Assignment 1

Group of two (up to 3) persons.
Submission in the Moodle of the:

I. code file ready to work (in colaboratory);

The quality assurance tester of a M&M factory retrieves a sample from the production every hour to determine some properties of chocolate peanuts. The factory uses a computer vision application to automatically calculate some properties of the sample, namely:

- the distribution of each color in the sample, e.g., the number of red (or blue, etc) chocolates. At the end, if the sample does not have chocolate peanuts of all colors, the system must raise an alarm by printing “Color *XPTO* is missing”.
- the average shape area of all chocolate peanuts in millimeters and organized by color.

Considering these requirements:

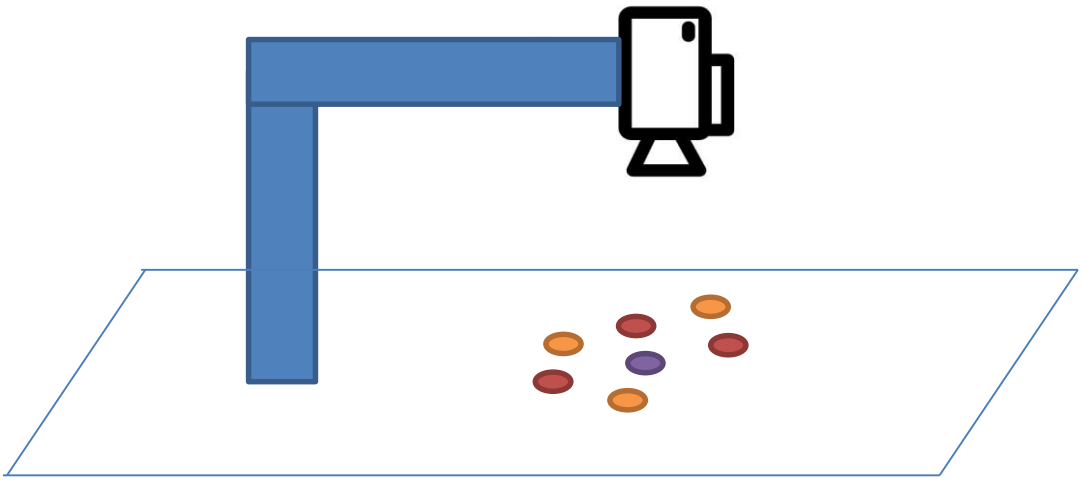

Figure 1 - setup of the imaging system.

a) Calibrate the intrinsic parameters and lens distortion of the camera.
b) Calibrate the extrinsic parameters of the camera setup (or instead, use the extrinsic image to manually measure the dimensions of a black

square of the chessboard in pixels. In this way, you will know the conversion between pixel to millimeter).

c) Consider only the images retrieved from a **White Background**. Implement the functions described above.
   I. Define a ROI (region of interest);
   II. Calculate the color distribution (up to 4);
   III. Determine the shape area for the chocolate peanuts in pixels;
   IV. Determine the shape area for chocolate peanuts in millimeters and group by color;
   V. Show a histogram of the shape areas of the chocolate peanuts for the entire sample;
   VI. Provide some recommendations that the M&M factory should take into consideration to improve the performance of the quality assurance process based on image processing (e.g., imaging setup, calibration process and photometric effects).

d) (*valorization of 3 values*) Consider the images retrieved from a Grey Background and repeat the previous point without defining a region of interest.