Stereo Image Correspondences using Fundamental Matrix

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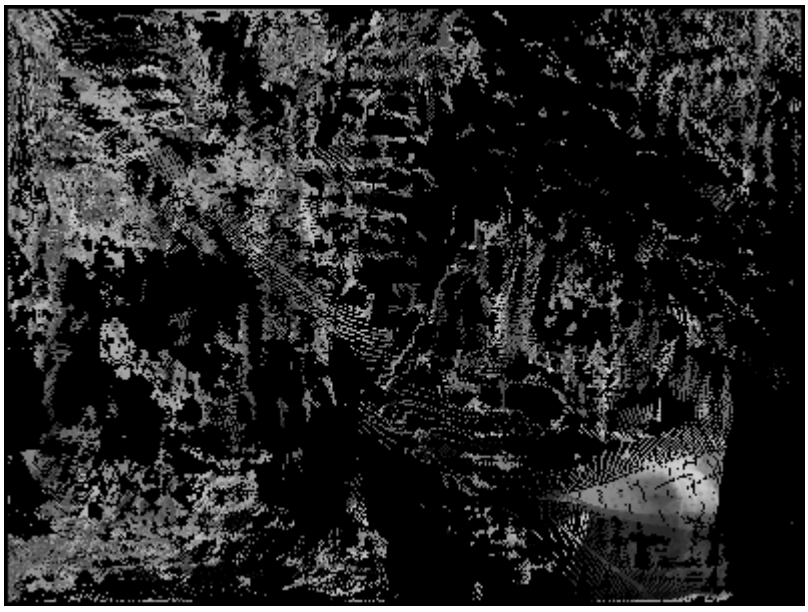
Data:

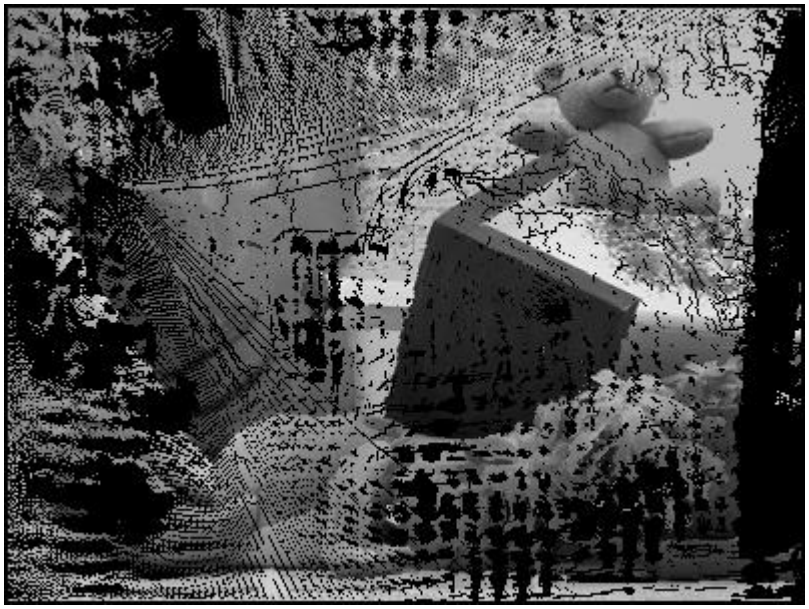
- The data consists of 4 sets of stereo images used from middlebury[1].

Algorithm:

- Finding point correspondences using SIFT.
- KNN matching is implemented to match the descriptors and top 2 matches for each descriptor in reference image are returned. David Lowe's ratio test is used to remove false positives. The corresponding points are used to compute fundamental matrix.
- The points are normalised for numerical stability according to the **formula**:
- Matrix A is computed and SVD is performed on it.
- The fundamental matrix is obtained from the last column of V.
- It is reshaped to (3,3) and rank 2 constraint is imposed by performing SVD on the fundamental matrix and setting smallest eigenvalue to 0.
- The fundamental matrix is denormalised using the same matrices used for normalisation.
- RANSAC is used for robust estimation. 8 point pairs are randomly selected from the set. Distance metric used is **formula:**
- Epipolar lines are computed for each point in reference image using fundamental matrix.
- SIFT descriptors are computed for points along the line and Euclidean distance is computed with corresponding descriptors in reference image. The point where minimum distance is found is patched with reference image.

Results:





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References:

- https://vision.middlebury.edu/stereo/submit/
- http://www.cs.cmu.edu/~16385/s17/Slides/12.4_8Point_Algorithm.pdf