Dyadic Interaction Assistant for Tracking Head Gestures and Facial Expressions

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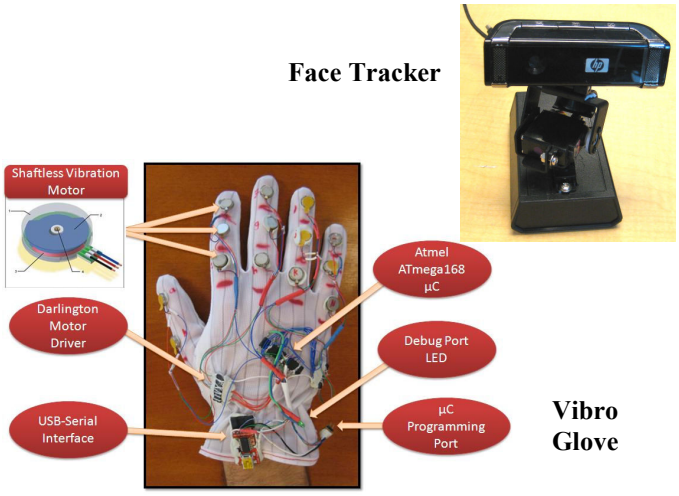
***Abstract*– In this paper, an face-tracking camera-based assistive technology is presented for extracting head and face based gestures which are delivered to individuals who are blind. The interface is capable of tracking the head and face of an interaction partner and delivering them through the recently developed VibroGlove interface. The construction of the interface as well as its application are detailed.**

INTRODUCTION

Nearly 27% of all information conveyed through interpersonal communication is displayed on the face [1], making the human face a visually data-rich object. Unfortunately, people who are blind cannot access this information. The face tracker described in this paper is primarily designed to track human faces when placed on a table opposite a person who is blind. The tracker provides a simple mechanism through which visual head and face based gestures of the interaction partner are extracted and then delivered to the VibroGlove, which is a vibrotactile interface developed towards conveying facial actions to the back of a user's palm. The construction and functioning of the glove itself is described in [2]. Figure below shows the face tracker and the VibroGlove.



IMPLEMENTATION

The face tracker consists of a auto-focus USB CMOS camera mounted on a pan-tilt mechanism. The pan-tilt is produced by two 180-degree servos controlled by a USB interface and powered by a rechargeable lithium ion battery. The control software utilizes the OpenCV library to continuously capture images from the CMOS camera and process each frame. Every image captured by the control software is passed through a Haar Object Detector with feature cascades corresponding to a face [3]. After ascertaining the location of the face through the Haar Object Detector, the control software moves the servos to pan and tilt the CMOS camera in the same direction the face moves. In every frame, the location and size of the object detected by the Haar Object Detector are filtered through a Kalman Filter that then predicts the location and size of the object for two important reasons: a) in case the Haar Object Detector does not detect the face in a successive frame, and b) reduce the impact of a falsely detected faces on the fluidity and integrity of the interface [4].

DESCRIPTION OF DEMONSTRATION

The demonstration will display how the interface tracks a face in real-time and the users will be able to wear the VibroGlove to feel the motions on the mouth. As soon as the user's face is within the range of the camera, the control software will detect and draw a square around the location of the user's face. The users will feel vibrations accordingly on the back of their palm indicating that a face has been detected. The user is encouraged to move their face and as long as the user's face stays within the field of view, the servos will tracj the face and keep it in the center of the field. Any facial expressions conveyed by the user's mouth will then be translated to vibration patterns on the glove. The user will be able to feel the various vibrotactile icons corresponding to the mouth movement patterns, like smile, surprise, anger etc.

REFERENCES

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