

## Exercise Sheet 7

Docente: Miguel Tavares Coimbra

1. **Color descriptors – HSI histogram.** Create a 256 coefficient descriptor that consists of the histogram of the color values of each pixel.
  - Convert the image into HSI color space.
  - Quantize each color parameter as follows:
    - i. *Hue* – 16 values (4 bits)
    - ii. *Saturation* – 4 values (2 bits)
    - iii. *Intensity* – 4 values (2 bits)
  - Combine these 3 values into a single *byte* as follows:  
 $hue \ll 4 \parallel saturation \ll 2 \parallel intensity$
  - Create the histogram for the whole image
  - [Optional] Visualize the histogram in such a way that each bar corresponds to the color of its respective bin.

Figura 1 – Histograma

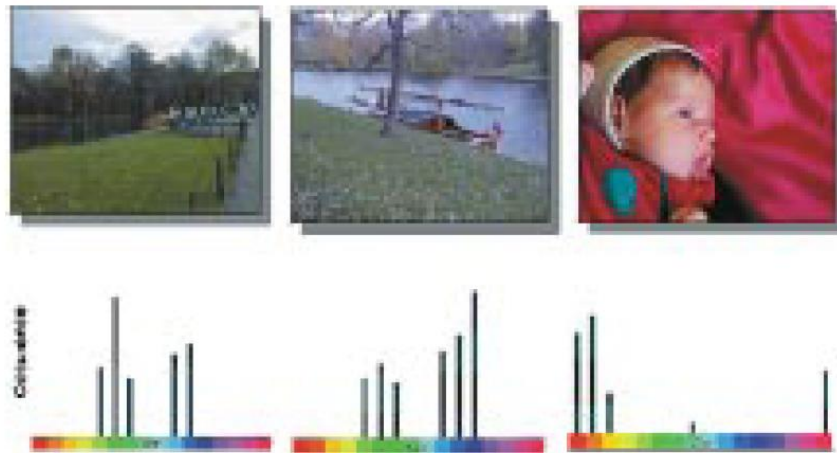


Fig. 2. Three color images and their MPEG-7 histogram color distribution, depicted using a simplified color histogram. Based on the color distribution, the two left images would be recognized as more similar compared to the one on the right.

**2. Texture descriptors – Local Binary Patterns.** Create a 256 coefficient descriptor that consists of a histogram of texture binary patterns for each pixel.

- Idea: Compare the *intensity* value of a pixel with its 8 neighbors.
- Start on the upper left corner.
- The result of the comparison is 1 if the value of the neighbor is larger or equal to the pixel value. Otherwise the result is 0.
- Combine all the results into a single byte (using *bit-shifting*), thus creating a *binary pattern* for each pixel.
- Create the histogram of the occurrences of each *binary pattern* for the whole image.

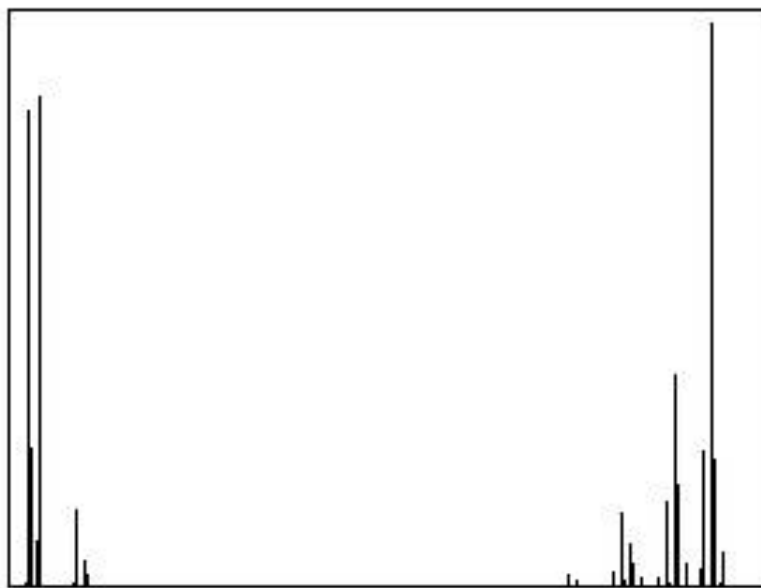
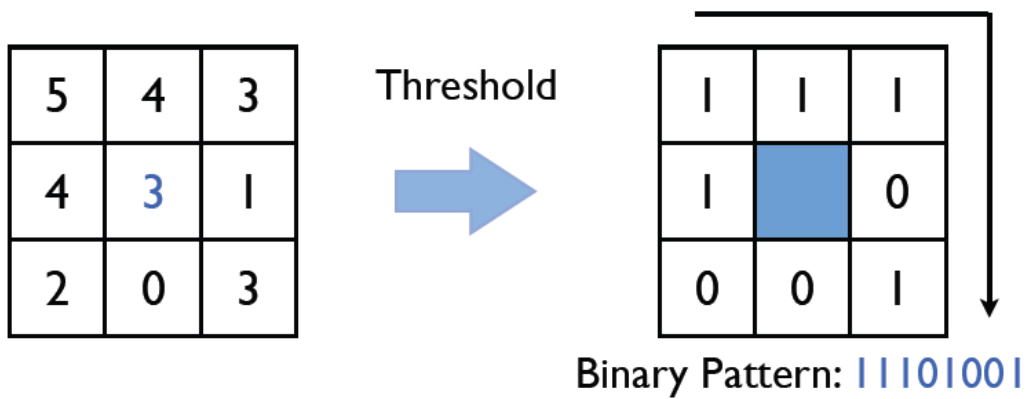


Figure 3 –HSI histograma of the image 'lena.jpg'