MEDICAL MIRROR

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Abstract - The Medical Mirror is a novel interactive interface that tracks and displays a user's heart rate in real time without the need for external sensors As ordinary people start to have access and control over their own physiological data, they can play a more active role in the management of their health. This revolution must take place in our everyday lives, not just in the doctor's office or research lab. However, current techniques for physiological monitoring typically require users to strap on bulky sensors, chest straps or sticky electrodes. This discourages regular use because the sensors can be uncomfortable or encumbering. In this work, we propose a new mirror interface for real-time, contact-free measurements of heart rate without the need for external sensors. Users can have the experience of remote health monitoring by simply looking into the Medical Mirror. Digital medical devices promise to transform the future of medicine because of their ability to produce exquisitely detailed individual physiological data.

Index Terms- Real Time system, Medical device, Digital devices

I. INTRODUCTION

The Medical Mirror is a novel interactive interface that tracks and displays a user's heart rate in real time without the need for external sensors. Currently, collection of physiological information requires users to strap on bulky sensors, chest straps, or sticky electrodes. The Medical Mirror allows contact-free measurements of physiological information using a basic imaging device. When a user looks into the mirror, an image sensor detects and tracks the location of his or her face over time. By combining techniques in computer vision and advanced signal processing, the user's heart rate is then computed from the optical signal reflected off the face. The user's heart rate is displayed on the mirror, allowing visualization of both the user's physical appearance and physiological state. Digital medical devices promise to transform the future of medicine because of their ability to produce exquisitely detailed individual physiological data. As ordinary people start to have access and control over their own physiological data, they can play a more active role in the management of their health. This revolution must take place in our everyday lives, not just in the doctor's office or research lab. Users can have the experience of remote health monitoring by simply looking into the Medical Mirror.

II.DESIGN

To encourage people to keep track of their vital signs on a daily basis, we designed the Medical Mirror to provide a natural user interface (Figure 1a). We utilized an LCD monitor with a built-in webcam to provide an interactive display. A two-way mirror was fitted onto the frame to present a reflective surface for the users in normal lighting conditions. This design means the LCD monitor and webcam are not visible to the user. However, the user is visible to the webcam and the LCD monitor can be used to project information onto the reflective surface of the mirror. The monitor and webcam are connected to a laptop running the analysis software in real-time. The Medical Mirror fits seamlessly into the ambient home environment,blending the data collection process into the course of our daily routines. For example, one can envision collecting health data when using the mirror for shaving, brushing teeth etc. This interface is intended to provide a convenient means for people to track their daily health with minimal effort.

II-I TECHNOLOGY

By combining techniques in computer vision and advanced signal processing, a person's heart rate can be computed from the optical signal reflected off the face with an error of less than three beats per minute [Poh et al. 2010]. An overview of the general steps in our approach to measuring a user's heart rate is illustrated in Figure 1b. First, an automated face tracker detects the largest face within the video feed from the webcam and localizes the measurement region of interest (ROI) for each video frame. The ROI is then separated into the three RGB channels and spatial averaged over all pixels to yield a red, blue and green measurement point for each frame and form the raw RGB signals. Next, the raw RGB signals are decomposed into three independent components using independent component analysis.

The power spectrum of the component containing the strongest blood volume pulse signal is then computed. Finally, the user's heart rate is quantified as the Frequency that corresponds to the highest power of the spectrum within an operational frequency band (45-240 bpm).

Figure :Real-time operation of mirror

II-II. MEASUREMENT OF HEART RATE

Heart rate is measured by finding the pulse of the body. This pulse rate can be measured at any point on the body where the artery's pulsation is transmitted to the surface by pressuring it with the index and middle fingers; often it is compressed against an underlying structure like bone. The thumb should not be used for measuring another person's heart rate, as its strong pulse may interfere with discriminating the site of pulsation. Possible points for measuring the heart rate are:1. The ventral aspect of the wrist on the side of the thumb (radial artery).2. The ulna artery.3. The neck (carotid artery).4. The inside of the elbow, or under the biceps muscle (bronchial artery).5. The groin (femoral artery).6. Behind the medial malleolus on the feet (posterior tibial artery).7. Middle of dorsum of the foot (dorsalis pedis).8. Behind the knee (politely artery).9. Over the abdomen (abdominal aorta

III.INTRACTION

A single user will be able to interact with the mirror at a time. When looking into the mirror, the user will see a box appear around his/her face and a timer will be displayed on the top corner of the box. Users will be asked to stay relatively as the timer counts down. After 15 s, the user’s heart rate will be displayed on the mirror, allowing simultaneous visualization of his/her physical ap pearance and physiological state. The heart rate measurement will be updated continuously until the user looks away.

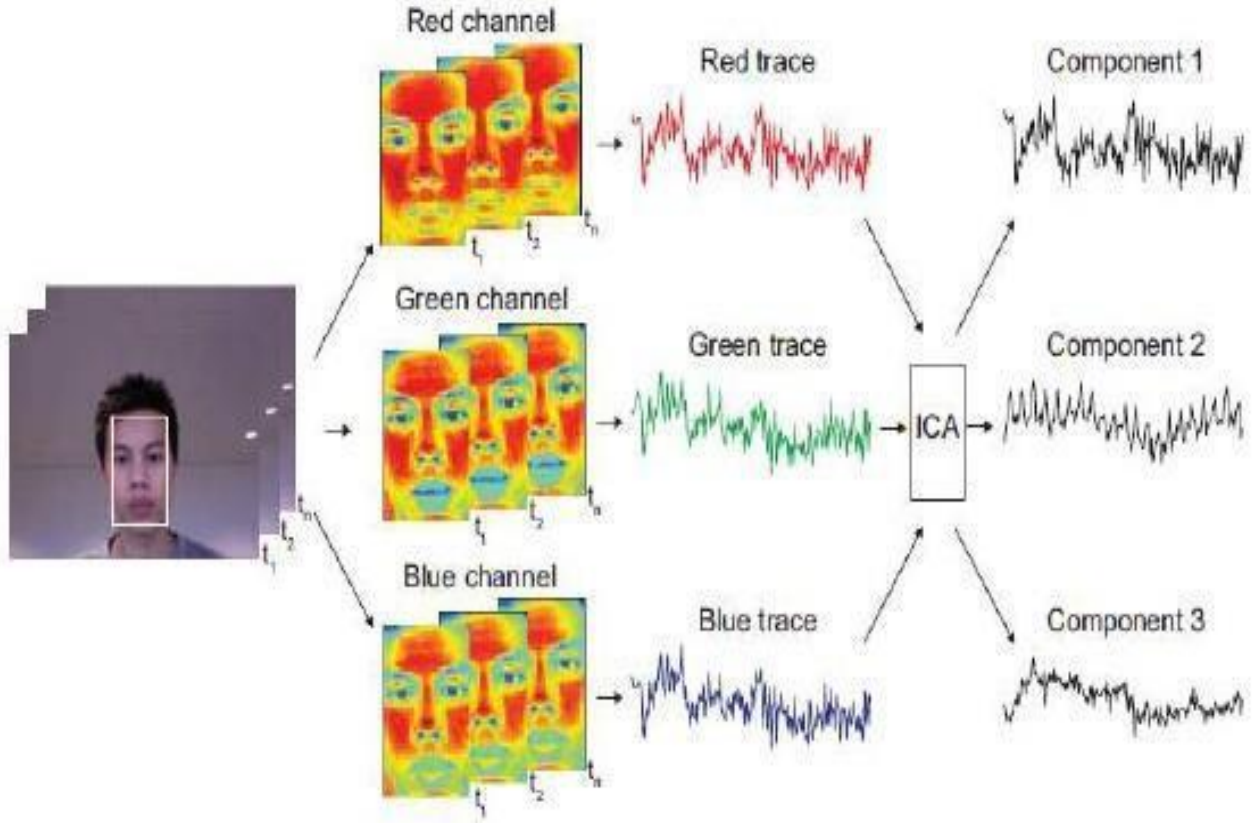

Figure: showing the pulse measurement methodology results

IV. CONCLUSIONS

This project illustrates an innovative approach to pervasive health monitoring based on state of the art technology. The Medical Mirror fits seamlessly into the ambient home environment, blending the data collection process into the course of our daily routines. For example, one can envision collecting health data when using the mirror for shaving, brushing teeth etc. This interface is intended to provide a convenient means for people to track their daily health with minimal effort. This concept describes a novel methodology for recovering the cardiac pulse rate from video recordings of the human face and implementation using a simple webcam with ambient daylight providing illumination. This is the first demonstration of a low-cost method for non-contact heart rate measurements that is automated and motion-tolerant. Moreover, this approach is easily scalable for simultaneous assessment of multiple people in front of camera. Given the low cost and widespread availability of webcams, this technology is promising for extending and improving access to medical care.

V.ACKNOWLEDGEMENTS

This paper is my seminar topic.Me and my collegue really work hard on this topic.I really thankful for her.For this paper I got a certificate also.

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