Overview

**Goal:** Build an authoring tool to transform a video of a board, with low resolution and sloppy handwriting to more readable form containing multimedia-like properties.

**Approach:** Writing on the board is automatically identified and grouped together based on ideas, allowing an author to repaint or replace each piece once. This can be clip art, photographs, hand drawn images, video, etc. These new images (or videos) are used to create a new video.

Regions

A region is the collection of all the writing on the board that is part of the same idea. It is the smallest basic unit that can be operated on without distributing the rest of the writing on the board.

**Lifespan of Region**

**Birth:** A region is born when the first stroke of writing is drawn on the board for that idea.

**Maturity:** A region is mature when the last stroke of writing is drawn on the board. Between birth and maturity the region is said to be "growing."

**Death:** A region dies when it is erased, the video ends, or it merges with another region.

**Algorithm for Finding Regions:**

1. Segment video into foreground (instructor) and background (board) layers
2. Fill holes in background with future (or past) information from the video
3. Subtract two "close" segmented frames
4. If there is a difference:
   a. Perform high pass filter on the later frame
   b. High frequencies indicate the difference is writing, otherwise, it is erasing
5. Writing that is close together in time and space form a region
6. Regions that overlap are merged together to form one region
7. A region is removed if there is erasing on top of it, or it merges with another region to form a new region

For more information see [1,2].

Method

Lecture with board is recorded

Background (board)  Video is segmented  Foreground (instructor)

Holes in background are filled with future information

Regions are identified

Author manually replaces each region

Final video is rendered with instructor layered on top of the new regions

Repainting Examples

References


For more information visit our web page http://www.cs.wisc.edu/graphics

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