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Human Activity Recognition for the Assessment of Daily-life Activities Using Machine Learning

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Topic: Biosignals and medical imaging

This study is a part of a larger project that focuses on the recording and analysis of movement and physiological data for clinical applications. One aim of the project is to extract gait parameters that can help in identifying abnormal human movements. Human activity recognition (HAR) is an important field of study that has the potential to recognize daily-life activities from gait parameters and has applications in the areas of medical diagnosis and fitness tracking [1].

The goal of this study is to extract small- and large-scale characteristics from IMU and physiological data that can assist in identifying a variety of daily activities to design a HAR system. In this study, we designed a human activity detection algorithm by fusing cutting-edge signal processing and machine learning methods. Existing IMU-based hardware has been used to record movement signals [2]. On 10 healthy volunteers, the proposed algorithm was evaluated to recognize 10 different static, dynamic, and transitional activities. To identify the different human movements, the recorded data estimated the number of time, frequency, and time-frequency characteristics. The classifier was created using the ensemble machine learning method known as random subspace (RS). Each participant received individualized hold-on validation for RS (70% of the data were utilized for training and the remaining 30% for testing). By reaching an overall accuracy of 97.11%, the findings show that the developed algorithm is capable of differentiating among various activities. The proposed algorithm as conceived works well for static, dynamic, and transitional tasks (figure 1). The suggested technique may be used to automatically identify typical everyday tasks for the effective management of movement disorders.

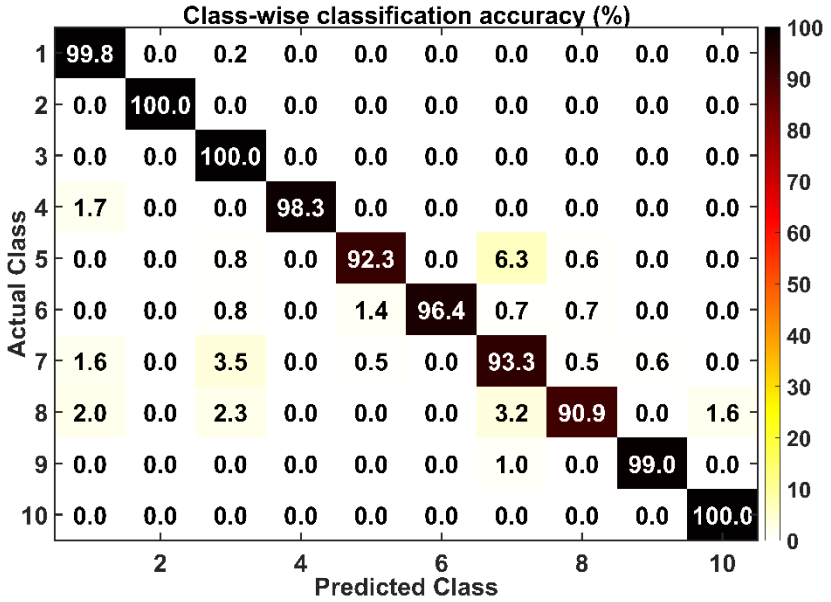

Figure 1. Walk normal (WN), walk dual (WD), walk slow (WS), walk fast (WF), stairs descend (SD), stairs ascend (SA), walk and sit (WSit), walk and lay (WLay), sitting (Sit), and laying (Lay) were the investigated daily life activities.

References

[1] Kim, E., Helal, S. and Cook, D. IEEE pervasive computing, 2009.
[2] Boutaayamou, M., Schwartz, C., Joris, L., et al. In BIOSIGNALS. 2019.