CV Assignment 1

Q1. Point the camera to a chessboard pattern or any known set of reference points that lie on the same plane. Capture a series of 10 images by changing the orientation of the camera in each iteration. Select any 1 image, and using the image formation pipeline equation, set up the linear equations in matrix form and solve for intrinsic and extrinsic parameters (extrinsic for that particular orientation). You will need to make measurements of the actual 3D world points, and mark pixel coordinates.

A box with a label on it

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Real world image with 6 points considering Z coordinate as origin.

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Matlab Codes:

Graphical user interface, application

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Computing QR factorization to get calibration and rotation matrix.

AB = [-10258400, -10258400,-3122760;-9672000,-9672000,-300240;-10258400,-10258400,-317400];

[R,C] = qr(AB)

R = 3×3

-0.5883 -0.5547 -0.5883  
 -0.5547 0.8063 -0.2055  
 -0.5883 -0.2055 0.7821

C = 3×3

107 ×

1.7436 1.7436 0.2191  
 0 0 0.1555  
 0 0 0.1651

We use below formula to compute translation matrix.

Graphical user interface, text, application

Description automatically generated

pr = [-105800;-100080;-105800];

t = ki\*pr

t = 3×1

3.5164  
 -3.5164  
 0.0000

2. Q2. Select any pair of images from the set-in problem 1 above. Compute the homography between those two images.

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For homography we used 2 images, first image co-ordinates are same as the previous question.

Matlab codes :

Table

Description automatically generated

Homogenous matrix is obtained by taking minimum from each column

Graphical user interface

Description automatically generated with medium confidence

3. Write a MATLAB script to find the real world dimensions (e.g. diameter of a ball, side length of

a cube) of an object using perspective projection equations. Validate using an experiment where

you image an object using your camera from a specific distance (choose any distance but

ensure you are able to measure it accurately) between the object and camera.

For this am calculating diameter and radius of a circular lid.

Graphical user interface, application, PowerPoint

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5. Setup your application to show a RGB stream from the mono camera and a depth map

stream from the stereo camera simultaneously. Is it feasible? What is the maximum frame rate

and resolution achievable?

It is feasible to run RGB stream from mono camera and a depth map stream from stereo camera.

Maximum framerate is 60fps. And resolution is 1920 X 1080.

A screenshot of a video game

Description automatically generated with medium confidence

6. Run the camera calibration tutorial. Compare the output with answers from Part A and Matlab

calibration exercise.

<https://github.com/Saikumarburagadda/CV_Assignment>

Matlab codes are also attached.