

Live Cartoon-like Media Art using Blurring and Edge Enhancement

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Abstract: Interactive media art for transforming reality to cartoon-like video is presented. The proposed method allows real-time application of cartoon effects to camera-acquired, real-world pictures. A bilateral filter and edge extraction are applied for smoothing out single-frame images and simulating brush outline, respectively. The proposed method may have applications in the entertainment field.

Keywords: Media art, Edge extraction, Bilateral filter, Style transformation

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1. Introduction

With the development of modern media art, artwork has a significant impact on everyday life. Compared with traditional forms of art, such as painting or music, interactive art (with participating audience) has dramatically changed the perception of artistic compositions.

Cartoons are important artistic creations, appearing in a variety of contexts. They use prominent lines and weakened details as expressive means and can be advantageous in education and stress relief.

By combining cartoon effects and reality, the idea of art has spread to the general public. Interactive forms facilitate the participation of the audience in the process of artistic creation. Moreover, art can receive more attention.

In this study, a form of interactive media art is proposed combining the expressiveness of cartoons and the diversity of modern media art. Advanced technology is used to imitate the brush and watercolor styles, based on realistic scenes. The audience and surrounding environment are converted to cartoon-like images. Changes in the audience are reflected in the corresponding cartoons on the screen immediately. To realize this transformation, two techniques are employed: edge improvement and image blurring.

2. Concept Outline

The proposed concept is shown in Fig. 1. A camera is located near the screen. As the audience walks in front of the screen, the camera obtains a real-time video sequence. Subsequently, the proposed algorithm processes each frame and combines edge enhancement with blurring.

Finally, the cartoon-like video sequence is shown on the screen. The OpenCV library is employed for algorithm implementation.

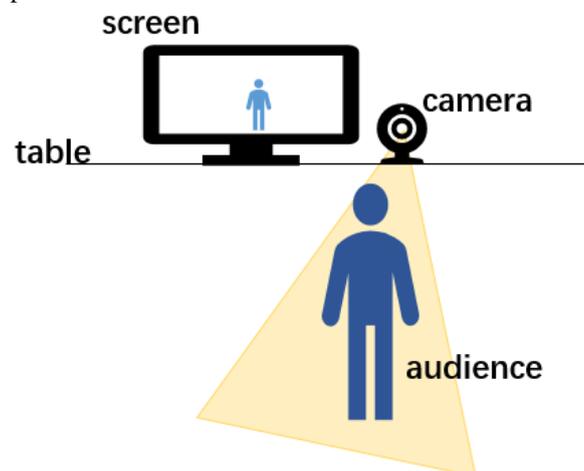


Fig. 1. Concept image

3. Methods

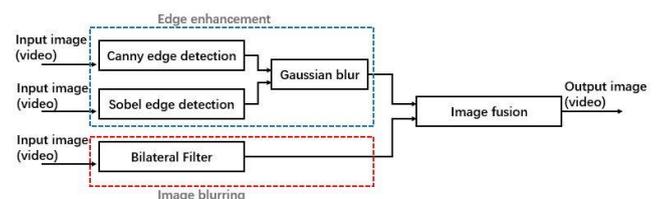


Fig. 2. Block diagram of proposed method

The proposed method is applied to the real-time video sequence acquired by the camera, and image fusion is used to render the cartoon-like pictures.

A. Edge enhancement

In the proposed technique, edge enhancement is used to imitate the traces of a brush. To this end, the Sobel operator is used, which can generate fat edges. Moreover, the Canny operator is more tolerant to image noise and quite effective in extracting weak patterns [1]. Hence, the composite application of these operators ensures the accurate extraction of edges, as shown in Fig. 3.

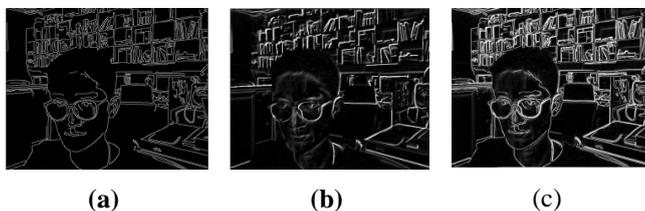


Fig. 3. Edge extraction: (a) using the Canny operator, (b) using the Sobel operator, and (c) composite result.

The Gaussian blur kernel is employed to generate smooth edges and thus render more natural images. Image binarization and color reversal are applied to generate the final brush style, as shown in Fig. 4.



Fig. 4. Brush style generation: (a) edge smoothing, (b) final brush style.

B. Image blurring

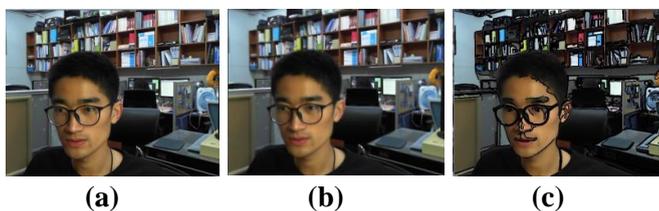


Fig. 5. Image blurring and final style: (a) input image, (b) blurred image, and (c) final cartoon style.

Bilateral filters consider the spatial as well as color distance between two pixels [2]. Therefore, they preserve edges during smoothing. Thus, a bilateral filter is employed for watercolor rendering. Subsequently, the watercolor and brush styles are combined to yield the final cartoon style. The blurring process is shown in Figs. 5(a) and (b). The filter smooths out the frame and preserves edge information. Fig. 5(c) shows the final output.

4. Conclusion

A method for generating cartoon-like pictures using live video was proposed. The brush style was imitated by the combined application of Sobel and Canny operators. A bilateral filter was used for the watercolor style. It was demonstrated that the proposed method provides aesthetically pleasing cartoon-like rendering of the audience and the background, and may be advantageous in entertainment and stress relief.

Acknowledgement

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References

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Biography



Shuxiang Song was born in Shandong in 1994. He received a B.S. degree in integrated circuit design and system integration from Qingdao University of Science and Technology in 2016. Currently, he is pursuing a M.S. degree in digital imaging at Chung-Ang University. His research interests include computational imaging, color registration and image enhancement.



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Joonki Paik was born in Seoul in 1960. He received a B.S. degree in control and instrumentation engineering from Seoul National University in 1984. He received the M.S. and Ph.D. degrees in electrical engineering and computer science from Northwestern University in 1987 and 1990, respectively. From 1990 to 1993, he worked at Samsung Electronics, where he designed image stabilization chip sets for consumer camcorders. Since 1993, he has been on the faculty at Chung-Ang University, where he is currently a professor in the Graduate School of Advanced Imaging Science, Multimedia, and Film. From 1999 to 2002, he was a visiting professor in the Department of Electrical and Computer Engineering at the University of Tennessee, Knoxville. Dr. Paik was a recipient of the Chester Sall Award from the IEEE Consumer Electronics Society, the Academic Award from the Institute of Electronic Engineers of Korea, and the Best Research Professor Award from Chung-Ang University. He has served the IEEE Consumer Electronics Society as a member of the editorial board. Since 2005, he has been the head of the National Research Laboratory in the field of image processing and intelligent systems.