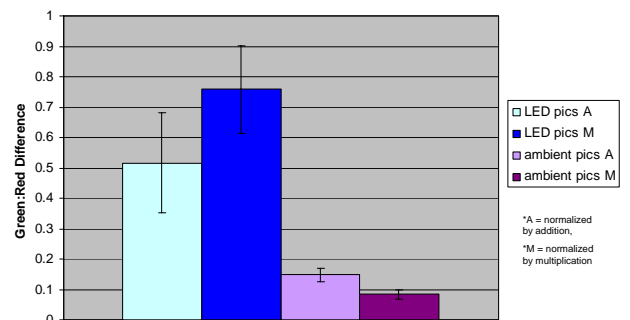
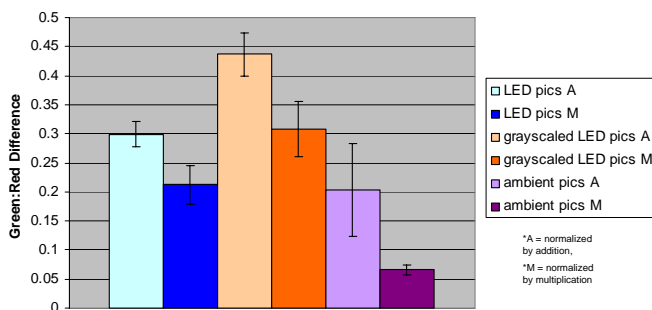
Using a Digital Camera as a Colorimeter to Capture Moss Color at Night with the Aid of LEDs

- Goal: measure the color of the moss by using a digital camera as a colorimeter
- Previous work shows that the green:red pixel ratio of digital images can indicate estimates in photosynthesis of the moss.
- In the field, variable lighting conditions can overexpose or underexpose the image, making analysis of the image difficult.



Proposed Solution:

- Taking images of the moss at night with the aid of LEDs allows for a controlled lighting situation.
- Images taken in the dark with LEDs as a light source will provide more reliable moss data than using ambient light.
- The green:red pixel ratio of the images indicates whether the moss is dry or wet.
- The Sony camera is a good choice for laboratory use; the Cyclops camera is a good choice for field use.



Sony Camera Results:

- Largest difference in green:red ratio between wet and dry moss was in the grayscale LED pictures, followed by the color LED pictures, then in the ambient light images.
- In the LED pictures, only one color channel was used to determine the pixel value; in the grayscale LED images, all color channels were used in getting the grayscale image.
- Either method using LED lighting is better than ambient lighting.

Cyclops Camera Results:

- The images taken with LEDs had a larger difference in green:red ratio than the ambient light images
- However, the LED images also had a larger standard error
- The LED images better highlight the differences between dry and wet moss green:red ratios, but further work will be necessary to reduce the standard error.

