Although the RGB space provides a direct method for displaying color images, it cannot handle the perceptual characteristics of colors such as intensity, hue, or saturation.

HSI stands for Hue, Saturation, and Intensity. This color space model is more in line with human's intuitive perception of colors.

Modifying one or more channels in an RGB image can cause shifts in hue, but modifying the I or S components will not. Therefore, histogram equalization or modification can be applied to the I and/or S components.

The method in Pitas and Kiniklis[1] shows that more visually appealing results are obtained, when the intensity component is only used. Saturation used either separately or jointly with intensity admits large values.

Assuming that the color pixel is modeled by the random vector $\vec{X} = (X_H, X_S, X_I)^T$,the PDF for the intensity component is given by[1]

$$f_{X_I}(x_{I_k}) = \begin{cases} 12 \times x_{I_k}^2 & for\ 0 \le x_{I_k} \le 0.5 \\ 12 \times (1 - x_{I_k})^2 & for\ 0.5 \le x_{I_k} \le 1 \end{cases}$$

[1] I. Pitas and P. Kiniklis, "Multichannel techniques in color image enhancement and modeling," in *IEEE Transactions on Image Processing*, vol. 5, no. 1, pp. 168-171, Jan. 1996, doi: 10.1109/83.481684.