Color Enhanced Emotion

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Abstract

The Color Enhanced Emotion system controls the human 'emotion' drastically. The system recognizes the facial expressions and controls skin pigment components using a real-time processor. By implementing the proposed system, an attendee can experience a system that will usher in a new era in communication and in movie editing systems.

Motivation

Man has invented numerous instruments and devices to enhance life that correct and extend several human input-output signals, such as glasses, hearing aids, and loud speakers. Then it's the next goal to enhance the most important and ambiguous human signal, i.e. emotion, in order to enable innovative communication and bring about the creation of a new communication culture.

For a long time, the representation of human emotion on the machine was achieved through recognition and control of the facial expression. Since facial expression can be controlled by the person, computer-generated images are predictable and not so impressive. Because such morphological operations require rather large calculation costs, real-time processing is difficult to implement. Then we propose a new system. The proposed system controls emotions by changing facial complexion, which cannot be changed by the person essentially, so color-enhanced emotional images are very impressive. Since calculation for such color processing can be performed quickly, we were able to realize a highly interactive system.

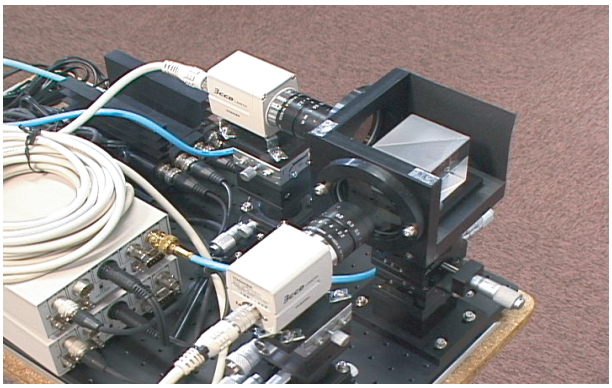
System

The system is made up of following components; 1)acquisition of the surface and body reflection images; 2)recognition of the facial expressions; 3)processing of the skin pigments; 4)output. Real-time processsing of them is implemented using a CPU and a GPU.

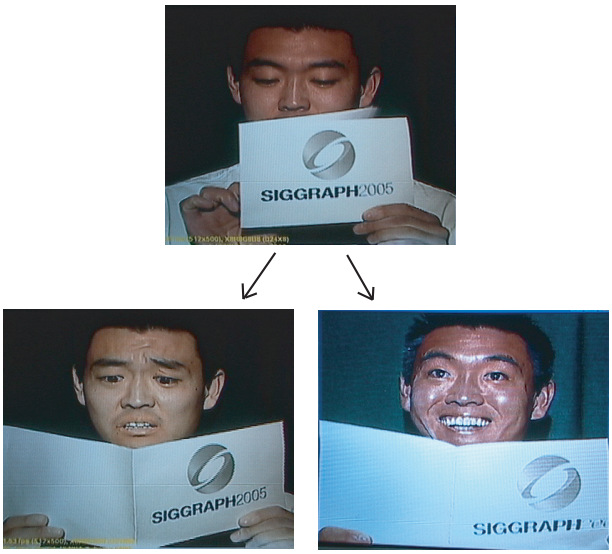
In the acquisition of the surface and body reflection images, through optical registration of two cameras and an S polarized light source, an S+P image (body reflection image) and an S+S image (surface and body reflection image) can be obtained simultaneously. In the recognition of the facial expressions, through the use of the computer vision technique, the movements of the parts of the face are tracked and the patterns of the movements are referenced against an emotion and movement database. In the processing of the skin pigments, body reflection images are decomposed using the independent component analysis method into melanin, hemoglobin and shading components. By increasing or decreasing the amount of each of these components, we can obtain effects such as suntanned, fair, drunk, pale, and various functional changes in complexion. In the output, by synthesizing these components and overlaying the decorated images, we can obtain the final output images.

Two cameras have VGA resolution, and the CPU decomposes the input images into the surface reflection image and melanin, hemoglobin and shading components. The GPU controls the amount of these components and synthesizes and outputs them. The system runs with full rate, about 30fps.

Subject's anger is enhanced on the monitor.



Dual cameras system which can decompose surface and body reflection in real-time.



Enhanced disappointment(left) and delight(right).