Project 2 guidelines- Augmented reality (AR)

In this project you are going to built an AR application.

This project will conclude the second part of the course, tackling the topics of:

- Transformation
- Camera calibration
- Feature detection

Part 1: perspective warping (70 points)

The output of this part is a 2d warped template that rests on some original 2d image.

1. Choose a good "feature-full" 2d image that you can track- this is your reference image to find the features and track them.
2. Print out the image and make a video of it on a planar surface while moving around the image- the movie must have big changes in rotation, translation and scale relatively to the image.
3. Follow the comments in `perspective_warping_empty.py` to complete this part.

Part 2: planer AR - demo cube (20 points)

1. Calibrate your camera from before with a printed chessboard (follow our calibration notebook). you will need `K` and `dist_coeffs` for this part.
2. copy and paste your finished part 1- only the warping lines are replaced with other lines- follow the comments in `planar_AR_empty.py` to complete this part.
3. NOTE: in this part you'll need to use `cv2.solvePnP`. **Add a section in the final PDF that talks about PnP and it's different variants, and include some of the basic math regrading the basic PnP approach.** This section should be at least a page (including equations) of you final PDF.

Part 3: planer AR - full 3d model (7 points)

Try render more elaborate 3D objects (textured .obj/.ply files) (try to use `open3d` or the older `pyrender` (less recommended)). Here you will tackle again the pojection from (virtual) camera to image using extrinsics and intrinsics data.

Part 3: planer AR - Animated 3d model (3 points)

try render a 3D object that changes with time.

submission guidelines:

1. Groups of up to 2 people.
2. Please add to the PDF some explanations. Maybe some debug outputs you have (images or data that is relevant).
3. Results expected in a .zip file with the name `PROJ2_NAME1_ID1_NAME2_ID2.zip` with content of:
    - A detailed summary of the work done and assumptions made. Where does your algorithm succeed and where it failed?
    - Code in .py files
    - The output videos in a reasonable format.
    - **Remember to add the final result video as a file in the .zip directory or as a link to youtube inside the PDF** (in this case please put it at the start and at the end of the report).
4. Submission is due 3 weeks from the last class.

Good luck!

Yoni Chechik