

Sensing, Computing, Actuating

Lecture 13 - Displays

This instruction exercise consists of three questions that show example questions related to the lecture on displays. In preparation for the exam you should of course not only study these questions, but also the examples shown on the lecture slides.

Exercise 1: Displays

- (a) You need to select a display for an application in a dark environment. You can choose between a transmissive or a reflective matrix display which display do you choose? (Explain your answer)

Answer: Transmissive needs to be used as there is no light in the environment to reflect.

- (b) To build a display that can show all possible colors it is not necessary that this display can produce all wavelengths. Explain why the display can produce all colors without the ability to produce all wavelengths.

Answer: Our eyes are sensitive to red, green and blue. By counting the ratio of photons the color is determined.

- (c) Electromagnetic radiation with a wavelength between 400nm and 700nm with sufficient strength can be seen by our eyes as light. Light with a specific wavelength creates a specific color impression, but the reverse is not true, a specific color impression does not tell us which wavelength this light has. Explain why this is the case.

Answer: Our eyes map a ratio of the light intensity in different wavelengths back to a color. Different wavelength combinations can have the same ratio and hence map back to the same color.

- (d) Explain how spatial color synthesis works.

Answer: Light is sent through three spatially separated color filters of red, blue, green colors. Because the density of these pixel elements is so small, our eyes interpret it as coming from a single source.

- (e) LCD is currently the most dominant display. Why are moving objects often not sharp on an LCD?

Answer: This is due to motion blur which occurs when an image is displayed for a duration of time. A video is a sequence of such images and our eyes interpret the motion in the images. Since an infinite motion seems to occur between two images, our brain blurs the object (i.e., it creates motion blur).

- (f) Does a scanning display show motion blur? (Explain your answer)

Answer: Yes, a scanning display reduces motion blur but it does not eliminate it completely. Steady (parts of an image) are still shown for a period of time and not instantaneous.