Robust Detection by Feature Matching

Last improvements and problems summary

Improvements

1. Before doing difference between rectified scene portion and template, equalize them. Then use differences histogram to discard wrong matches.

DONE

But...

Improvements

When an image with low colors intensities variance is equalized, it doesn’t work very well.

Improvements

2. Degenerate homography check done using Simone's hint.

Hint taken from "Automatic Homographic Registration of a Pair of Images, with A Contrario Elimination of Outliers" by Lionel Moisan, Pierre Moulon, Pascal Monasse.

DONE

But...

Improvements

- **In some images more or less any homography is considered “twisted” and thus discarded**
- **Singular values ratio threshold to be used changes a lot among different images.**

Improvements

3. **Self-similar features used to recover possible good matches that didn’t pass the ratio test.**

DONE

Improvements

4. **Non planar objects trials.**

NOT DONE

Open problems

1. **If the number of self-similar matches is greater than the number of the other matches, the Gaussian of the distances is biased towards the self-similar matches, and then is more difficult, if not impossible, find self-similar matches as Gaussian outliers.**

Open problems

2. We noticed that inside an execution of our algorithm, the homographies are selected by RANSAC in a deterministic way.

For example:

- **Execute RANSAC**
- **Homography found is bad, so discarded**
- **Re-execute RANSAC**
- **Homography found is the same as before!!!**

We need to do something in order to avoid that the next homography is equal to the discarded one.

Open problems

We solved this by eliminating the farthest inlier of the bad homography before re-executing RANSAC.

The eliminated points are re-inserted after that a good homography is found.

This is not a good way to proceed because if:

- **The eliminated points belong to a good homography**

AND

- **We found this homography while the points are temporary out**

We don’t use them to compute it and so the homography is not good at best.

Possible improvements

1. **The pixelwise difference norm histrogram looks like a gamma distribution.**

Could be useful set up a goodness-of-fit distribution test, instead of checking the median/mean.

Possible improvements

2. **We noticed that the openCV SIFT-descriptors detector transforms the image in grayscale before calculating them.**

Could be useful computing SIFT-descriptors for each RGB channel.