Vision Based Navigation Assignment 2

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17-11-2019

Exercise 1

For each model, for a number of different 3D points, the test function calls *project* method with the 3D point and then calls *unproject* method with the resulting 2D projection. It expects initial 3D point and unprojected point to be approximately same.

Exercise 2

The difference between *Curve Fitting* and *Robust Curve Fitting* examples is that in the latter a loss function, namely Cauchy Loss, is used to handle outliers so that the fitted curve does not deviate too much from the ground truth. Loss function reduces the influence of residual blocks with high values which usually corresponds to outliers.

Exercise 3

The program takes *–show-gui*, *–dataset-path*, and *–cam-model* as CLI parameters. *–dataset-path* is a required parameter.

When analyzed visually, all models except pinhole model fits very well to the lenses, it is not possible to see errors without zooming. Pinhole model produces visible errors.

Important quantitative results are as follows, the best and the worst results are color coded for each row:

	pinhole	ds	eucm	kb4
initial cost	1.795667e+07	5.353182e+06	5.353182e+06	5.788049e+06
final cost	1.565735e+05	1.627482e+02	1.627604e+02	1.619844e+02
iterations	16	15	7	8
total time (s)	1.271187	0.930397	0.570077	0.547835

Final cost can be interpreted as the quality metric. *kb4* has the best final cost and *pinhole* has the worst. Still, all models other than pinhole performed very similarly.

In terms of total time, *kb4* performed best while *ds* performed worse than the other two. This may be explained according to number of iterations, *ds* and *pinhole* required twice as many iterations than the other two models.

Initial cost has also an effect on the performance but it may not be very crucial as *kb4* had a slightly worse initial cost but it achieved the best final cost.