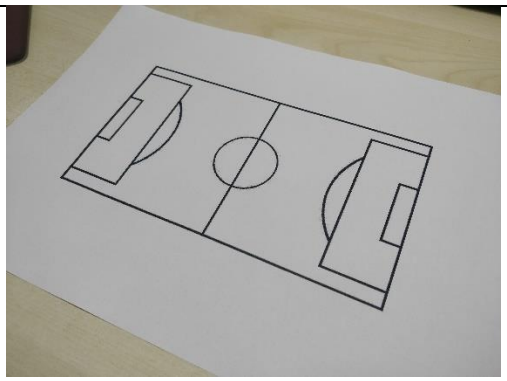
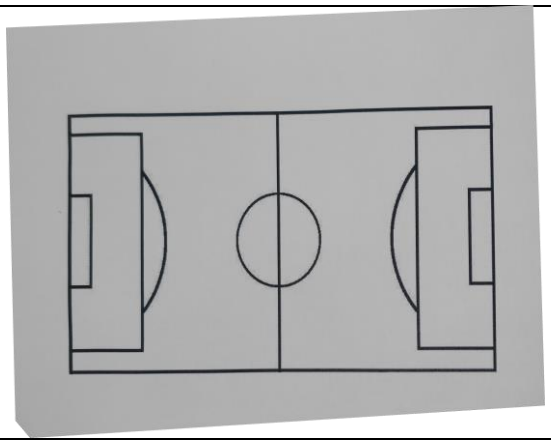
Gebze Technical University
Department of Computer Engineering
BIL 665 / BIL 463
(Introduction to) Computer Vision
Spring 2021
HW1
Apr 5th 2021

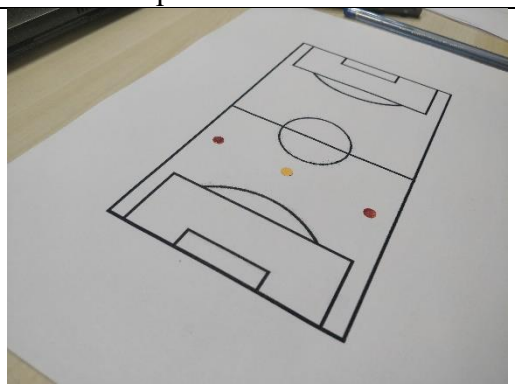
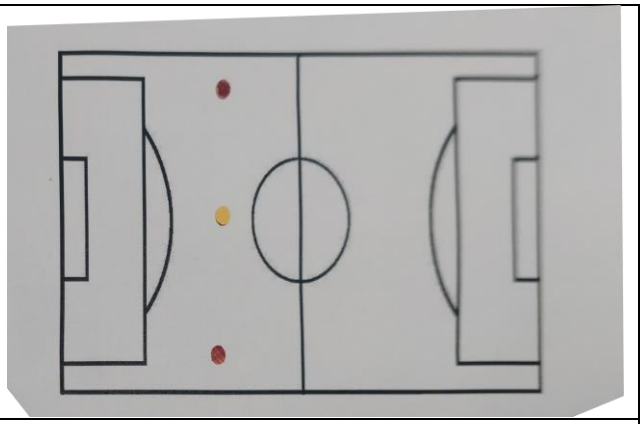
Download and install OpenCV (https://opencv.org/) with the Python interface. You may use any version of OpenCV and Python.

Run some of the sample code and tutorial code until you are comfortable with the environment.

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.

These are the algorithm steps for your homework

1. Take a picture of the soccer field.

2. Ask the user to mark four corners of the soccer field.
3. 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.
4. Estimate a homography between the input image and the model soccer field. OpenCV functions findHomography or getPerspectiveTransform will be helpful.
5. Derive formulas for estimating the homography yourself from these 4 points. Use your formulas to find the homograph and compare your results with the openCV results.
6. Using the new transform, transform the input image and display the output as shown above. You may use OpenCV function perspectiveTransform.

Write a report that includes

- Your sample screen shots
- Your homography formulas and calculations
- Comparison with openCv results.
- Your results from each step

Notes

- Do not use any available image processing functions from OpenCV other than the functions above.
- Your program should be interactive; it should let the user mark 4 corner points in order.
- Your report is important, 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 NOTEBOOK.
- Zip your source code files and a few screen captures into a single file and submit to moodle/Teams.
- We will provide sample soccer field and a few examples field pictures with this homework.