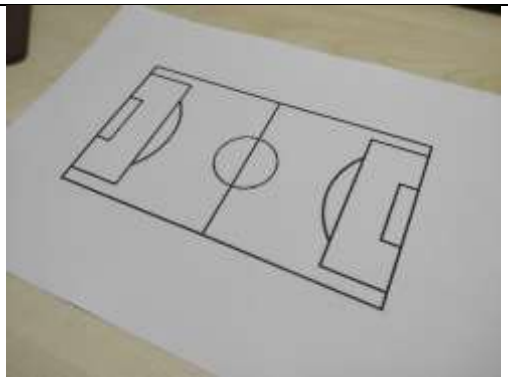
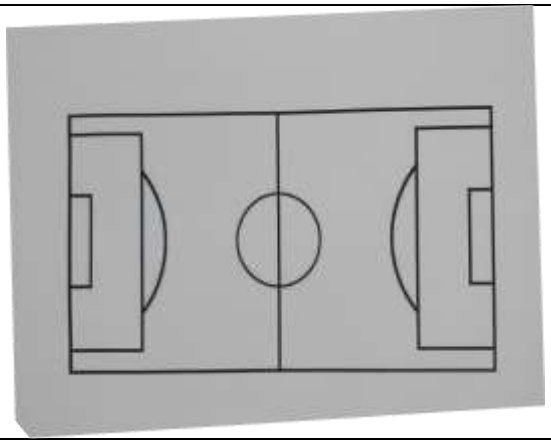
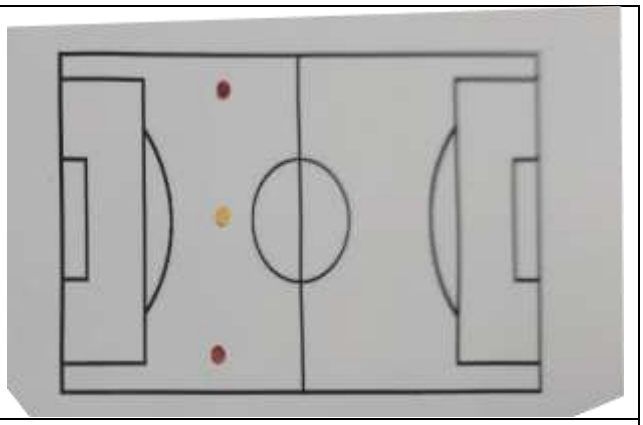
Gebze Technical University
Department of Computer Engineering
BIL 665 / BIL 463
(Introduction to) Computer Vision
Spring 2024
HW1
Apr 1st 2024

In this homework, you will capture image of a target soccer field on paper. Your program will then estimate a homography that transforms this image to model soccer field. You will display the input and output images at the same time on your screen as follows

	
Input	Output model field

Another example

	
Input	Output model field

Note that there may be small circles on your soccer field to see how they are transformed to the model soccer field. This configuration kind of simulates an offside detection case.

Part A

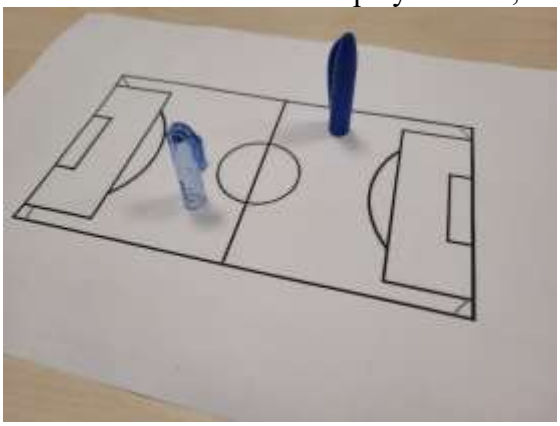
These are the algorithm steps for your homework

1. Take a picture of the soccer field with your cell phone.

2. To be able to find the homography, you need 4 points. For the 4th point use the intersection of the parallel lines of the soccer field. To distinguish the corners, you may print different markers for each corner such as digits.
3. Estimate a homography between the input image and the model soccer field. OpenCV functions findHomography or getPerspectiveTransform will be helpful.
4. Using the new transform, transform the input image and display the output as shown above. You may use OpenCV function perspectiveTransform.

Part B

1- Take the images of the same soccer board with players on it, such as



2- Transform the input image to model soccer field. Note that the players will look very weird on this model because they are not part of the homography plane.
3- Draw a circle around the players and transform the image back to original form. At the end you are supposed to get a picture like this. This step is tricky, you need to figure out some problems.

4- Do this with a different color for each player. You are supposed to detect the players automatically and draw the circles automatically without any user help. Be careful about not overpainting the players.

Write a report in PDF for each part that includes (report is compulsory)

- Your sample screen shots
- Your homography formulas and calculations
- Your results from each step for both parts.

Notes

- Do not use any available image processing functions from OpenCV other than the functions above.
- You are allowed to AI based helpers such as ChatGPT, however you should indicate where you use it in your code and report.
- Your PDF report is important, no report, no grades, please prepare it with care.

- You will demo your program after the class. You will download your program from Moodle, then compile and run. Please bring your web camera and computer for the demo.
- YOU WILL NOT BE ALLOWED TO MODIFY YOUR PROGRAMS. YOU WILL RUN YOUR PROGRAM FROM THE JUPYTER (OR COLAB) NOTEBOOK.
- Zip your source code files and a few screen captures into a single file and submit to Teams.
- We will provide sample soccer field template.