

Confidently Stable Matching

Given:

1. Putative correspondences $p \in P$
2. Symmetric occlusion E relation on pairs $p, q \in P$
3. Interval statistic $I(p) = [\underline{c}(p), \bar{c}(p)]$

matching table entries

the interval represents our uncertainty

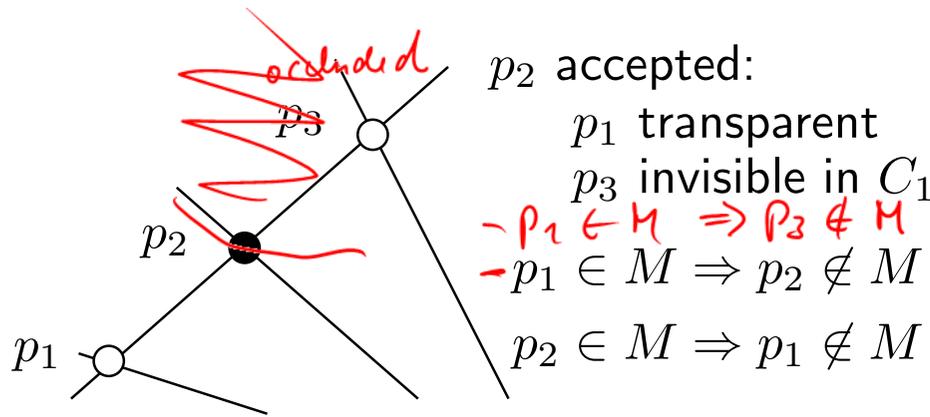
big $c \rightarrow$ better correlation (similarity)
big $\delta \leftrightarrow$ small image variation

Construct:

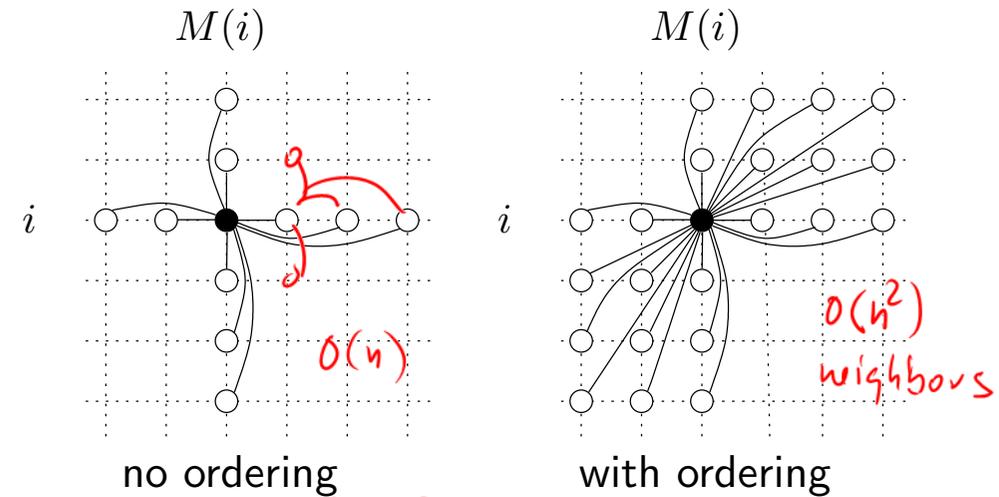
$$\underline{c}(p) = \bar{c}(p) - \delta(p)$$

1. Simple 'occlusion' graph $\mathcal{G} = (P, E)$

Obs: Independent vertex sets of \mathcal{G} are matchings.

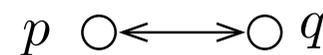


$p = (i, M(i))$ occludes/rejects neighbors in \mathcal{G}

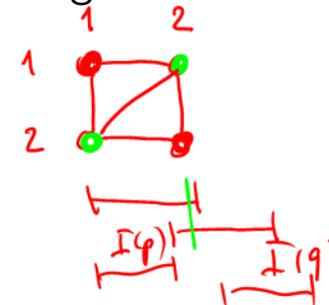


2. Graph orientation:

$I(p) \cap I(q) \neq \emptyset$ oriented both ways

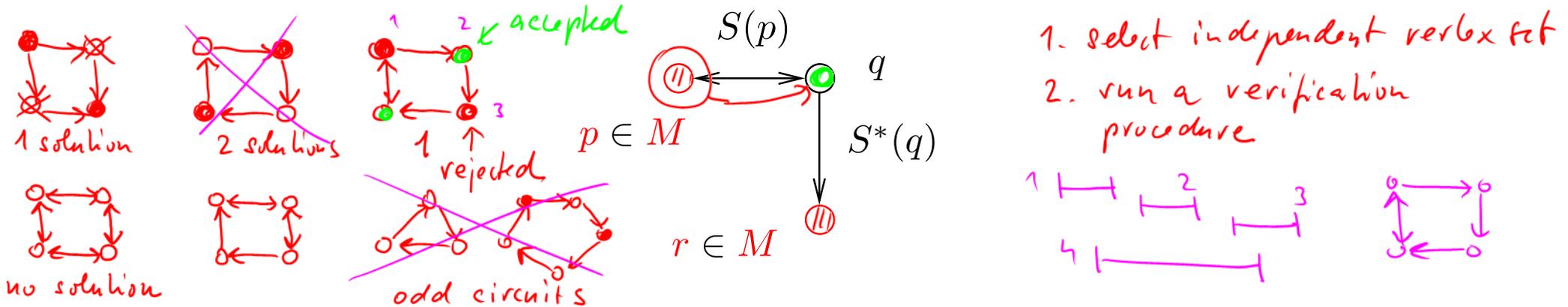


$I(q) > I(p)$ oriented strictly



Strict Kernel of an Oriented Graph

Def. Independent vertex subset M is a strict sub-kernel of \mathcal{G} if for every $p \in M$ it holds: every successor $S(p)$ is followed by a strict successor $S^*(q)$ back to M .

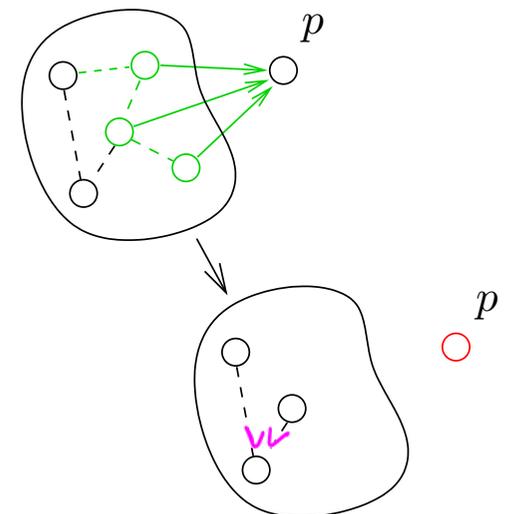


Proposition: Let \mathcal{G}^* be graph \mathcal{G} oriented by the interval overlap relation. Then (1) there is a **unique** maximum strict sub-kernel of \mathcal{G}^* for **any graph \mathcal{G}** and (2) it can be found in polynomial time.

Algorithm

1. Initialize $M := \emptyset$.
2. Find a sink $s \in V(\mathcal{G}^*)$. a sink has no successor
3. If there is no sink in \mathcal{G}^* , terminate and return M .
4. Add s to M .
5. Remove s and all its predecessors $P(s)$ from \mathcal{G}^* .
6. Go to Step 2.

*$N \times N$ matching table N^2
 $O(N \cdot N^2)$ faster $O(N^2 \log N)$*



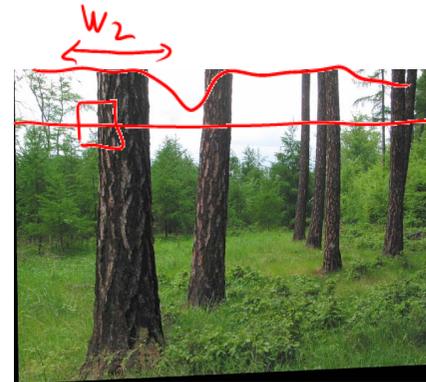
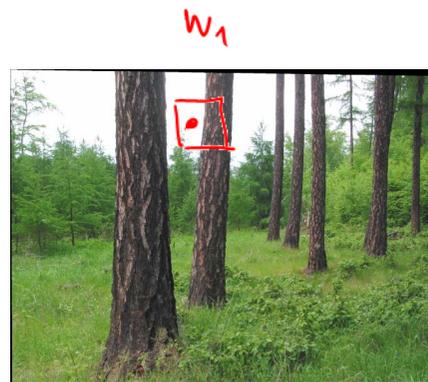
• **Faster algorithm exists**

Algorithm Comparison

Dynamic Programming

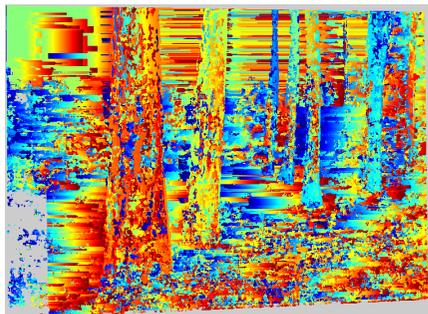
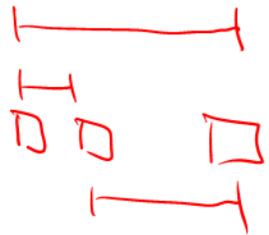
- dense disparity map (every pixel explained as matched or occluded)
- false positives if ordering does not hold
- $O(n^2)$ algorithm

Scharstein, Boykov
Comparison of algorithms

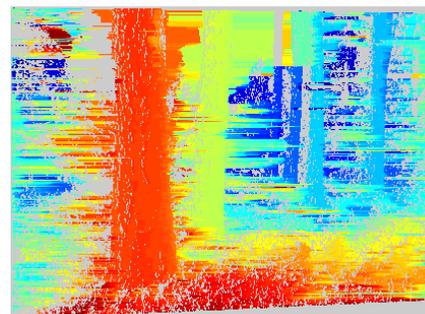


w_1, w_2 5x5 pixels

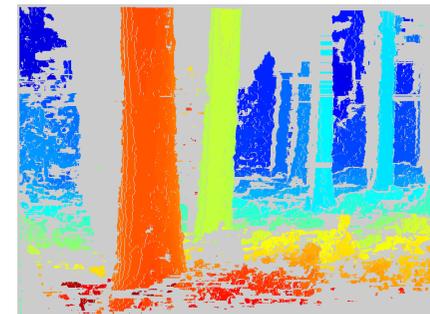
$$SSD = \sum_{i=1}^{25} (w_1(i) - w_2(i))^2$$



WTA



DP



GK

winner-take-all \uparrow DP
model does not hold : illusions
model (ordering) does not hold \Rightarrow that part of the scene not interpreted

- Simple things do not work





