Introduction

The project is called **Whiteboard cleaning with xArm.** The aim of the project is to efficiently clean the whiteboard with the help of xArm. For the purpose of the project, a specific area is selected on the whiteboard, where the user can draw something with the marker. For the project demo we decided to start with the red marker. However, the final version will be able to work with the markers of all colors.

Main text

xArm part

So far we've been able to make the xArm move in the dedicated area on the whiteboard. Firstly, the rectangular area on the whiteboard was drawn with the black marker.
Secondly, the UFACTORY xArm software was used. More specifically, python IDE was used to program the xArm. Necessary parameters were chosen to permit the xArm to move horizontally through five columns and wipe the board.

Image processing part

We created programs for thresholding the images obtained from the camera on the xArm. Specifically, our program is able to detect things drawn with the red marker on the whiteboard. An openCV blob detector with necessary parameters was used to detect red drawings. The program prints out coordinates of detected drawings and draws their borders on the original image. Necessary values for thresholding (HSV, wbt, exposure) were selected during testing the program and written into a separate file.
Moreover, we have a program that thresholds the blue drawing and shows more multiple coordinates.

Challenges and solutions

During our work we faced different challenges.
Challenges with the image processing part:

1) Computer operating system didn't recognize the xArm camera
   Solution: necessary parameter(marked with bold) in the code line *camera = cv2.VideoCapture(**6**)* was selected based on the input of the command "v4l2-ctl --list-devices".

2) Problem with connecting to the xArm camera through a laptop: the program showed only 1 frame of the camera and then crashed.
   Solution: use another laptop to check if the problem is with the camera. (It turned out that the issue was with the laptop)
3) Blob detector sometimes doesn't detect all the blobs:
   Solution: adjust threshold parameters and blob detection parameters.

Challenges with the xArm part:

1. Most Xarm motor move only in circular part so its difficult to wipe the board in a straight line moving only one motor
   Solution: Move servo motors needed to do a certain action and also a lot of trial and error
2. Connect to the xArm using the Python on our computer and not the python software(Ufactory Studio)
   Solution: Download necessary libraries and necessary python packages
3. Whiteboard surface is hard to clean (probably the surface is old or a sponge is not good enough)
   Solution: Different sponges can be tested or a different whiteboard area selected.

Future plan:

Combine the image processing part with the xArm. For that image processing code can be written in a function that returns coordinate values. And xArm code can use these values to move accordingly. Needed time frame for a person to move away from the xArm will be added to the code.