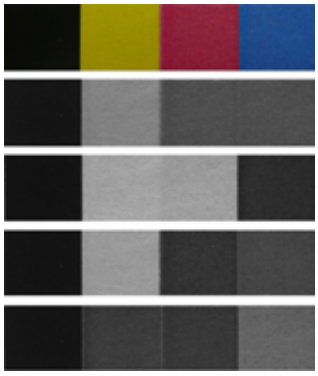
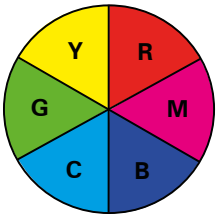
2.3 Light and colour



Colour bar illuminated with various wavelengths



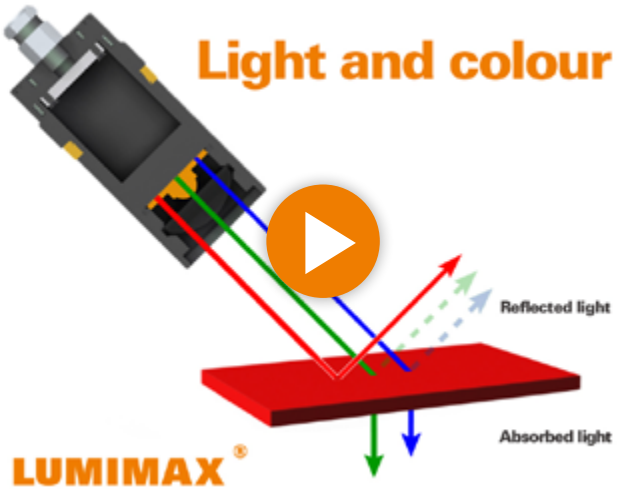
Colour wheel

In chapters 2.1 and 2.2, we covered some basic theoretical principles related to light, wavelength and colour. We now want to use this chapter to bring these concepts together and relate them to the topic of image processing. Especially in the case of image processing tasks involving coloured objects and backgrounds, choosing the right wavelength is an important aspect. Particularly when using monochrome cameras, use of the right light colour can achieve effects that decisively improve solutions to many Machine Vision applications.
Contrast is significantly improved in the object image without additional optical or software filters being needed. This considerably simplifies the image processing task.
The principle itself is very simple: an object reflects certain wavelengths and therefore appears coloured to the human eye. An object that we perceive as red therefore reflects the red portion of the light. Other wavelengths are instead absorbed.
Conversely, this means that lighting a red test object with red light will make the object bright in the image. If we illuminate it instead with a wavelength containing no red portion, the light will be absorbed and the object will appear dark.

If we take a second look at the colour wheel, this effect can easily be transferred for use on other colours and wavelengths. If a yellow object is irradiated with blue lighting, it appears black. When lit with red or green light, it reflects the red or green colour portions of the light. The object appears bright. Here, it is important to remember that white bodies reflect all wavelengths and black bodies absorb light most strongly. Accordingly, these bodies usually respond independently of the colour temperature.

Special cases apply to the non-visible spectrum, i.e. to infrared and ultraviolet light. These topics will be discussed in chapters 2.4 and 2.5.

The range of applications for coloured lighting is very broad indeed. Examples of its use include inspection of printing on products in the packaging industry, in the assembly of coloured plastic parts or for pick-and-place tasks involving coloured objects or backgrounds.



Video can be viewed from https://iimag.de/en/lumimax/useful-facts/videos/video-light-and-colour.html

White QR code on red background under **red** light

White QR code on red background under **blue** light