HAPTIKOS: Haptic Vest for the Deafblind and Visually Impaired

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1 Introduction

Deafblindness is a condition that hinders an individual's interaction with the people and environment that surrounds him or her. Interaction through touch, which is called haptics, is generally employed by deafblind communication methods. These include the block alphabet, Braille and social-haptic communication. The project aimed to develop the prototype of a system that could communicate information to the user using haptic communication.

2 Methodology

Fig 1. The haptic vest.

The vest is made out of neoprene - a soft, flexible fabric - for comfort. The 10x10 vibration motor matrix is placed in the internal dorsal part of the vest. The camera is fixed on the superior left corner of the frontal part of the vest.

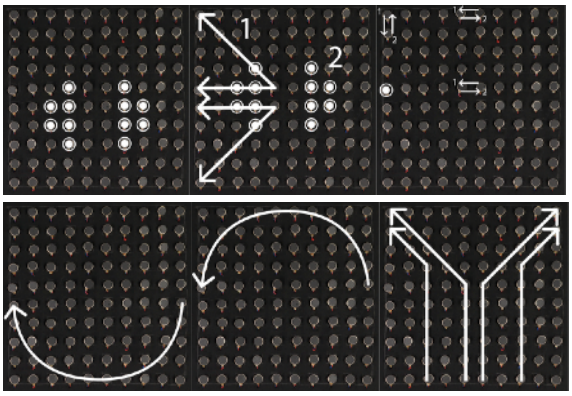

Fig 2. Vibration patterns for anger, disgust, fear, happiness, sadness and surprise.

A camera on the vest captures the interlocutor's facial image and a facial expression recognition software classifies it in anger, disgust, fear, happiness, sadness, surprise or neutral. The vest then uses vibration patterns, based on the manual signals for social-haptic communication, to convey this information to the user. This gives real time feedback about one's environment, which enriches communication. The device also receives text input from a keyboard which allows words and phrases to be conveyed using vibration patterns that simulate the block alphabet and braille on the vest.

3 Results

The average recognition rate for the 7 facial expression classes was 62.5%. The best recognized expressions were anger, disgust, happiness and surprise.

The average recognition rate for the 26 letters of the alphabet was 88% using the block alphabet and 84.6% using Braille. Average word recognition was 84% using the block alphabet and 74.5% using Braille.

In the learning phase, users took on average 1.23 trials to correctly guess 5 out of 6 vibration patterns. The average recognition rate in the test phase was 92.86%.

4 Conclusion

The haptic vest prototype communicates information using social-haptic communication, block alphabet and Braille through a vibration motor matrix, automatically. Software evaluation results show that recognition of "neutral", "fear" and "sadness" facial expressions could be improved. The results have proved that it is possible to use the haptic vest to convey information using social-haptic communication, block alphabet and Braille through vibration patterns and that the users can learn these patterns quickly. These results indicate the great impact this device can have on deafblind people's communication, contributing to their development, accessibility and social inclusion.

5 References

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