

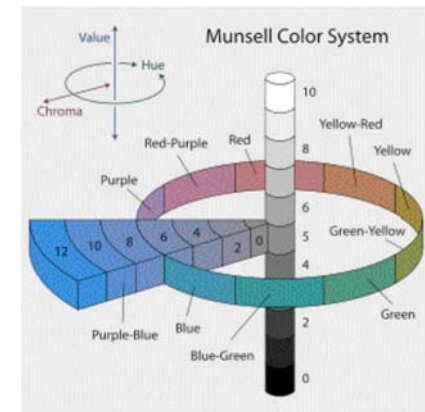
Color adjustment with Multimatrix in digital cameras

Alfonso Parra AEC

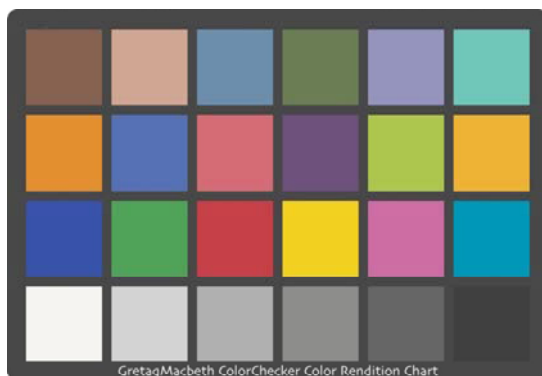
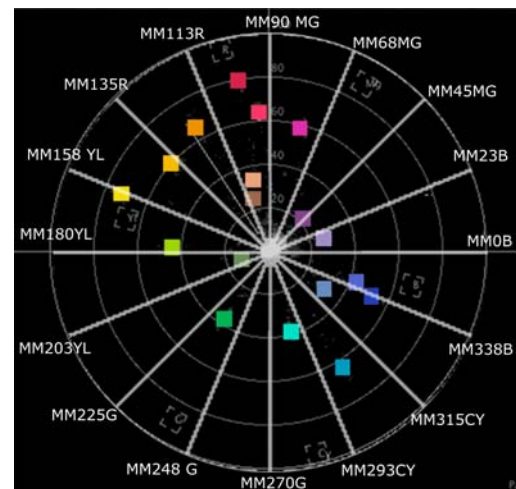
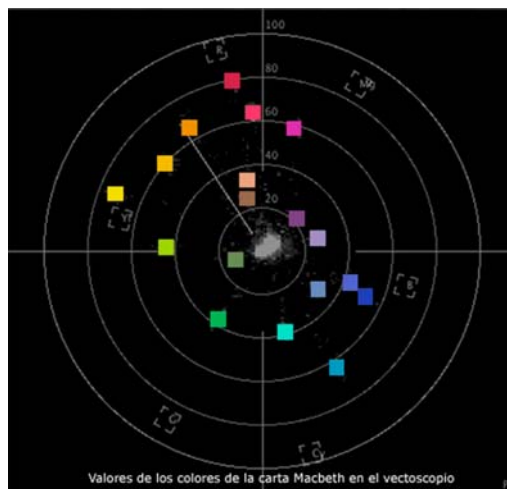
Multimatrix is a digital camera option that allows the user to modify specific color areas without affecting other colors. This tool changes color tone as well as saturation. To make the adjustments, the user needs to use a vectorscope.

Practically all the current color systems, including the CIE's XYZ color space, are based on the three-dimensional color perception model developed by Albert Munsell (1858-1918). Munsell's "tree" distributes color around a pole that determines their brightness, from black to white and all the intermediate grays in between. Primary and intermediate colors, from purple to red, are organized around the pole. A color's distance from the pole indicates greater or lesser saturation. The vectorscope we use works the same way; thus, any color movement to the left or right indicates a change in tone, and its proximity or distance from the center indicates the degree of saturation.

In the F900 digital camera, the multimatrix option that modifies color appears like this. PHASE chooses the color to be modified. HUE modifies the color tone with values that stretch from +99 to -99, and SAT modifies the color saturation from -99 to +99. The page includes pre-fixed color spaces like SMPT or the ITU, EBU and NTSC.



The color space used by the multimatrix is divided into 16 zones, as shown in the graph below. The user can act on each of these zones independently. To see the changes, I've used the Macbeth color chart, as seen in the vectorscope.



Macbeth color chart and its representation in Vectorscope

Diagram of chart

Dark Skin	Light Skin	Blue Sky	Foliage	Blue Flower	Bluish Green
Orange	Purplish Blue	Moderate Red	Purple	Yellow Green	Orange Yellow
Blue	Green	Red	Yellow	Magenta	Cyan
White (0.05) *	Neutral 8 (23) *	Neutral 6.5 (44) *	Neutral 5 (70) *	Neutral 3.5 (1.05) *	Black (1.50) *

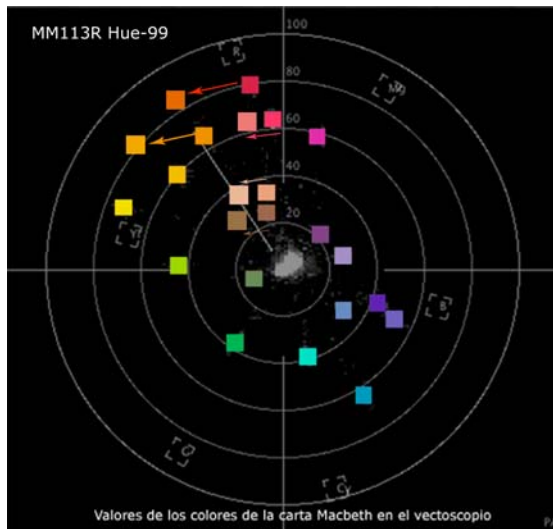
ColorChecker is a registered trademark of GretagMacbeth LLC. *Optical Density

16 zone division in multimatrix represented in Macbeth colors

Let's see how to modify the MM113R color zone. As you can see, it corresponds to the red zone. I've chosen this color because, as is well known, red is "peculiar" in video and here we can see

how to manage this tone to obtain a more natural color, or achieve slightly warmer or colder skin tones. I've used the maximum and minimum values to be able to see the differences clearly.

MM113R hue-99



As can be observed, when acting on 113R, the red and oranges are modified as well as the Caucasian and darker skin tones.

Observe how these colors modify their tones becoming warmer as they move towards the yellow.

The red becomes orange and the orange becomes yellower.

The salmon tone is less red, less magenta.

Skin tones are warmer, which could be useful when shooting outdoors on a cloudy day and we want to achieve a more pleasant skin tone, for example.



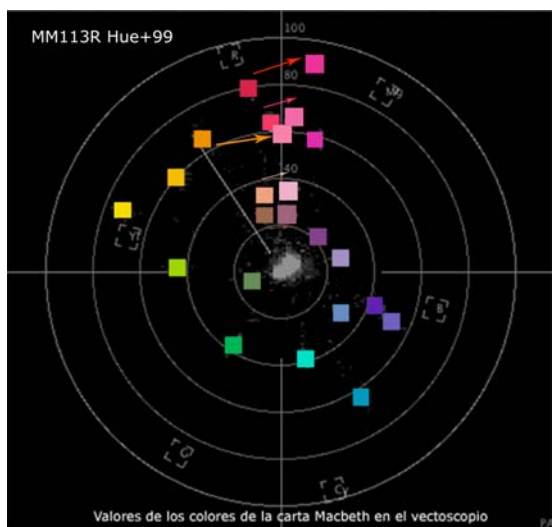
Color modifications with Hue -99



Standard chart colors.

I've desaturated and darkened the colors that are not affected on the chart in order to clearly appreciate the modifications.

MM113R hue+99



If the HUE with positive values is modified, the reds move towards the magenta.

The red practically disappears to become Magenta. The orange and the salmon color too.

Skin tones also start to change, becoming more purple and magenta.

In my case, and in normal conditions, when I want to obtain a natural skin tone, together with grading, I move the tone slightly to positive values and desaturate the red somewhat.

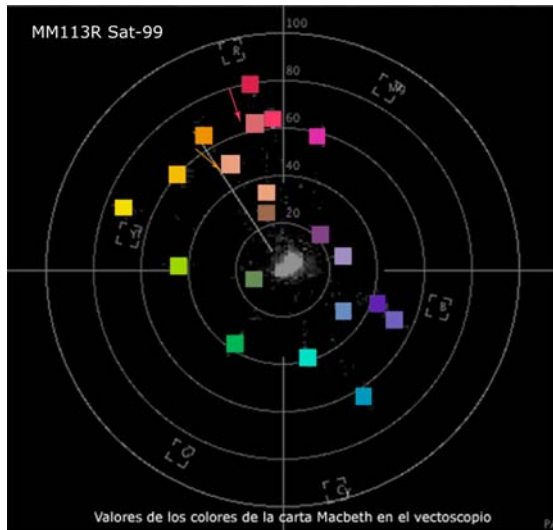


Colors modified with Hue +99



Standard chart colors.

MM113R Sat-99



Moving the SAT value to negative desaturates the corresponding color; in this case, you can see how the reds, oranges and soft reds are affected. Skin tones are not affected, but, in any case, if what you need is a natural appearance, both in faces and red tones in general, it is best to desaturate said value. Normally, I take this value to -40 .

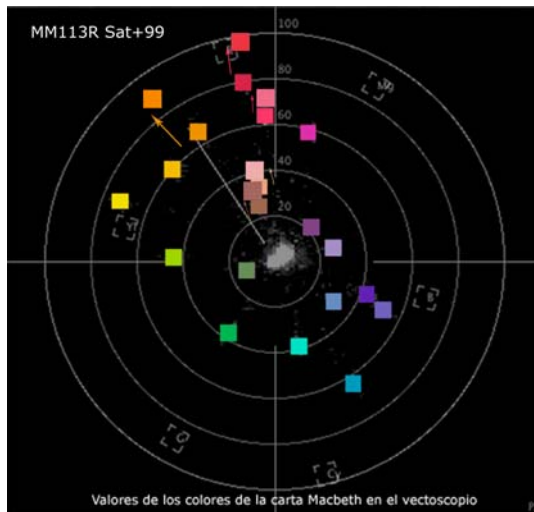


Colors modified with SAT -99



Standard chart colors.

MM113R Sat+99



Positive values in SAT saturate reds and oranges and the skin tones slightly. I normally apply a slight saturation to the reds (+50) when I shoot in very cold, cloudy outdoors with very pale actors.

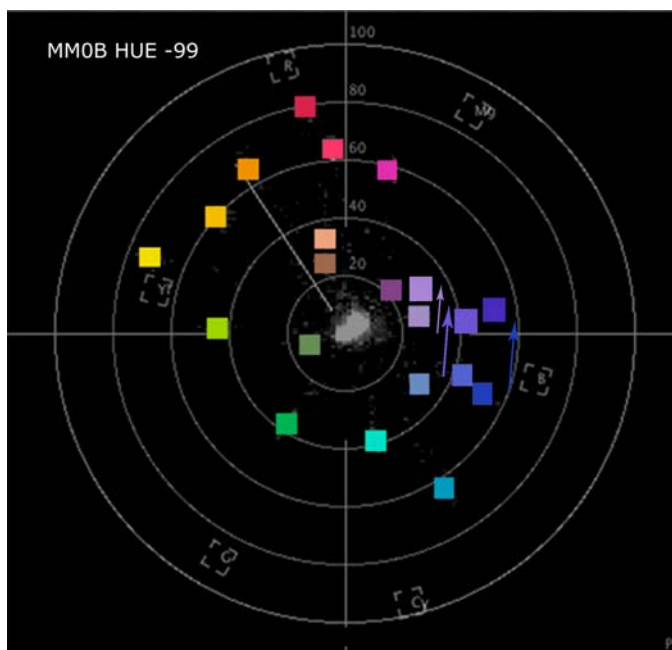


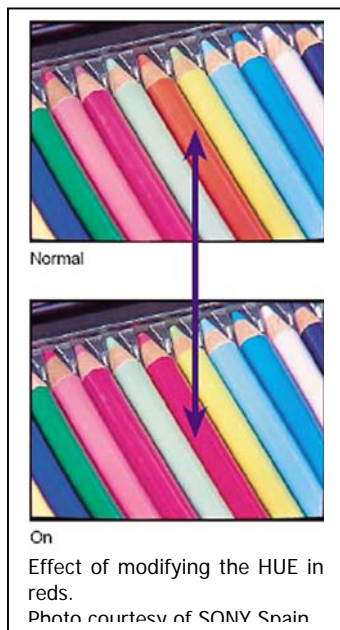
Colors modified with SAT +99



Standard chart colors.

Modifying color with the multimatrix lets the user achieve certain color tones and, for example, adjust chroma color tones, whether they be greens or blues, especially when they are lit by lights with deviations, as is the case with fluorescent or incandescent lights. In the graph, for example, you can see the effect on the blue when varying the HUE in -99; the blues become colder moving towards magenta.





In sum, the multimatrix tool together with the user matrix lets the user adjust the camera's colorimetry to the needs of each production, and thus helps to achieve the adequate tone in post-production with less "devices" and "errors" due to compression.

References:

High Definition and 24P cinematography. Paul Wheeler. Focal Press

www.xrite.com

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www.poynton.com

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