Nonrigid Image Registration Using Higher-Order MRF Model with Dense Local Descriptor

- Registration: Finding an optimal label (displacement) set of MRF energy model

- Conventional Model: block matching costs + pairwise priors

\[ E(x|\theta) = \sum_{s \in V} \theta_s(x_s) + \sum_{(s,t) \in E} \theta_{st}(x_s, x_t) \]

- Proposed Model: dense local descriptor (SIFT) matching cost + first- and second-order priors

\[ E(x|\theta) = \sum_{s \in V} \theta_s(x_s) + \sum_{(s,t) \in F} \theta_{st}(x_s, x_t) + \sum_{(s,t,u) \in F_H} \theta_{stu}(x_s, x_t, x_u) \]

\[ \lambda_{st} \min (\|d(x_s) - d(x_t)\|_1, T_{st}) \]

\[ \lambda_{stu} \min (\|d(x_s) - 2d(x_t) + d(x_u)\|_1, T_{stu}) \]

- Optimization Strategy: decomposed scheme + coarse-to-fine scheme + TRW message passing

- Experimental Results

- Proposed model produces more accurate and smoother displacements