Machine Vision Project Report

"Shape Detection on the Sorting Line"

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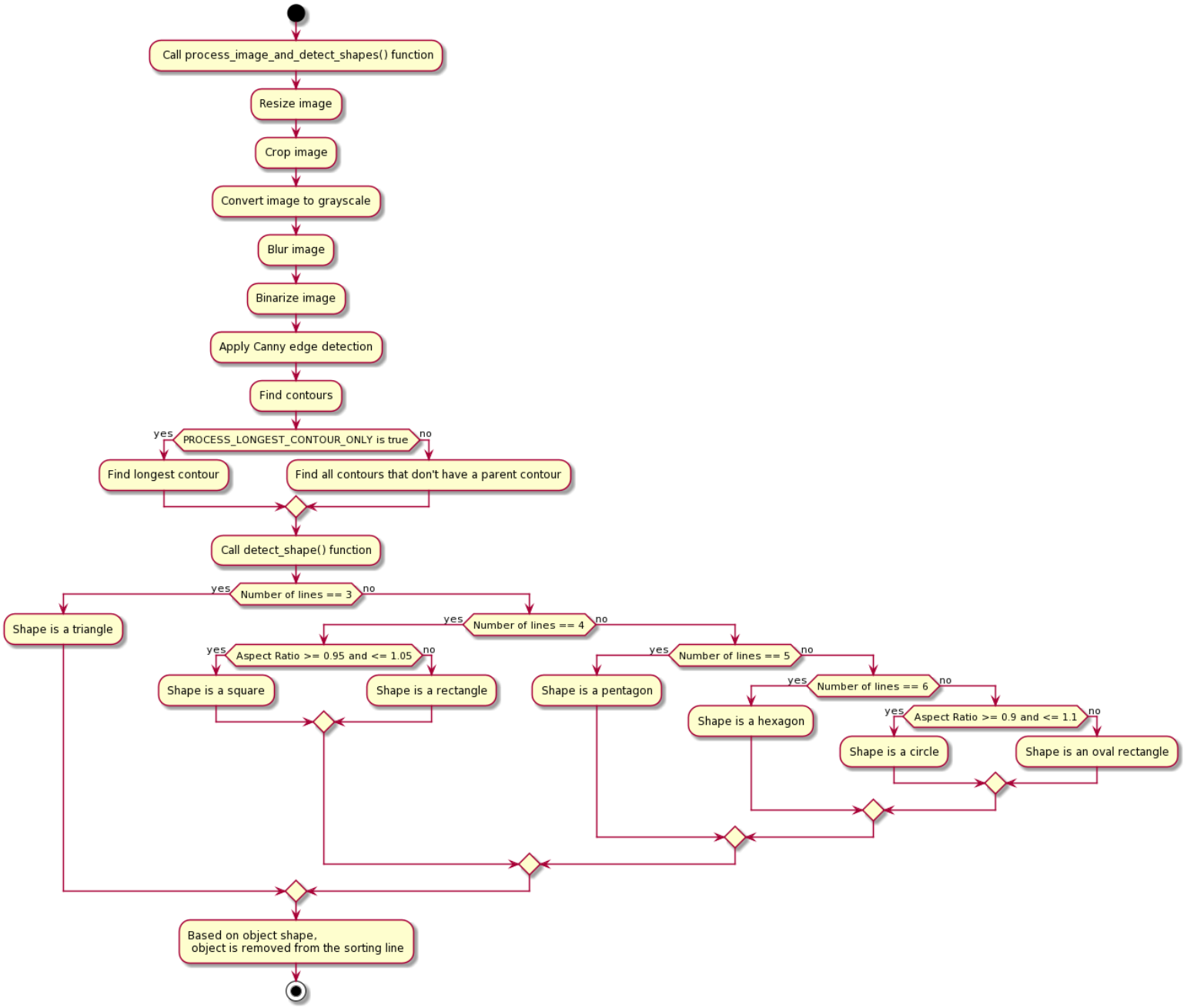
1. Activity Diagram

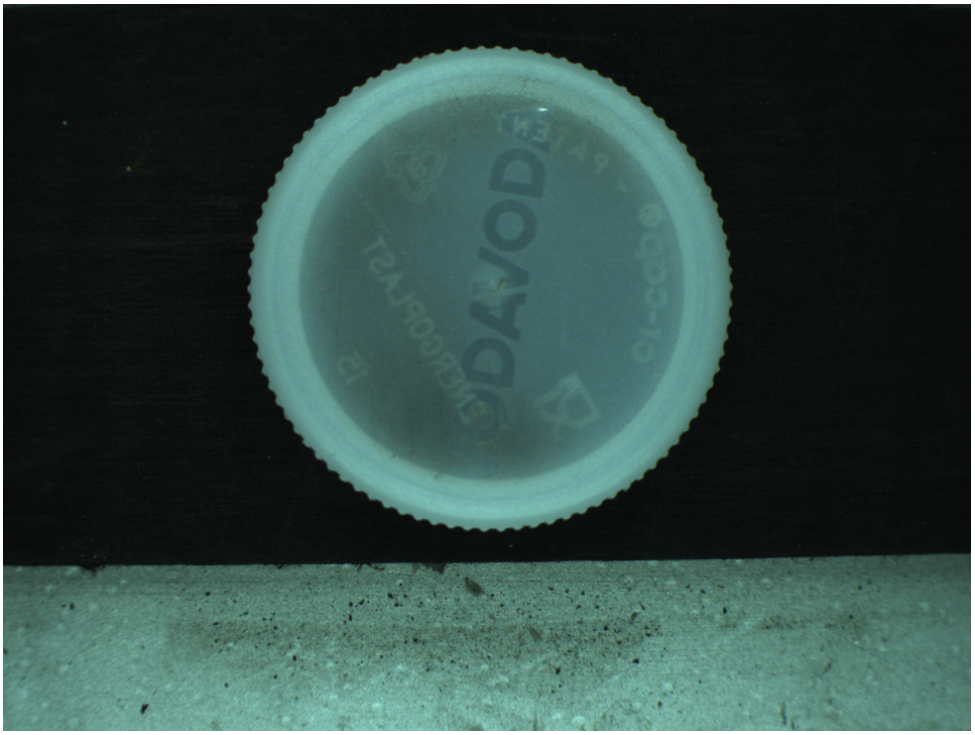


2. Algorithm Explanation

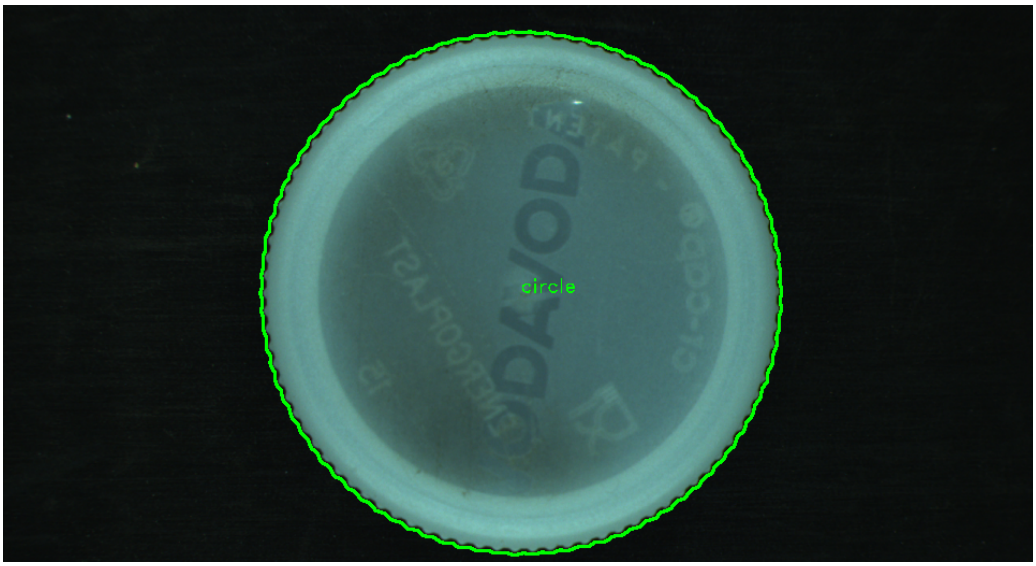
The function to detect object shapes is called when the object has been detected to be under the camera and the photo has been taken. This image is then processed by the *process_image_and_detect_shapes()* function. Initially, the image is resized, cropped (for the removal of the non-black-background part of the image which obstructs detection), and converted to grayscale. Then, the image is blurred to remove inaccuracies of physical not-completely-black background and imperfect object colors, binarized, and Canny edge detection is applied to detect edges. The contours in the image are identified and depending on the configuration, either all contours without a parent contour are processed or only the longest contour is selected for processing. This prevents smaller contours which are the result of inaccuracies from being processed and labeled. The *detect_shape()* function is then called to identify the shape based on the number of lines in the contour. It checks the number of lines and identifies the shape as a *triangle*, *square*, *rectangle*, *pentagon*, *hexagon*, *circle*, or an *oval rectangle*. For *squares*, *rectangles*, *circles*, and *oval rectangles*, it differentiates between them based on the aspect ratio. Finally, the object is removed from the sorting line based on the detected shape.

3. Results

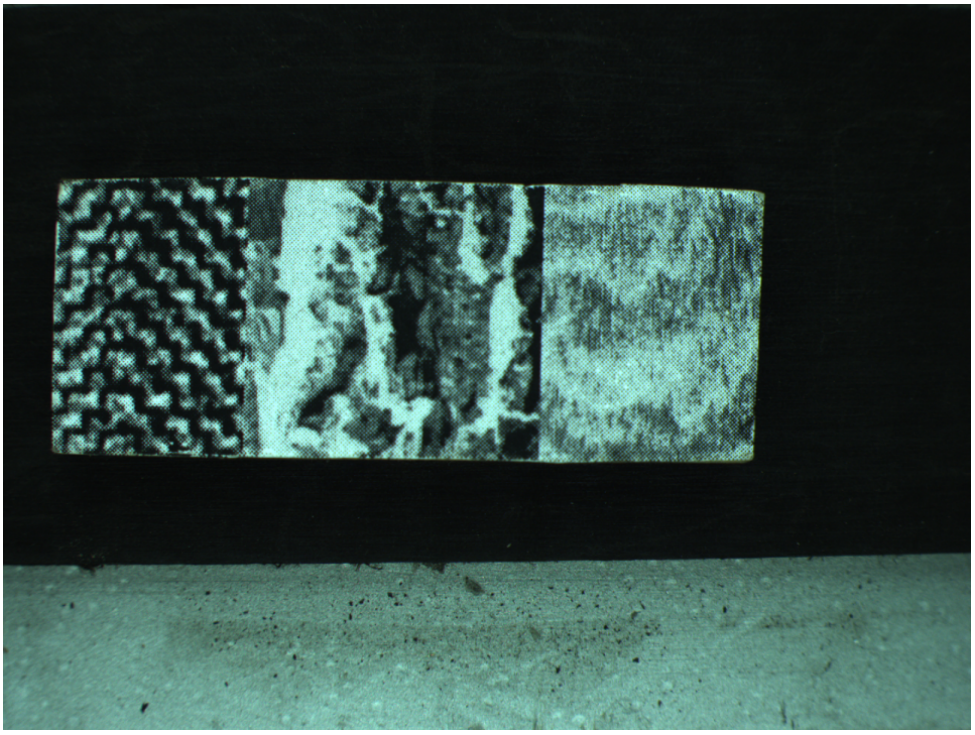
Some of the images with the resulting post-processing image are shown below.



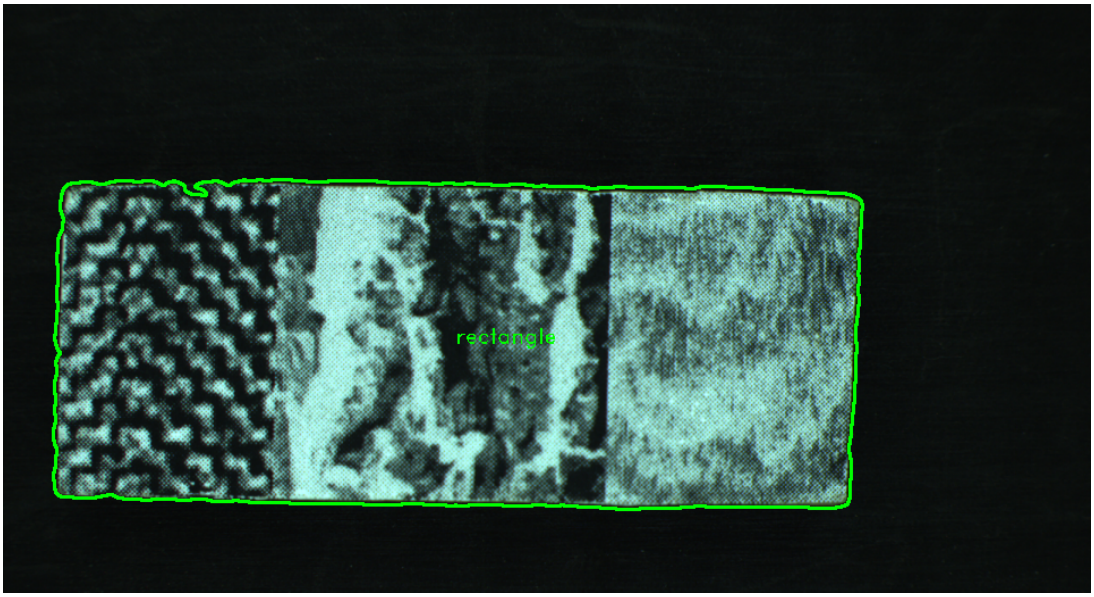
(Picture 1 - Original image of a bottle cap)



(Picture 1.1 - Bottle cap detected as a circle)

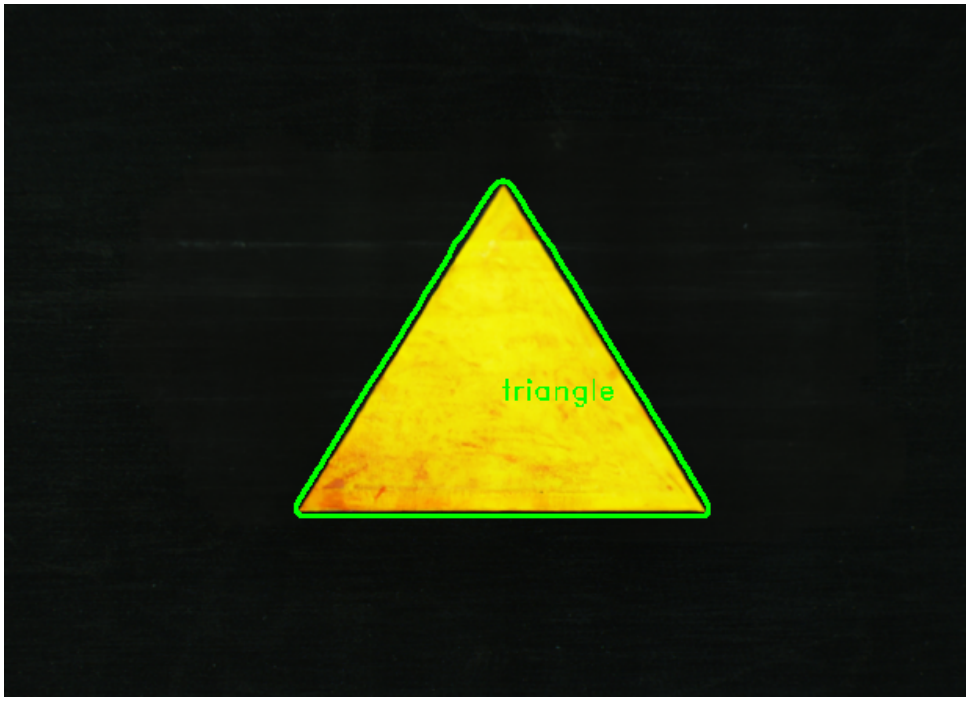


(Picture 2 - Original image of a piece of rock)

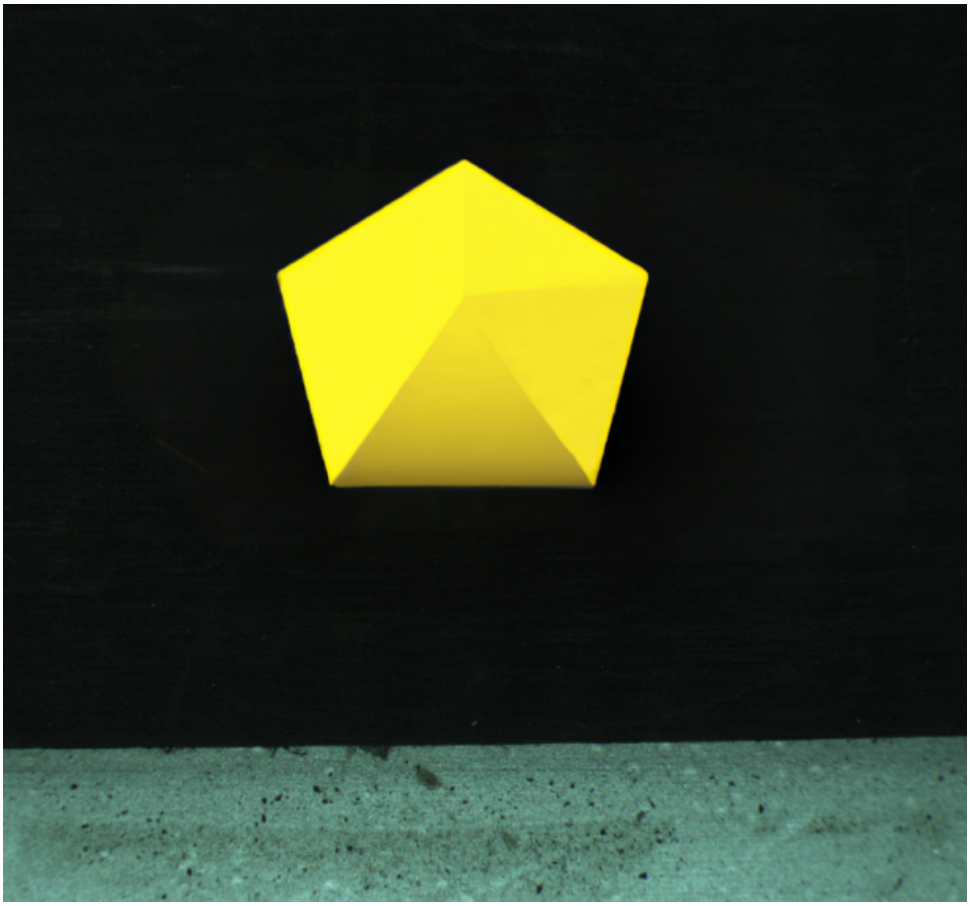


(Picture 2.1 - Piece of rock detected as a rectangle)

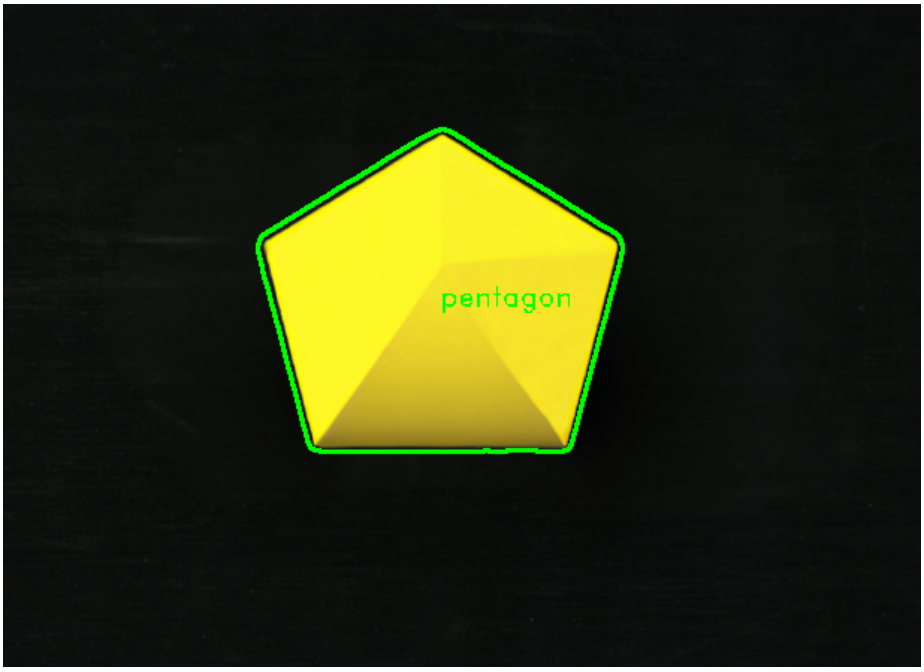
(Picture 3 - Original image of a triangle)



(Picture 3.1 - Physical triangle detected as a triangle)



(Picture 4 - Original image of a small pentagon)



(Picture 4.1 - Pentagon detected as a pentagon)