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Evaluating the effectiveness of algorithms used for human fall detection

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This paper presents a study on evaluating the effectiveness of algorithms used for human fall detection. For this purpose, a personal fall detector based on a micro-controller and MEMS sensors was built. Detection algorithms described in scientific papers are discussed. The issue of artificial intelligence and its impact on the development of the fall detection issue was described. Three algorithms were implemented on the fall detector:
• threshold algorithm;
• threshold algorithm with additional time window analysis;
• algorithm using data analysis and machine learning.
Their operating principles are described, as well as the process of training the SVM model. Next, tests conducted on the fall algorithms are described, covering various scenarios, such as moving around the apartment, falling and lying motionless, moving up stairs, sitting on a chair, walking with momentary loss of balance, and clapping hands. Results and a final analysis of the performance of the tested algorithms are presented. Summarizing the final results, it can be concluded that the artificial intelligence-based model showed the most promising results in detecting falls, especially in situations that may be difficult for traditional algorithms to identify. The algorithm was tested on the FallAlld data set. It achieved an accuracy of 94.3%. The correctness of the results it achieved during field testing was as high as 97.14%. While the threshold algorithm will achieve a correctness of 87.14%, and the algorithm with an additional analysis of the time window will achieve a correctness of 94.29%.

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