A MODEL OF SPINAL NETWORK WITH A HUGE DEGREE OF FREEDOM

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ABSTRACT

Our recent studies on mathematical modeling of the human gait control system are introduced. To start, in relation to the dynamic stability of human gait, several topics that could arise from nonlinearity of the underlying dynamical system are discussed [1-3].

We emphasize that construction of mathematically tractable-caricature models and detailed mathematical analyses of those models are indispensable to understanding the emergent mechanisms of those behaviours. The use of caricature models together with challenges to constructing detailed large scale models of human body *in silico* should play important roles to elucidate dynamics-induced human functions.

A simulation environment (platform) that are under development for the use in construction of a detailed large scale dynamical system model is introduced. Among various subsystem consisting the human gait control system, the neural network located at spinal cord was chosen, and the platform was applied to develop a large sacle dynamical system model of the spinal network. The model includes several hundreds of conductance-based biophysical neuron models (both motor neurons and inter-neurons) to simulate altanating excitations between two sets of motoneuronal; pools invervating antagonist muscle groups. A preilimnary of our exploration of the model's dynamics is briefly discussed.

Keywords: locomotion, nonlinear dynamical system, central pattern generators.

References

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