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YUSOFF, M.A.A.M., AZMI, N.L., NORDIN, N.H.D.

A WHEELCHAIR SITTING POSTURE DETECTION SYSTEM USING PRESSURE SENSORS
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Department of Mechatronics Engineering, Kulliyyah of Engineering, International Islamic University Malaysia, Kuala Lumpur, Malaysia

Abstract
The usage of machine learning in the healthcare system, especially in monitoring those who are using a wheelchair for their mobility has also helped to improve their quality of life in preventing any serious life-time risk, such as the development of pressure ulcers due to the prolonged sitting on the wheelchair. To date, the amount of research on the sitting posture detection on wheelchairs is very small. Thus, this study aimed to develop a sitting posture detection system that predominantly focuses on monitoring and detecting the sitting posture of a wheelchair user by using pressure sensors to avoid any possible discomfort and musculoskeletal disease resulting from prolonged sitting on the wheelchair. Five healthy subjects participated in this research. Five typical sitting postures by the wheelchair user, including the posture that applies a force on the backrest plate, were identified and classified. There were four pressure sensors attached to the seat plate of the wheelchair and two pressure sensors attached to the back rest. Three classification algorithms based on the supervised learning of machine learning, such as support vector machine (SVM), random forest (RF), and decision tree (DT) were used to classify the postures which produced an accuracy of 95.44%, 98.72%, and 98.80%, respectively. All the classification algorithms were evaluated by using the k-fold cross validation method. A graphical-user interface (GUI) based application was developed using the algorithm with the highest accuracy, DT classifier, to illustrate the result of the posture classification to the wheelchair user for any posture correction to be made in case of improper sitting posture detected. © (2024) International Islamic University Malaysia-IIUM.

Author Keywords
classification; machine learning; posture detection; pressure sensor; smart wheelchair

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Correspondence Address
NORDIN N.H.D.; Department of Mechatronics Engineering, Malaysia; email: liyanazmi@iium.edu.my

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