UNIVERSITY WEST

Inspection project

General Goal

The goal of this project is to do object identification and quality inspection and sorting of 2 different sizes of board needles with the help of a camera using OpenCV. To solve this project, you will work in groups of two or three. There are three levels to this project, the lowest level is pass, and the others are to receive bonus points on the final exam. The second level will give you a 10 % bonus on the exam, and the third level will give you a 20 % bonus on the exam. The prerequisites for each level of the project are stated under Grading.
You are allowed to use previously made code and scripts including aruco-markers.

Prerequisite

You will use the camera equipment supplied by the university; it is in the room next to the automation line. You will use this equipment to collect images and for the final presentation of your work. You can choose between the Basler cameras of web-cameras.

Python Dependencies

If you want to use a basler camer You will need the pypylon package in python, the latest version of pypylon can be run on python 3.11.0.
Note that there have been updates to the aruco-code functionality, examples out on internet might be outdated.

Examination

The examination will be carried out by the students doing a short live demonstration of the program in real-time to demonstrate that the program works.

The students will have 5 minutes to set-up and start the program, if the program fails to start there will be a re-examination of the lab at a later date.

After a successful demonstration the students' needs to present the code and explain how it works.

If the students pass the practical examination, they need to upload the code well-commented code in a zip file on canvas as *Student_GroupNumber*.zip.

Grading

There are three grading levels.

Level 1 - Pass

To **Pass** the program needs to be able to do the following to a needle placed in a fixed position:
- Be able to identify and distinguish between the two needle sizes by indicating on the bottom left with text:
  - Size of the needle (large or small)
  - Colour of the needle head
- Not recognizing or ignoring foreign objects
- The needle border needs to be highlighted.

Figure 1 Needles will have two distinct sizes, allowed error is +-1 mm

Size 1:	Head	-	Ø4mm
	Length	-	20 mm
Size 2:	Head mid	-	Ø5mm
	Length	-	25mm

Level 2 – 10 % bonus on the exam

As well as fulfilling Level 1, the program needs to be able to detect the needle anywhere in the image at any rotation and with crossed tips. The rotation also needs to be displayed in the image
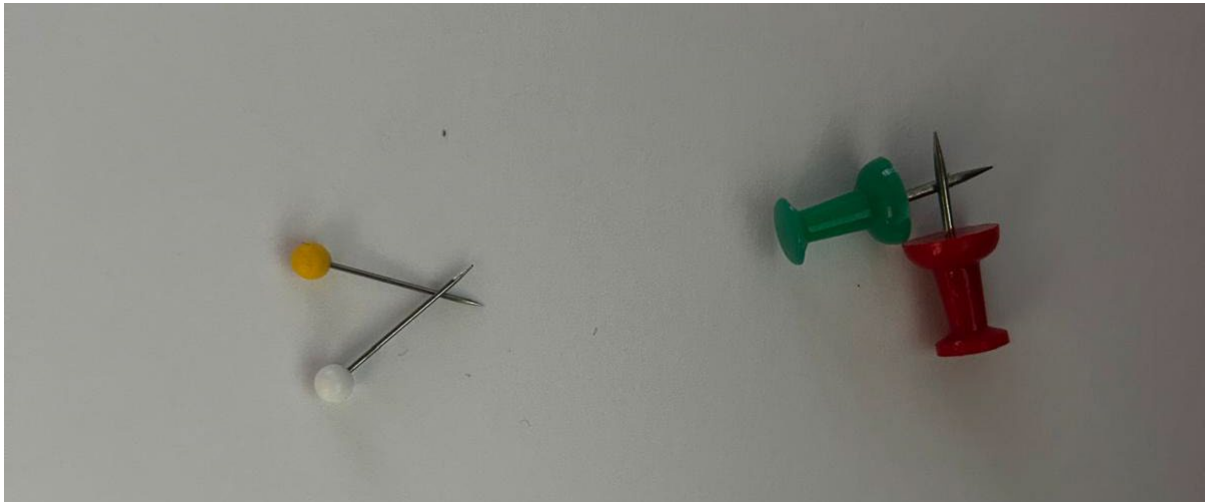

Figure 2 Needles that have crossed tips for which the program needs to distinguish between the products.

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Level 3 – 20 % bonus on the exam

As well as fulfilling Level 2, the program needs to detect if there are any defects needles. This needs to be indicated by some sort of graphical marker such as a ring or box with a text.