Exercise

16 December 2013

In this exercise, you will solve the stereo matching problem using Belief Propagation. We use the same functions for data costs and smoothness costs from the previous assignment.

$$\mathcal{E}(\ell) = \sum_{p \in \mathcal{I}} D_p(\ell_p) + \lambda \sum_{(p,q) \in \mathcal{N}} V_{pq}(\ell_p, \ell_q)$$

$$D_p(d) = |I_L(x, y) - I_R(x + d, y)|$$

$$V_{pq}(\ell_p, \ell_q) = w_{pq} * min(|\ell_p - \ell_q|, K)$$

BP on chains - Exact inference : Your first task is to construct a graphical model where each row of the image forms a chain as shown in below figure (2-connectivity). Perform inference using Belief Propagation by passing messages from left to right and back.

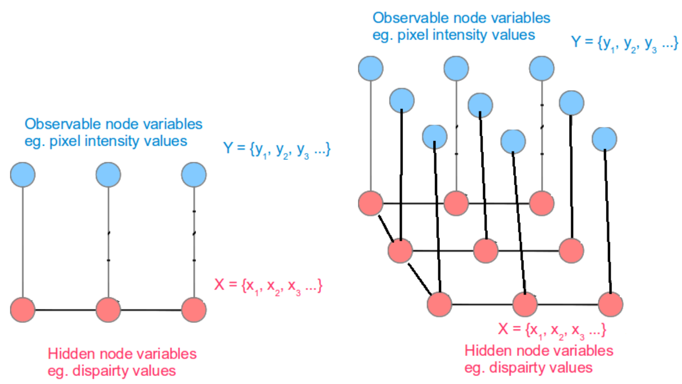

Figure 1: A chain network (left) and a tree network (right)

BP on trees - Exact inference : Your second task is to construct a tree network and perform inference using BP. A tree graphical model for the stereo matching problem can be constructed by introducing a single link between chains (from each row). You can assume that the link is inserted as shown in the above figure.

For this exercise, we use the same Tsukuba image pair, from the previous assignment, available here with 16 disparity levels, i.e, $d = 0, 1, ...15$. You can set λ and K to 1 and 2 respectively. The smoothness weight (w_{pq}) is set to be 15. You can evaluate the accuracy of your disparity map using the ground-truth available here. Note that when applying BP to chains or tree-structured graphs the optimal labels should be computed using backtracking.

Submission Mail your source code and report to `nikos.komodakis@enpc.fr` The report should include the obtained disparity map and accuracy for the stereo matching problem. The deadline for this exercise is 6^{th} January.