Branch and Track
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- The objective:
  - tracking similar objects and discovering repetitive patterns

- Highlights in the framework:
  - DP + generalized distance transform (Felzenszwalb et al., 2008) for the online tracking of a dynamic pictorial structure.
  - Efficient sub-window search (Lampert et al., 2009) for optimal branching.
  - Feature sharing for the tracked windows

Three possible tracking outcomes.

- Single window tracking:
  $$\overline{W}_k = \arg \min_{W_k \in \mathbb{R}} \{ E(W_k) + \lambda \kappa(W_{k-1}, W_k) \}$$

- Tracking a dynamic pictorial structure:
  $$\overline{T}_k = \{ V_k, E_k \}$$ where $$T_k$$ is a tree.

  $$\overline{T}_k = \arg \min_{T_k} \left\{ \sum_{W_k \in \mathbb{V}_k} E(W_k^i) + \lambda \sum_{(W_k^i, W_k^j) \in E_k} \| (W_k^i - W_k^j) - (W_{k-1}^i - W_{k-1}^j) \|^2 \right\}$$

- Branching conditions: The child window resembles its parent window and the parent window resembles its own appearance at inception.

From left to right: one sample frame, the user input and the results with branch and track.

The MATLAB / C++ code is available at:
www.cs.duke.edu/~steve/branch_and_track.html