令和5年度生体医歯工学共同研究拠点

成果報告会

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<文部科学省共同利用・共同研究拠点>

Augmented Data Glove for Advanced Hand and Finger Motion Interactions

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1．研究目的

According to a survey conducted by Japan's Ministry of Labor and Health, over 23,000 individuals in the country are deafblind, with many more experiencing gradual losses of both their sight and hearing due to their disabilities. Deafblindness results from the impairment of the two fundamental human sensory functions, namely vision and hearing, frequently giving a rise to communication challenges. Earlier works reported assistive hardware/software systems, incorporating input/output gloves equipped with sensors and actuators to transmit the traditional Malossi alphabet and similarly, Lorm alphabet gloves used as a communication and translation devices for the deafblind. In our work we extend the above methods by introducing a more intuitive input interface supporting single hand signing for enhanced mobility and employing piezoelectric actuators for the haptic feedback. More specifically, we are developing a haptic data glove that utilizes the mobile Malossi alphabet to facilitate two-way communications through tactile and vibratory means [1, 2]. The innovation aims to diminish the reliance of deafblind individuals on caregivers and interpreters, thereby enhancing their independence.

2．研究成果

This work presents the prototype design of tactile input and output data gloves as human-machine interface components, specifically tailored to support two-way communication for individuals who are deafblind, both locally and remotely. The signal flowchart for the integrated system, as illustrated below shows the Arduino Nano microcontroller, with the IO Expanders, interconnecting the message-sending and the message-receiving gloves.
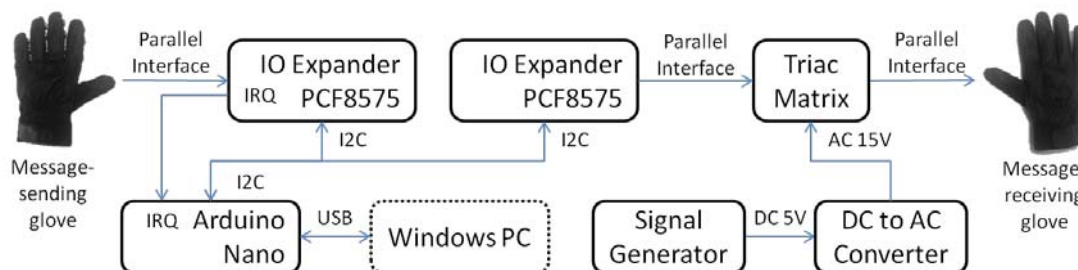
The work can be extended to other application domains, such as emergency services, critical operations, and disaster management. In particular, data gloves can play a crucial role in extreme situations like earthquakes, hurricanes, floods, and fires, where hearing and vision can be severely impaired. Therefore, we intend to explore the design and development of specialized waterproof and/or fire-resistant data gloves that utilize reliable communication channels and can operate independently for extended periods in such circumstances.

3．参考文献

1) Hung, P.C.K., Kanev, K., Nakamura, A., Takeda, R., Mimura, H., Kimura, M. (2023). Prototyping of Haptic Datagloves for Deafblind People. In: Barolli, L. (eds) Innovative Mobile and Internet Services in Ubiquitous Computing . IMIS 2023. Lecture Notes on Data Engineering and Communications Technologies, vol 177. Springer, Cham. DOI:10.1007/978-3-031-35836-4_29

2) Hung, P.C.K., Bottoni, P., Kanev, K., Nakamura, A., Mimura, H., Kimura, M., Development of Haptic Data Gloves for Bilateral Communication, *The 8th International Symposium on Biomedical Engineering ISBE2023*, Hamamatsu, Japan, November 21-22, 2023.