BagherCalib User Guide

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Installation

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1) Run the BagherCalib.m file in MATLAB.
2) Matlab version 4.0 or later is required.

Things to do

If you have a 3-D calibration object, you can cope with a single image. In order to obtain satisfactory calibration result, the object should cover the entire image as well as possible. Also, multiple images are supported. Then, the images should be captured from different viewpoints changing the camera orientation and distance. In case of a coplanar calibration target a single image is not adequate and a set of images (2-6) is needed to solve all the camera parameters. The coordinates of the coplanar control points should be selected so that the z coordinates become zero. The 3-D coordinate unit is millimeter and image coordinate unit is pixel. The calibration coordinate system is right-handed. The origin of the image coordinate system is in the top left corner, x axis is to the right and y axis downwards.

The input data to BAGHER_CALCAMPAR-routine is following:

First parameter is a string that defines the camera type. The valid camera types are listed in BAGHER_CONFIGC.M that is a function where the user can add his own configuration data. The data consists of the following information:

NDX number of pixels in horizontal direction
NDY number of pixels in vertical direction
Sx effective CCD chip size in horizontal direction [mm]
Sy effective CCD chip size in vertical direction [mm]
f0 nominal focal length (needed in case of coplanar targets)
rad radius of the control points [mm]
name name of the setup

The calibration data is given in separate matrices for each image. The maximum number of images is currently six. The data matrix structure is following:

Columns 1 to 3: x, y, and z coordinates of the control points. In case of a
a coplanar target the z-coordinates must be zero.
Columns 4 to 5: corresponding x- and y- image coordinates.

Columns 6 to 8: normal vector [nx ny nz] of the target surface around
the control point given in the world coordinate frame,
for example [0 0 1], in case of a coplanar target.

The output data is following:

- Eight intrinsic camera parameters:
  par(1)=scale factor ~1
  par(2)=effective focal length
  par(3:4)=principal point
  par(5:6)=radial distortion coefficients
  par(7:8)=tangential distortion coefficients

- The position and orientation of the camera for each image:
  pos(1:3)=x, y, z -coordinates (actually, the position
  of the calibration coordinate frame origin with
  respect to the camera coordinate frame)
  pos(4:6)=w, p, r Euler rotation angles around x, y, z axes.
- Number of iterations required
- Sum of squared error terms
- The remaining error in pixels. This error gives a guideline to detect the accuracy of the calibration. The error should be non-systematic with the standard deviation less than 0.2 pixels. If the error is larger, something goes wrong.
- Covariance matrix of the estimated parameters. The diagonal elements gives the variance of the estimates.

For more information about the method, see:

Heikkil, J, "Geometric Camera Calibration Using Circular Control Points", *IEEE Transactions on Pattern Analysis and Machine Intelligence*, Vol. 22, No. 10, Oct 2000.

Contact with Us

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