# **Video Textures**

Arno Schödl Richard Szeliski David Salesin Irfan Essa Microsoft Research, Georgia Tech







1 1









### **Transition Costs**

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











#### Deadends

No good transition at the end of sequence





### **Future Cost**

- Propagate future transition costs backward
- Iteratively compute new cost

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

4 4

#### **Future Cost**

- Propagate future transition costs backward
- Iteratively compute new cost



#### **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



#### **Future Cost**

- Propagate future transition costs backward
- Iteratively compute new cost

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

Q-learning

### Future Cost – Effect



#### **Visual Discontinuities**

• Problem: Visible "Jumps"



### Finding Good Loops

- Alternative to random transitions
- Precompute a good set of loops up front (using dynamic programming)



### Crossfading

• Solution: Crossfade from one sequence to the other.





### Morphing

Interpolation task:



 Compute correspondence between pixels of all frames



### Morphing

• Interpolation task:



Compute correspondence
between pixels of all frames



- Interpolate pixel position and color in morphed frame
- based on [Shum 2000]







### Crossfading



### Frequent Jump & Crossfading





### Video Portrait – 3D



Combine with IBR techniques

### **Region-based Analysis**

• Divide video up into regions



• Generate a video texture for each region



#### **User-controlled Video Textures**





User selects target frame range

fast



#### Summary

- Extensions
  - regions
  - external constraints
  - video-based animation



### Summary

- Video clips  $\rightarrow$  video textures
  - define Markov process
  - preserve dynamics
  - avoid dead-ends
  - disguise visual discontinuities



### Discussion

• Some things are relatively easy



## Discussion

• Some are hard

