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]. Because of those algorithms work with the full affinity matrix of the Graph Matching Problem, whose size is equal to $n_1n_2 \times n_1n_2$, it is time and memory consuming to perform tests for graphs with more than 200 nodes each. Our algorithms, however, was created to work with graphs bigger than that. To be able to perform the comparison, we fixed the number n_1 of points in the first set to 100 and vary the number of outliers $\bar{n}$ in the second set from 0 to 50. The discretization of the continuous solution is performed in all cases using greedy assignment from [3].
For the first test we set number of outliers $\bar{n}$ to zero and vary only the deformation noise σ^2. We call this test *deformation test*. It's results are shown at the Fig. 1 and 2.
In the second test, *outliertest*, we fix deformation noise $\sigma^2 = 0.03$ and compare the behavior of the algorithms in case of increasing number of outliers $\bar{n}$ (see Fig. 3 and 4).

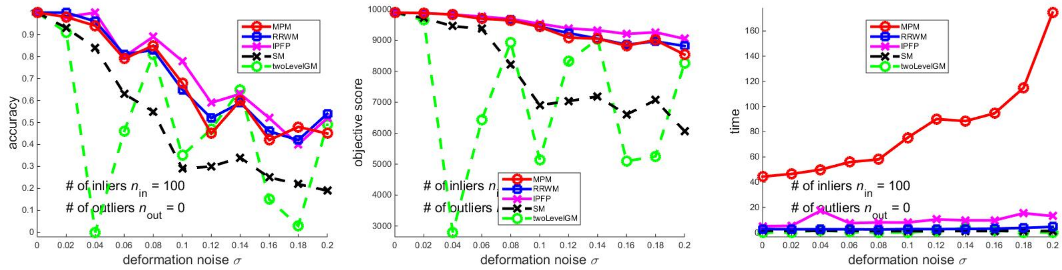

Figure 1: Deformation test: $n_1 = 100$, $n_2 = 100$, $\sigma^2 \in [0, 0.2]$

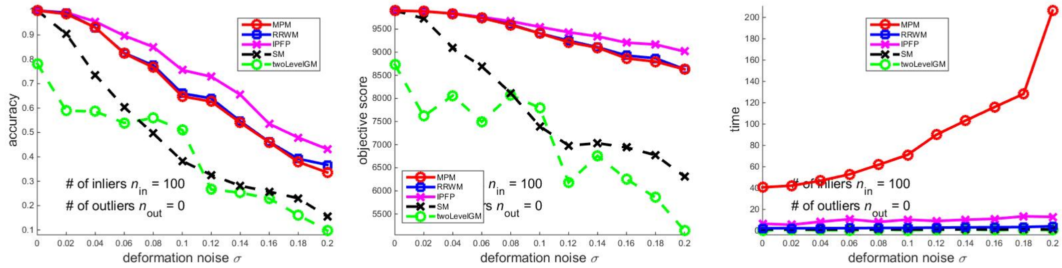

Figure 2: Average of 10 deformation tests: $n_1 = 100$, $n_2 = 100$, $\sigma^2 \in [0, 0.2]$

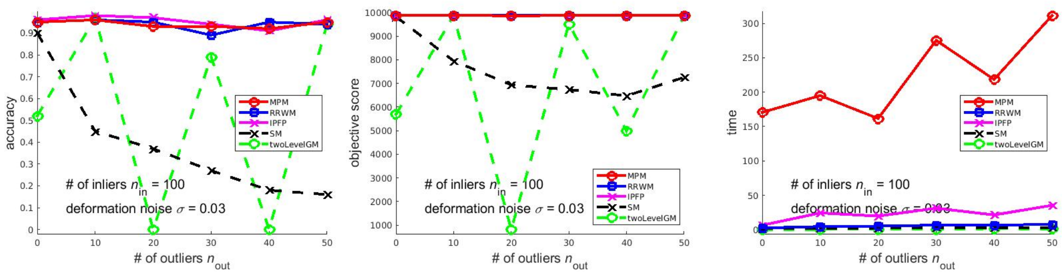

Figure 3: Outliers test:$n_1 = 100$, $\bar{n} \in [0, 50]$, $\sigma^2 = 0.03$

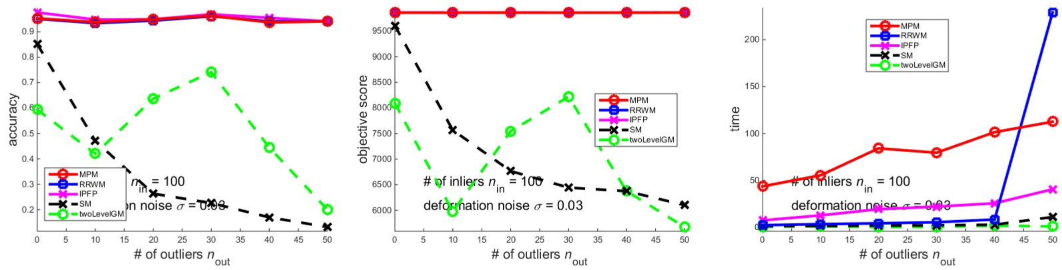

Figure 4: Average of 10 outlier tests:$n_1 = 100$, $\bar{n} \in [0, 50]$, $\sigma^2 = 0.03$

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.