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1. Analyzing Clinical Test Tubes

The code of this application and the images used are available in the Demo Applications subfolder in your Open eVision installation folder.

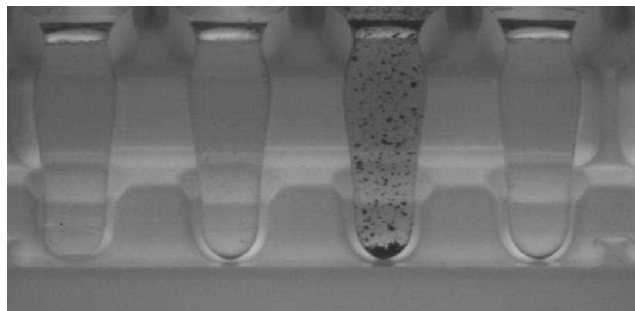
Application objective

In clinical laboratories, it is common to analyze the reaction of blood plasma samples with reagents to determine specific substances presence or deficiency. The result of this analysis then helps to diagnose the clinical case.

This application demonstrates how to detect the reaction of human blood plasma with given test reagents using Open eVision tools.

The inspection is based on images featuring 4 test tubes containing blood plasma sample with Reagent 1 to Reagent 4 respectively. The reactions are observed and discoloration and/or bubble or particle apparition indicate a positive reaction to the corresponding reagent.

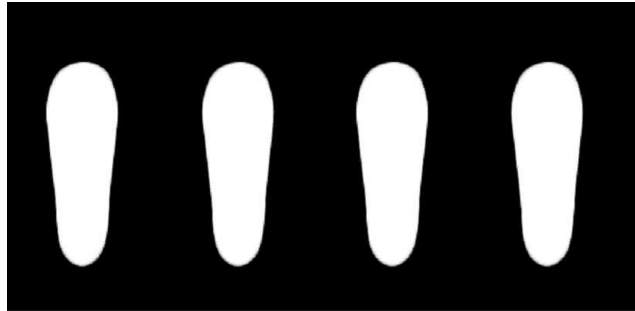
Note: To run this program, you need the EasyImage, EasyGauge and EasyObject licenses.



Creating a flexible mask

The inspection uses a flexible mask to restrict the image analysis to the test tube content only.

1. Create the flexible mask based on a reference image as illustrated. Only the white areas of this flexible mask are processed.
2. Load the flexible mask image before starting the inspection.

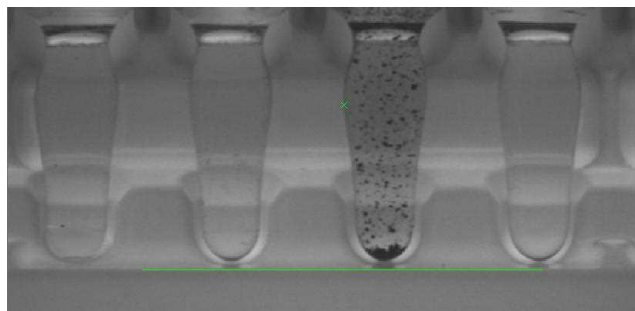


As the position of the test tubes may vary from one image to another, the flexible mask must be realigned as follows:

3. To register the position of the test tubes accurately, use a combination of:
 - A **ELineGauge** that detects the tubes mounting base line and measures its rotation angle.
 - A **EPointGauge** that detects the third tube left edge.



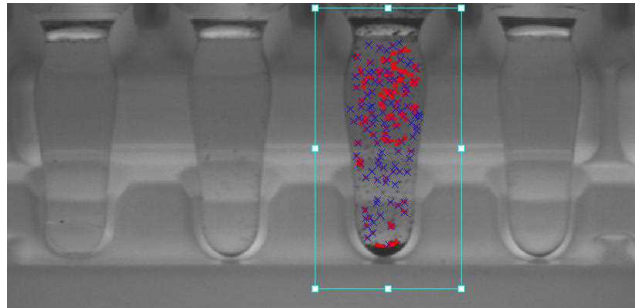
4. Use the angle and the point coordinate values retrieved as reference data.
5. Load the corresponding EasyGauge model file before starting the inspection.



Inspecting the test tubes

1. The application aligns the flexible mask with the image under test:
 - The **ELineGauge** and **EPointGauge** tools return the orientation and the position of the test tubes.
 - The application compares these results with the reference data.
 - It aligns the flexible mask with the EasyImage **ScaleRotate** method.

2. The application uses the EasyObject library to detect the presence of bubbles, discoloration or particles inside the test tubes:
 - As each reagent exhibits a different reaction, each tube is tested separately with different parameters or pre-processing.
 - The application positions a ROI around each test tube sequentially.



3. In case of Reagent 1, the application executes some pre-processing to reveal the bubbles:
 - **WhiteTopHatDisk**
 - **Median** filtering
 - **ECannyEdgeDetector**
4. The application performs the blob analysis.

