

CSCE 448/748 - Computational Photography

Video Textures

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Video Textures

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Still photos



Video clips



Video textures



Problem statement



video clip



video texture

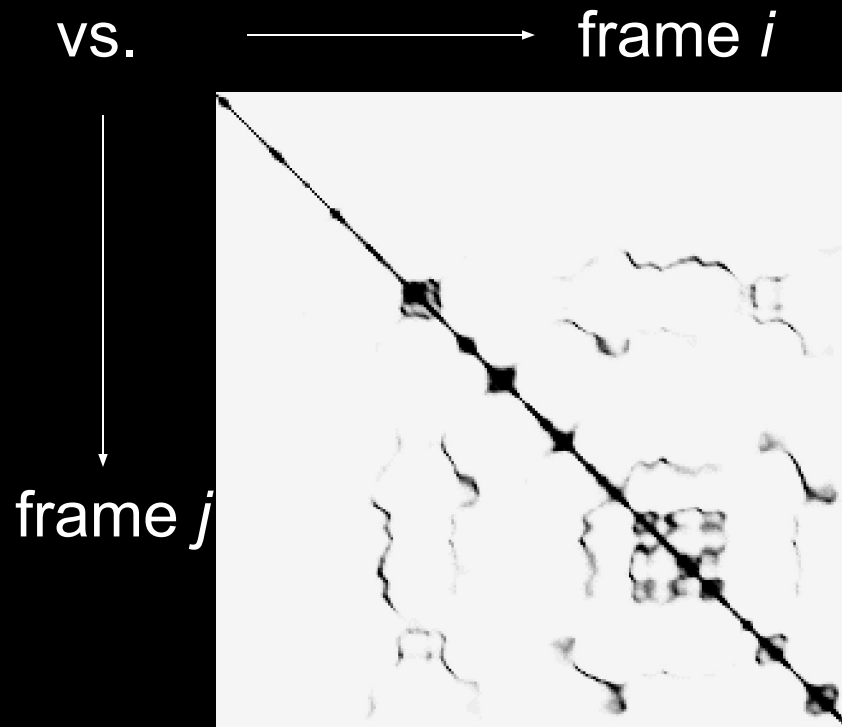
Our approach



- How do we find good transitions?

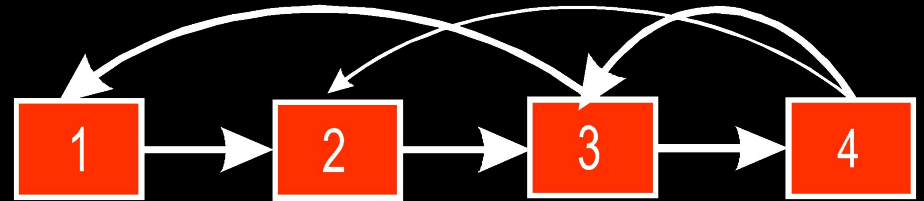
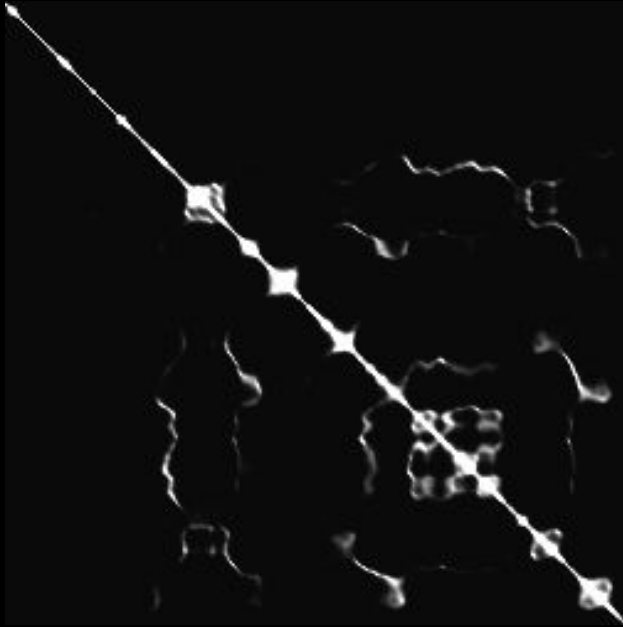
Finding good transitions

Compute L_2 distance $D_{i,j}$ between all frames



Similar frames make good transitions

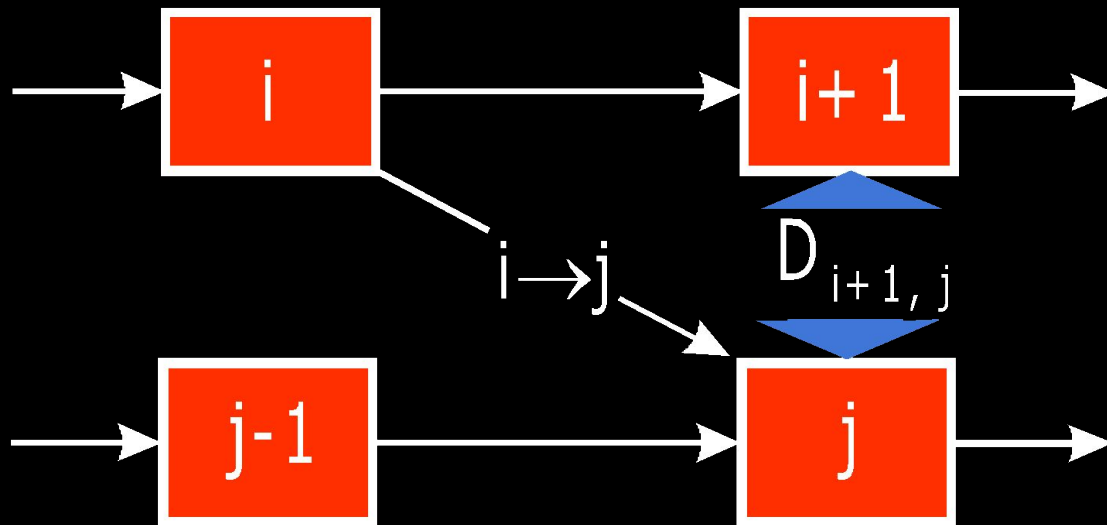
Converting to probabilities



Similar frames make good transitions

Transition costs

- Transition from i to j if successor of i is similar to j
 - Cost function: $C_{i \rightarrow j} = D_{i+1, j}$



Transition probabilities

- Probability for transition $P_{i \rightarrow j}$ inversely related to cost:

- $P_{i \rightarrow j} \sim \exp (- C_{i \rightarrow j} / \sigma^2)$



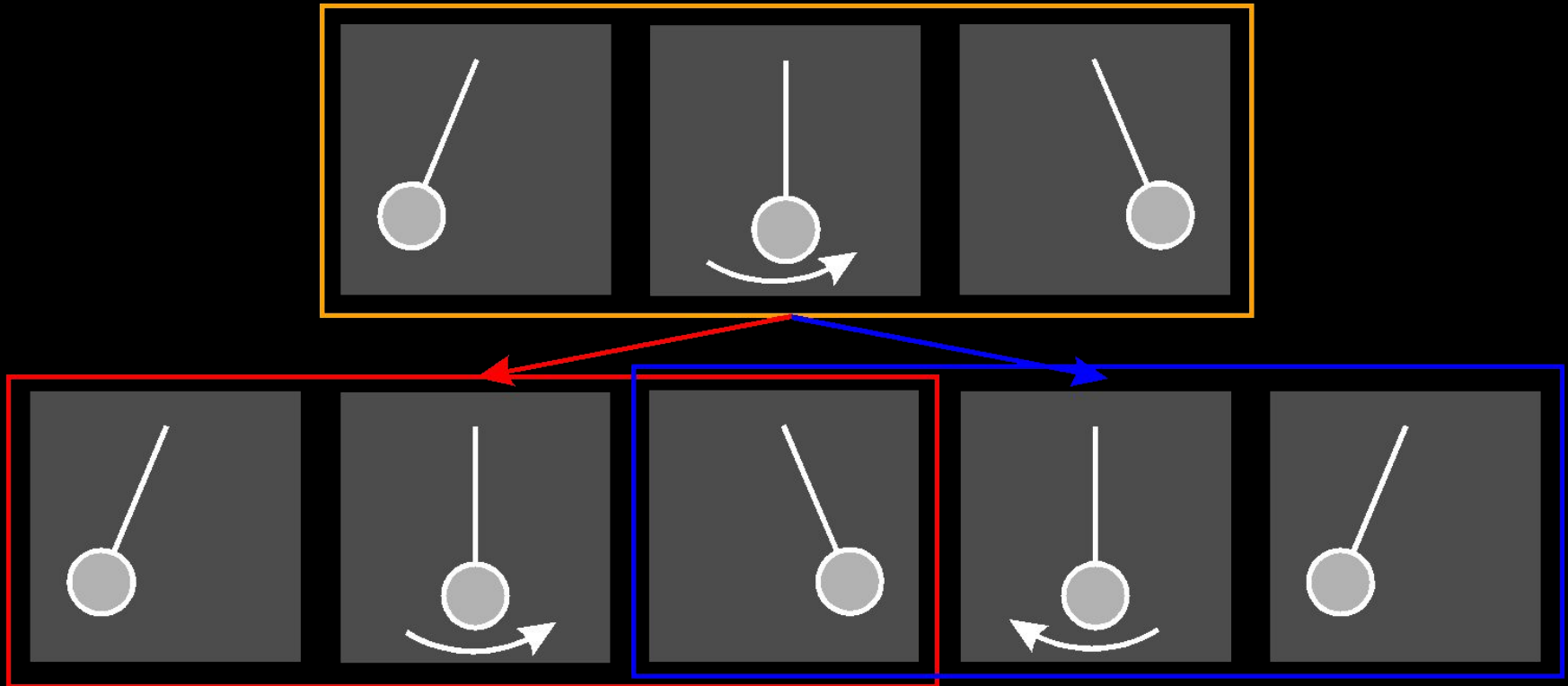
high σ

low σ

Preserving dynamics



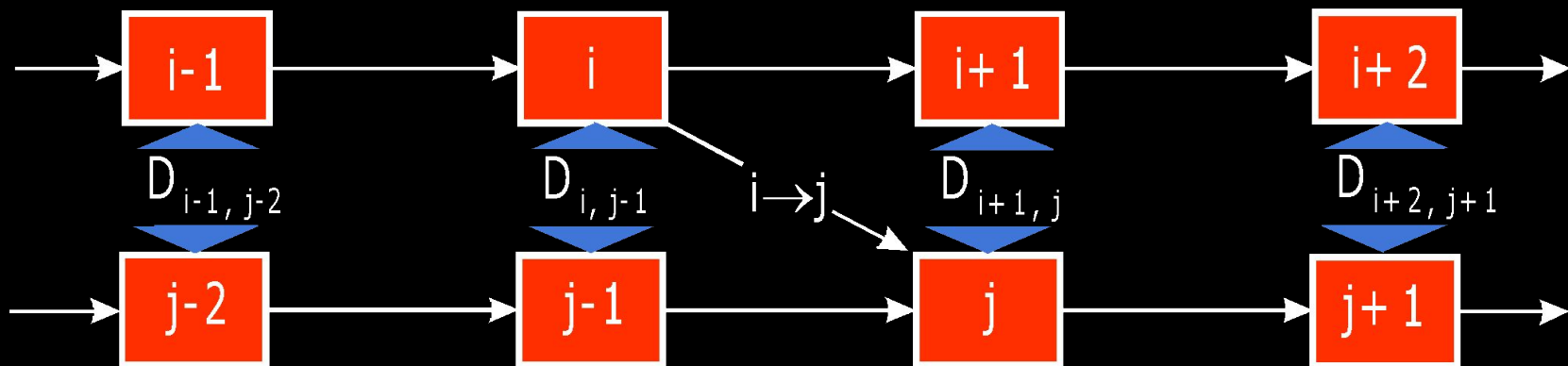
Preserving dynamics



Preserving dynamics

- Cost for transition $i \rightarrow j$

- $$C_{i \rightarrow j} = \sum_{k=-N}^{N-1} w_k D_{i+k+1, j+k}$$



Preserving dynamics – effect

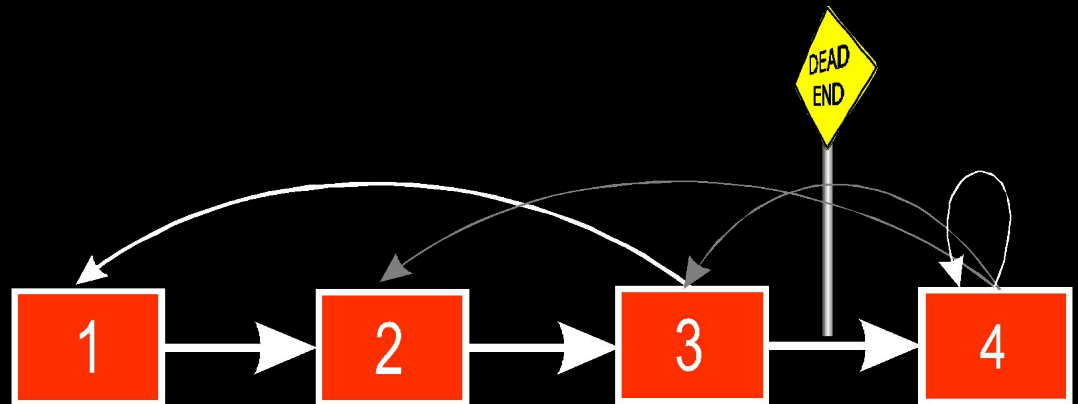
- Cost for transition $i \rightarrow j$

- $$C_{i \rightarrow j} = \sum_{k=-N}^{N-1} w_k D_{i+k+1, j+k}$$



Dead ends

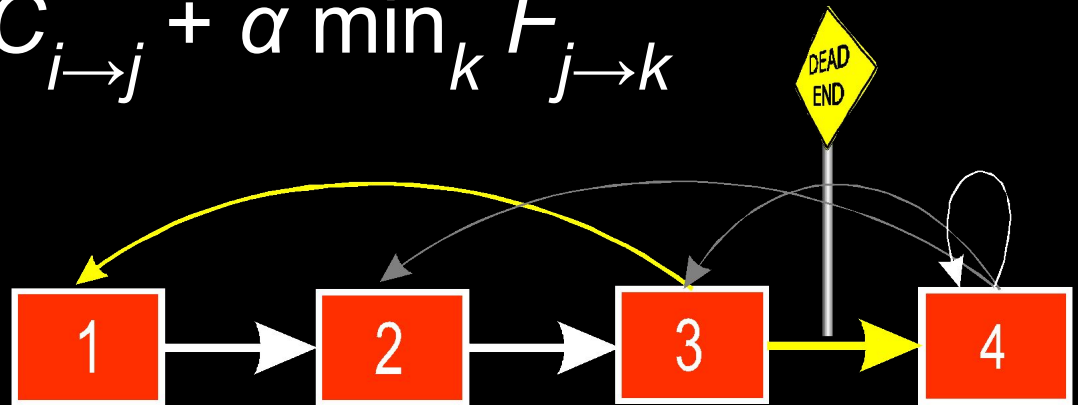
- No good transition at the end of sequence



Future cost

- Propagate future transition costs backward
- Iteratively compute new cost

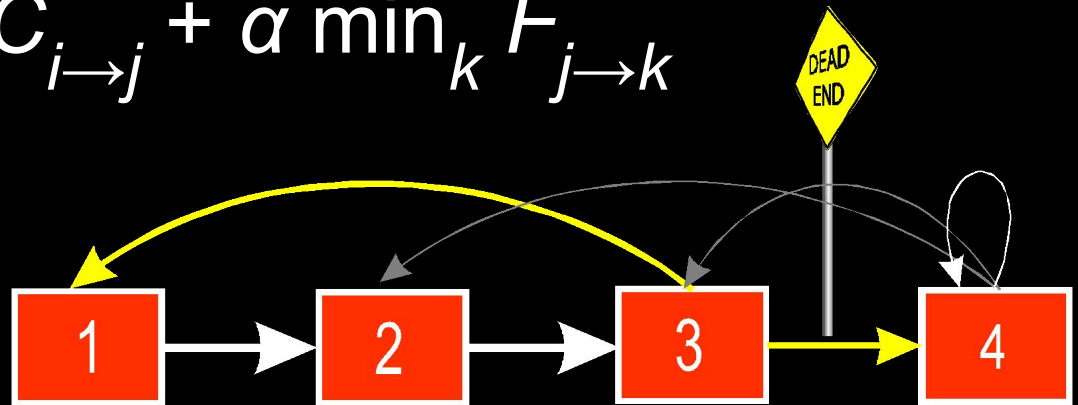
- $$F_{i \rightarrow j} = C_{i \rightarrow j} + \alpha \min_k F_{j \rightarrow k}$$



Future cost

- Propagate future transition costs backward
- Iteratively compute new cost

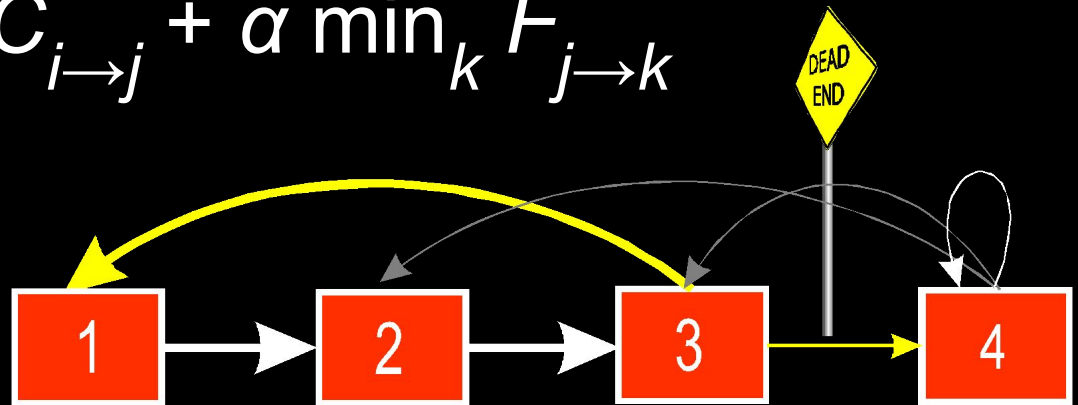
- $$F_{i \rightarrow j} = C_{i \rightarrow j} + \alpha \min_k F_{j \rightarrow k}$$



Future cost

- Propagate future transition costs backward
- Iteratively compute new cost

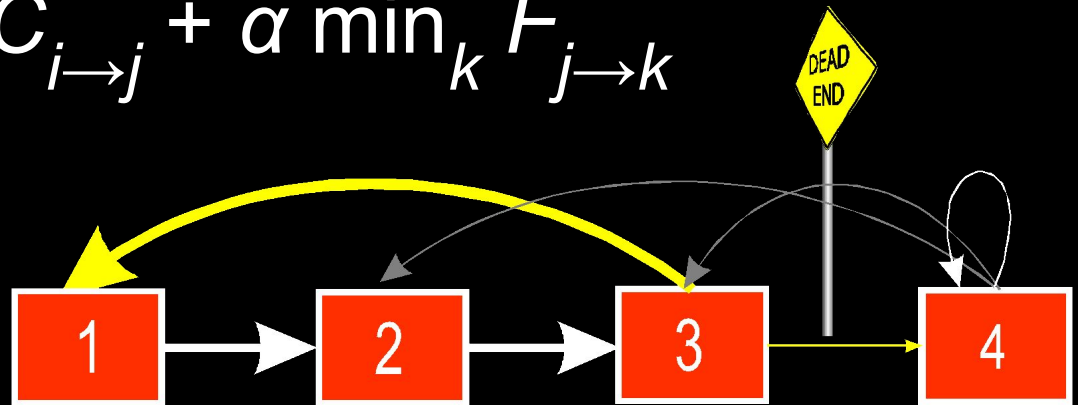
- $$F_{i \rightarrow j} = C_{i \rightarrow j} + \alpha \min_k F_{j \rightarrow k}$$



Future cost

- Propagate future transition costs backward
- Iteratively compute new cost

- $$F_{i \rightarrow j} = C_{i \rightarrow j} + \alpha \min_k F_{j \rightarrow k}$$



Future cost – effect



Finding good loops

- Alternative to random transitions
- Precompute set of loops up front



Video portrait



- Useful for web pages

Region-based analysis

- Divide video up into regions



- Generate a video texture for each region

Automatic region analysis



Discussion

- Some things are relatively easy



Discussion

- Some are hard



Liao et al. (SIGGRAPH 2013)

Berthouzoz et al. (SIGGRAPH 2012)