EE838 Assignment 9
Robust estimation: Automatic computation of F

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Detailed assignment explanation

1. Preliminary: study the lecture note about "Automatic computation of F"
2. Detailed implementation
   A. RANSAC for the fundamental matrix F estimation [Model : $x'^T F x = 0$]
      i. Input : two pairs of stereo images

      ii. Objective : Compute the fundamental matrix (F) between two images
      iii. Interest points : Compute interest points in each image (Default : VL_SIFT)
         1. Download VLFEAT from the website → http://www.vlfeat.org/download.html
      iv. Putative correspondence : Compute a set of interest point matches based on proximity and similarity of their intensity neighborhood (Default : VL_UBCMATCH)
      v. RANSAC robust estimation : Repeat for N samples
         1. Select a random sample of 7 correspondences and compute the fundamental matrix F
         2. Calculate the distance $d_\perp$ for each putative correspondence
         3. Compute the number of inliers consistent with F by the number of correspondences for which $d_\perp < t$ pixels
         4. If there are three real solutions for F, the number of inliers is computed for each solution, and the solution with most inliers retained.
            (Choose the F with the largest number of inliers.
            In the case of ties choose the solution that has the lowest standard deviation of inliers.)
      vi. Non-linear estimation : Re-estimate F from all correspondences classified as inliers by minimizing a cost function, e.g., using the Levenberg-Marquardt algorithm
      vii. Guided matching : Further interest point correspondences are now determined using the estimated F to define a search strip about the epipolar line

3. In your report, answer the following questions.
   A. Discuss the advantage/problem/limitation of RANSAC for estimating the fundamental matrix.
   B. Analyze the difference in results as each RANSAC parameter changes.
      (Inlier distance, number of iteration etc..)
   C. [BONUS] Analyze the difference in results as each method changes.
      (Feature extraction methods, feature matching methods, RANSAC variants, distance measures etc..)

Submission guidelines
- On the top of your report, clarify your name, ID number, and the assignment title.
- Make your report as a single PDF file.
- Write your report in English.
- Title your report as "A#_firstname_lastname.pdf", where '#' indicates the assignment number (e.g., **A9_Gildong_Hong.pdf**).
- If there are additional files for assignments, put them into a folder along with your report, and then compress into a zip file (e.g., **A9_ Gildong_Hong.zip).**
- Upload your report (or zip file) to the submission page of the KLMS.

What to submit for assignment 9
- A report that does not exceed 8 pages
  (Focus on analysis & discussion rather than method descriptions or code explanations)
- MATLAB code files
  (Detailed annotations are required)

Helpful resources
- Lecture Notes
- Google