Posted: 9/10/2024 **Due: 9/16/2024 at 6:00PM**

Question 1: True or False?

Tell whether each of the following statements is true or false by checking the appropriate box. It may be a good idea for you not to check any box if you do not know the correct answer, because you will lose points for incorrect answers (and get zero points if you do not give an answer).

Statement	True	False
a) Saturation is a measure of the overall amount of light within the visible spectrum.	[ ]	[✓]
c) A color with a hue of 120 degrees and saturation and intensity greater than zero looks blue.	[ ]	[✓]
d) In the human retina, the color-sensitive light receptors are called cones.	[✓]	[ ]
i) The focal length of a camera is the distance between its lens and the object to be photographed.	[ ]	[✓]
i) Every RGB color can be converted into a corresponding HSI value.	[✓]	[ ]

Question 2: It's all about HSI

(a) Explain how colors are represented in the HSI color space. What are its dimensions, the range of values in each dimension, and how do changes in these values affect the represented color? Please provide as much detail as you can think of, but do not use any mathematical formulas.

(b) What are the advantages of the HSI color space as compared to the RGB color space for artificial vision systems and for humans? Again, please give as much detail as possible.

(a) The HSI color space represents colors using three dimensions: Hue, which defines the type of color (e.g., red, green, blue) and ranges from 0° to 360°; Saturation, which indicates the vividness or purity of the color and ranges from 0 (gray) to 1 (fully saturated); and Intensity, which measures the brightness of the color and can be represented from 0 to 1 (normalized) or 0 to 255 (for digital imaging). Changes in hue shift the color along the spectrum, changes in saturation adjust the color's vividness, and changes in intensity affect how light or dark the color appears.

(b) The HSI color space aligns more closely with human perception by separating color (hue) from brightness (intensity) and vividness (saturation), making it more intuitive than RGB. It is also advantageous for artificial vision systems because it simplifies color recognition and segmentation, as hue remains relatively stable under changing lighting conditions. Unlike RGB, where all channels are affected by light changes, HSI allows systems to focus on hue for more consistent detection. Additionally, HSI facilitates easier color manipulation and is widely used in image processing tasks like contrast adjustment and object recognition.