

# A Computer Vision and Vibrohaptic Glove-Based Piano Learning System for the Visually Impaired

Ian Juha Cho, Jin Park, and Hosung Bae

Hankuk Academy of Foreign Studies, Yongin, Gyeonggi, South Korea

ianisnumber2027@gmail.com, jinparkdevelop@gmail.com, baehosung06@gmail.com

**Abstract**— The visually impaired are unable to enjoy leisure activities as much as ordinary people due to various limitations. To expand the scope of leisure activities for the visually impaired, we have developed a vibration glove-based system that helps with piano learning. Previous research used 88 infrared light-emitting diodes and gloves with infrared receivers to provide feedback to the user, but this method had many limitations. In particular, the inconvenient user experience and low accuracy were the biggest problems. Our method solves both problems using a camera and an image processing algorithm. As a result of testing the model on 20 piano images, it was shown that all keys were perfectly recognized in 75% of cases, and the gloves could be comfortably used in practice without any difficulty. Thus, our method presents a simpler user experience for the visually impaired, without requiring any special modifications to the piano.

**Keyword**— Image Processing, Computer Vision, Piano Pedagogy, Visual Impairment, Assistive Technology



Ian J. Cho was born in Long Beach, California, in 2006. This author is currently studying at Hankuk Academy of Foreign Studies in Yongin, Gyeonggi. He has written a research paper on a flexible system call interface for multi-platform operating systems. He wishes to study computer science, with a concentration in operating system development.



Jin Park was born in Seoul, South Korea, in 2006. This author is currently studying at Hankuk Academy of Foreign Studies in Yongin, Gyeonggi. He has participated in various science fairs, including the International Science and Engineering Fair. He wishes to study pure or applied mathematics in the future.



Hosung Bae was born in Bundang, South Korea, in 2006. This author is currently studying at Hankuk Academy of Foreign Studies in Yongin, Gyeonggi. He wishes to study physics or mechanical engineering in the future.