Non-rigid point matching

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Abbreviation:	matching
Number of instances:	4
Number of variables:	19 or 20
Number of labels:	19 or 20
Number of factors:	fully connected or sparse
Order:	2
Function type:	general pairwise potential

Description The matching dataset contains 4 instances of a non-rigid registration task between geometric point sets. A source and a target set of 2D points are given as input in this case, where the target set is assumed to have been generated by applying a non-rigid deformation to the source points (see Fig. 1 for an example). One then seeks to recover a mapping $\mathcal{T}$ between these two point sets.
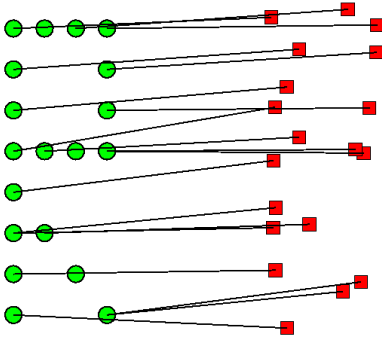

Figure 1: An example of non-rigid point matching. Target points (red) were generated by applying a global rigid motion plus a random non-rigid perturbation to the source points (green).

Objective / Learning The above task can be formulated as a multi-label MRF optimization problem, where source vertices correspond to MRF sites and target vertices correspond to possible labels. In this case, the unary potentials are all set to zero, whereas the pairwise potentials measure the geometric distortion for each pair of source points p, p' as follows:

$$\varphi_{pp'}(\mathcal{T}(p), \mathcal{T}(p')) = \begin{cases} \frac{|d(p,p') - d(\mathcal{T}(p), \mathcal{T}(p'))|}{d(p,p')}, & \text{if } \mathcal{T}(p) \neq \mathcal{T}(p') \\ M, & \text{otherwise} \end{cases}$$

(1)

where $d(\cdot, \cdot)$ denotes Euclidean distance and M is a large constant used for not permitting many-to-one matchings. No learning has been applied in this case.

References