

# Graph Matching Framework

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## 1 Experimental Evaluation

In this chapter we present the evaluation results of the proposed algorithm on some synthetic data and on some real images.

### 1.1 Synthetic Point set Matching

For the first test we adopted a commonly used approach of evaluation Graph Matching algorithms on the synthetic generated set of nodes (see [1], [2], [4]).

For this propose one generates first  $n_1$  normal distributed points  $V_1 \subset \mathbb{R}^2$  with zero mean and standard deviation 1. The second set  $V_2$  is created from the first one by adding noise  $\mathcal{N}(0, \sigma^2)$  to the positions of points in  $V_1$  and  $m$  additional normal distributed points with  $\mathcal{N}(0, 1)$ . That means, that the set  $V_2$  consists of  $n_2 = n_1 + \bar{n}$  nodes, where  $n_1$  points are inliers and  $\bar{n}$  points are outliers. The task is to find the correspondences between points in two sets.

In this test we follow the setup in [1] and compare our approach with following state of the art methods: *MPM* [1], *RRWM* [2], *SM* [3], *IPFP* [4]. We fixed the number  $n_1$  to 100 and vary the number of outliers  $\bar{n}$  and the standard deviation  $\sigma^2$  of the noise in the inlier positions. The discretization of the continuous solution is performed in all cases using greedy assignment from [3].

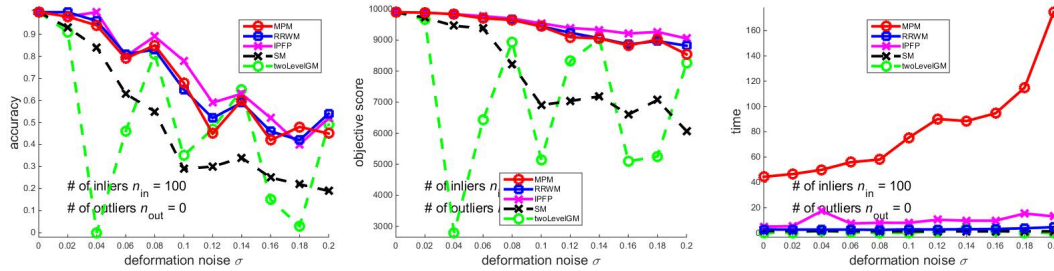


Figure 1: Deformation test:  $n_1 = 100$ ,  $n_2 = 100$ ,  $\sigma^2 \in [0, 0.2]$

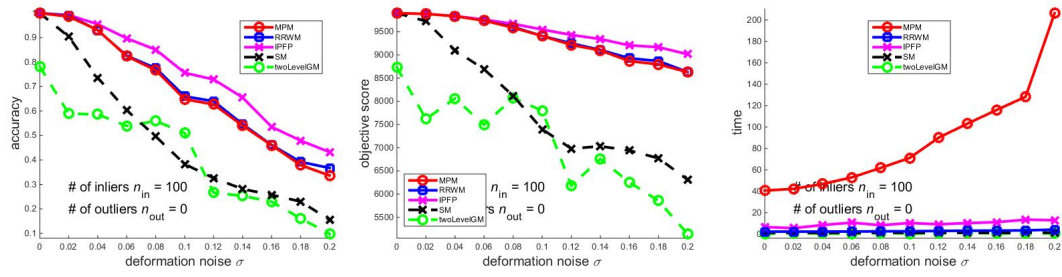


Figure 2: Average of 10 deformation tests:  $n_1 = 100$ ,  $n_2 = 100$ ,  $\sigma^2 \in [0, 0.2]$

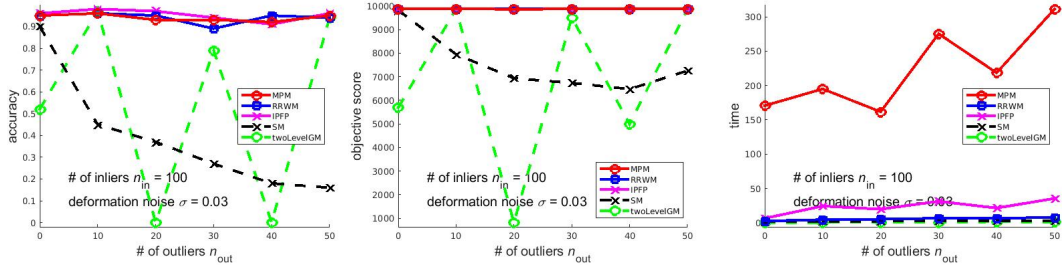


Figure 3: Outliers test:  $n_1 = 100$ ,  $\bar{n} \in [0, 50]$ ,  $\sigma^2 = 0.03$

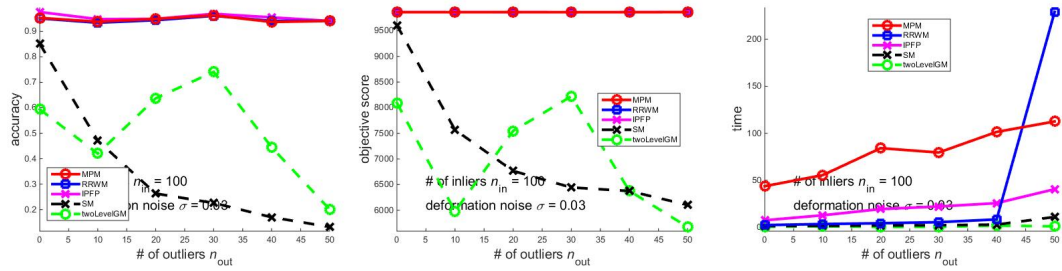


Figure 4: Average of 10 outlier tests:  $n_1 = 100$ ,  $\bar{n} \in [0, 50]$ ,  $\sigma^2 = 0.03$

## 1.2 Image Affine Transformation

## 1.3 Real Images

## References

- [1] M. Cho and O. Duchenne. Finding Matches in a Haystack : A Max-Pooling Strategy for Graph Matching in the Presence of Outliers. *CVPR*, 2014.
- [2] M. Cho, J. Lee, and K. M. Lee. Reweighted Random Walks for Graph Matching. *ECCV*, 2010.

- [3] M. Leordeanu and M. Hebert. A spectral technique for correspondence problems using pairwise constraints. In *ICCV*, 2005.
- [4] M. Leordeanu, M. Hebert, R. Sukthankar, and M. Herbert. An Integer Projected Fixed Point Method for Graph Matching and MAP Inference. In *NIPS*, 2009.