A video human-computer interface to record paintings in progress

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Abstract

This communication describes a system to capture paintings in progress. An adapted algorithm based on statistical foreground substraction is used to mask the artist hand and his tools in image sequences. This allows a better understanding of the artist gesture and his mind.

Keywords: video interface, foreground subtraction, painting.

1 The Context and the System

In 1956, Henri-Georges Clouzot has presented an innovative movie technique to record Picasso's painting in progress [Clouzot 1956]. The filmmaker placed his camera behind a semi-transparent surface on which the artist drew with special inks that bled through. The camera records the painting on film, taking the point of view of the canvas. This allows to capture the moment and the mystery of creativity. This communication presents a similar application allowing to capture stroke-by-stroke paintings. It presents also recent computer vision and image processing techniques. The proposed video human-computer interface requires only two numerical cameras and a notebook. The developped algorithm combines depth-based and movement-based segmentations. It masks the artist hand and his tools in the image sequence in order to record only the painting changes. Color, texture or form characteristics cannot be used because it is too constraining in this application.

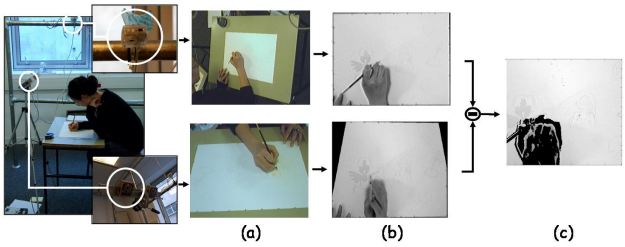

Figure 1: (a) Original images providing from the 2 cameras, (b) homographic rectified images, (c) mask providing from the thresholded difference between the two rectified images.

A depth-based segmentation is obtained by substracting and thresholding the two homographic rectified images comming from the two cameras (see figure 1). The hand is not correctly segmented, but the obtained mask is an hand presence indicator. Therefore, a temporal differencing of this mask allows to estimate if the hand moves or not. Hand non-activity criterium can then be designed from the depth-based segmentation. This criterium is used to modulate the Stauffer and Grimson's foreground substraction method. This method is based on a Gaussian Mixture Model [Stauffer and Grimson 1999]. Their approach uses a fixed learning rate α to merge in the background model (i.e. the canvas) the new still objects (i.e. the brushstrokes): $1/\alpha$ defines the time constant which determines changes. The choice of α stills crucial for the mentionned approach (A bad choice causes bad segmentation - see figure 2.b). In this communication, an original modulation of α considering the hand non-activity criterium is proposed. Basically, when the hand does not move, α is decreased in order to keep the hand in the foreground model (see figure 2.c).

2 Results and Discussion

The figure 3 shows a short extract of a result image sequence[1]. Each brushstroke is recorded. It validates the approach. Therefore, the method runs in real-time.

Figure 2: Foreground substraction results using an inadapted fixed α (b) or a hand non-activity modulated α (c) from the image sequence (a).

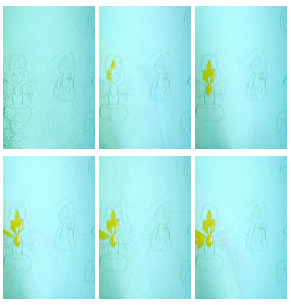

Figure 3: A short extract of a result sequence.

Future works will be dedicated to increase the output image quality, particularly the color rendering. Mixing the result image sequence with video resulting from other numerical techniques (animation, movie,...) could be considered. Another way consists in designing a multimodal interface: considering its color and position on canvas, each brushstroke can be associated with a particular music or sound. Endly, by using a camera network dedicated to 3D reconstruction, this approach can be extended to sculpture or pottery recording.

References

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[1]The author thanks Miss Kazune Osato, a Pierre and Marie Curie University graduate, for her artistic contribution.