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Universal activation function for data-driven gait model

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Abstract

Gait generation for biped robot is a tedious task for locomotion in an uncertain environment. In this research paper, the authors have developed the deep learning approach for modelling the human locomotion kinematics dataset on an uneven surface which can be further used as a reference trajectory for the biped robot. However, choosing the right activation function for deep learning is a very challenging task. This research work has proposed the universal activation function for the kinematic modelling which is adaptive in sense of application. Twenty-five different activation functions from the literature are compared with the presented activation function in term of mean and maximum model prediction error along the gait trajectory. It shows that the universal activation function-based gait model outperforms others by large margins. Additionally, the parameter sensitivity of the presented activation function is discussed in detail. Moreover, the complexity analysis and running time are also investigated. Furthermore, two cases of 5% and 10% variation in the input are analysed to evaluate the prediction ability of the developed gait model with a 95% prediction interval.

Keywords

gait model, activation function, prediction interval, data-driven, biped robot

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