White Balancing in complex lighting environment

White Paper by Takami Hasegawa / Dick Goudriaan

By Dick Goudriaan date: 05-Nov-2023

Prism is our pasion

- We are used to use <u>white light</u> as a source to create a color picture with high color fidelity.

- With a light source of CRI close to 1, cameras with Bayer based sensor can do good imaging. The Bayer algorithm, by software, can create perfect image quality.

  - *Color temperature between 4000k to 6000k kelvin has good color quality. memo: CRI display is not common in camera industry. Most cameras rely on other methods to measure and adjust the color accuracy, such as using presets, custom white balance, or color checkers.*

- But when your light conditions are not perfectly controlled. What options do you have as system developer to create a good white balancing?

- Applications are semiconductor industry [where yellow is used] or outside applications like drones. Or big factories where light cannot be controlled aswell.

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Using single color LED lighting

Green LED 524 nm

Typical bayer response
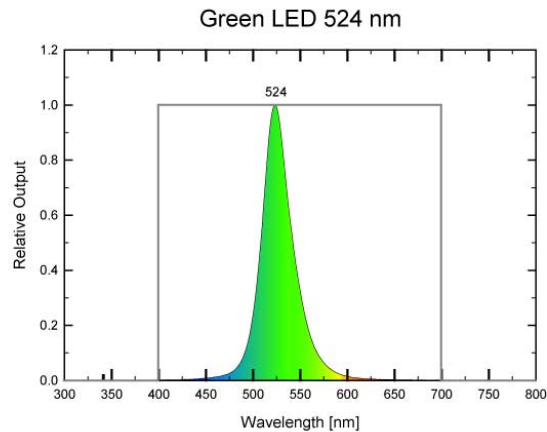
- Single color LED lighting is not monochromatic but does have contents of other wavelengths as well.
- Green Led for example has typical a curve as in the picture left.
- Common is to use the green channel as input for the white balancing.
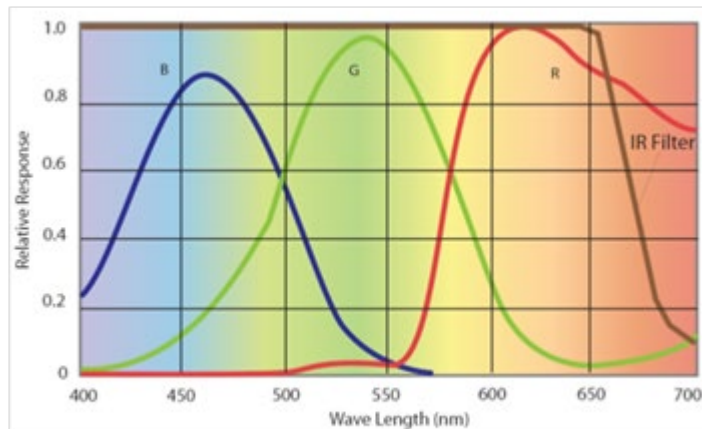
- The purpose of this paper is to illustrate the complexity of white balancing and promoting the prism [Multi-sensor] camera as an alternative where white balancing cannot be controlled.

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Dynamic range of white balance

PROS : Good dynamic range of White Balance camera is using at outside such as remote sensing, drone and tunnel lighting

Test method : Comparing ability of White Balance by using G-LED.

Summary : Prism camera has better dynamic range of white balance.
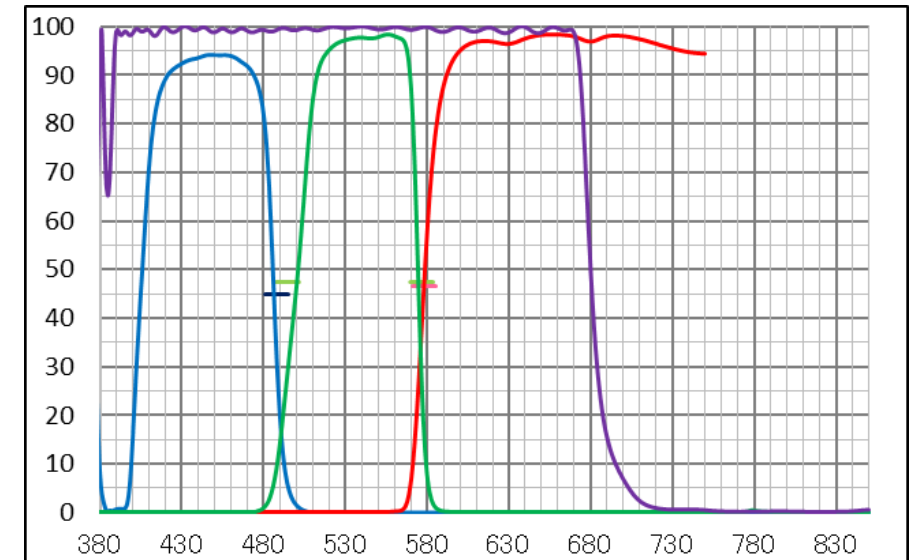
Spectral response of prism

PURE SPECTRA

Passion for prisms

Bayer: Before WB

Prism: before WB

F4   f8mm   35msec

WB done by white cup.

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PURE SPECTRA

Passion for prisms

Bayer: Before WB

Bayer: After WB, prior color processing

The Sepia tone is due to the overlap of R and B response of the used green LED lighting

Sepia tone picture needs to be processed by Bayer Algorithm

F4   f8mm   35msec

WB done by white cup.

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PURE SPECTRA

Passion for prisms

C2 : Before WB

C2 : After WB

The green channel of the prism has no blue or red response.

Automatic WB using the cup creates a color picture

Summary: Prism camera's color reproduction is very good

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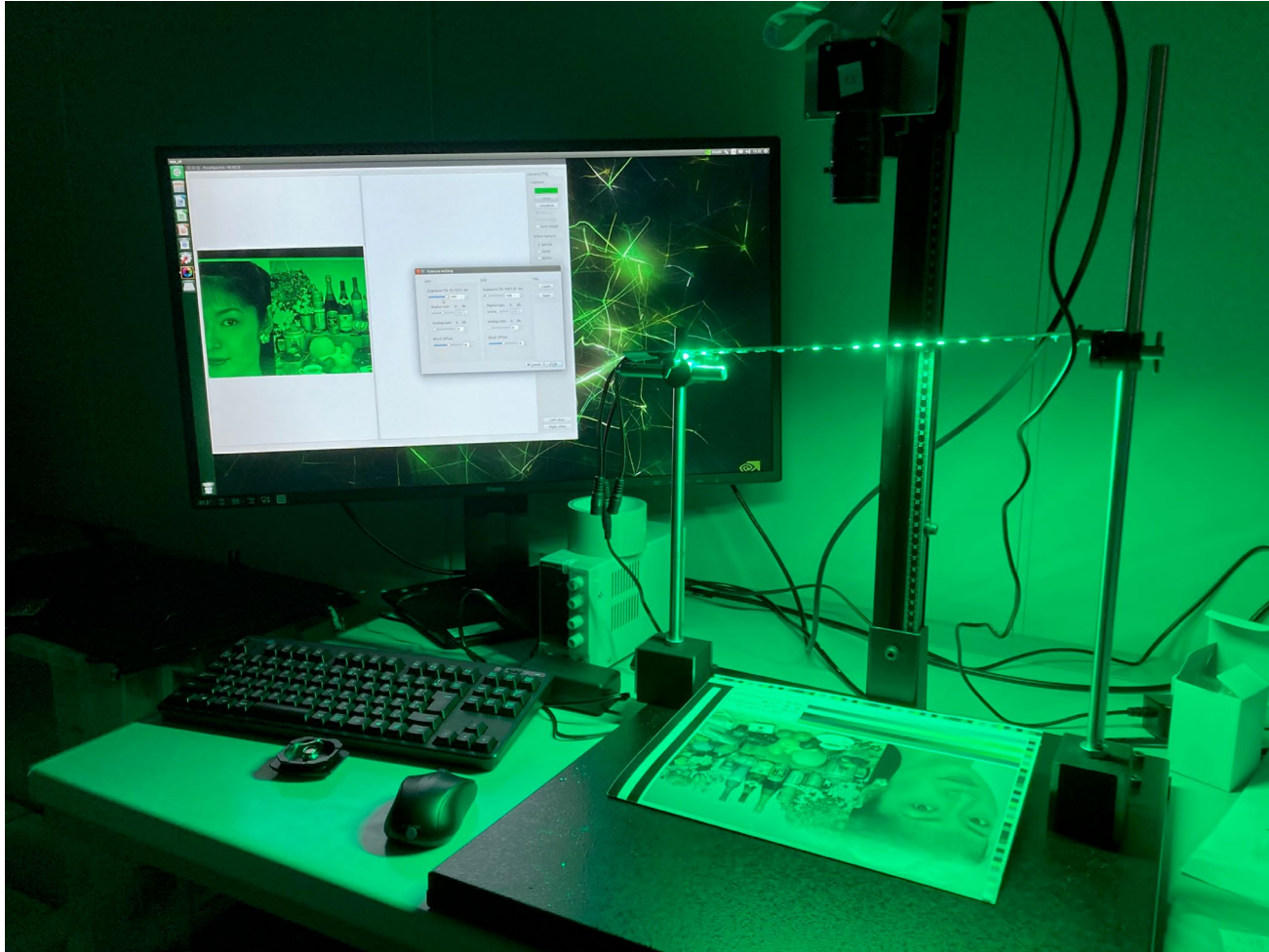PURE SPECTRA

Passion for prisms

Bayer: After WB

C2: After WB

Summary: Prism camera's color reproduction is very good @ not controlled lighting circumstances

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White Balancing measurement

We created a perfect color image in a "dark room" using green light only.

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