Two-stage feature selection using ranking self-adaptive differential evolution algorithm for recognition of acceleration activity

ABSTRACT

Widespread research on activity recognition is becoming an imperative topic for improving the quality of human health. The fast development of sensing technology has become a fundamental platform for researchers to implement a system that could fulfill human needs. Due to privacy interests and low cost, wearable sensing technology is used in numerous physical activity monitoring and recognition systems. While these systems have proved to be successful, it is crucial to pay attention to the less relevant features to be classified. In such circumstances, it might happen that some features are less meaningful for describing the activity. Less complex and easy to understand, feature ranking is gaining a lot of attention in most feature dimension problems such as in bioinformatics and hyperspectral images. However, the improvement of ranking features in activity recognition has not yet been achieved. On the other hand, an evolutionary algorithm has proven its effectiveness in searching the best feature subsets. An exhaustive searching process of finding an optimal parameter value is another challenge. Consequently, this paper proposes a ranking self-adaptive differential evolution (rsaDE) feature selection algorithm. The proposed algorithm is capable of selecting the optimal feature subsets while improving the recognition of acceleration activity using a minimum number of features. The experiments employed real-world physical acceleration data sets: WISDM and PAMAP2. As a result, rsaDE performed better than the current methods in terms of model performance and its efficiency in the context of random forest ensemble classifiers.

Keyword: Activity recognition; Feature ranking; Self-adaptive differential evolution; Relief-f; Random forest