Załącznik nr. 2

Abstract

Data gloves currently being built for recognizing hand movements during sign language communication have inadequate ergonomics, unsatisfactory efficiency, which is due, among other things, to a misunderstanding of the essence of sign language by researchers building such gloves. The purpose of the present work is the construction and testing of the author's sensor glove with the smallest possible number of required sensors. The research described in this paper focuses on experiments involving the use of machine learning technology. Training data was obtained from 15 participants performing both static hand gestures of the Polish Sign Language Alphabet (PSLA) and dynamic gestures. Experiments with static gestures consisted of classifying them using 6 classifiers. The best gesture recognition performance of 99% was obtained for the *k*-Nearest Neighbors in Random Subspaces classifier. Using the decision tree algorithm with the Gini coefficient, the hierarchy of the influence of the individual piezoelectric sensors of the glove on the classification effectiveness was determined and then confirmed in the re-performed gesture classifiers. For data from three sensors, an accuracy of 94% was achieved. In the next stage of the research, dynamic gestures of the letters of the Polish Sign Language Alphabet were recognized. Using a neural network built from spline layers and GRU recursive units, dynamic gesture classification was carried out with an accuracy of 99% for data containing readings from all 10 piezoresistive sensors and six axes of the inertial sensor. The most important strand of work focused on the selection of the most relevant sensors. Due to the strong correlation relationship of the signals recorded from the sensors determining the hierarchy of features by statistical methods, brute-force selection was carried out, checking the effectiveness of each possible combination in the process of training the neural network. The results obtained prove the possibility of classifying PSLA letters with an accuracy exceeding 98% on the basis of data from only three piezoelectric sensors and 6 axes of an inertial sensor, and indicate the existence of a tercet of such sensors that is universal for each person. Proving the thesis of effective classification of PSLA letters using less than 5 sensors, it was shown that it is possible to use data gloves with a simplified design, which may allow to improve the ergonomics of the glove, its reliability and acceptability for people with disabilities.