Indian Institute of Science
Centre for BioSystems Science and Engineering

BSSE Annual Work Presentation

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Forward predictions in biological motor control

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ABSTRACT

In our day to day life, we make variety of movements like reaching for a glass of water, handling a tool etc. To control such movements, the Central Nervous System (CNS) sends motor commands to the muscles which generate forces and cause the body movement. The CNS also receives the sensory consequences of these motor commands through visual and proprioceptive feedbacks but only after a delay period of (~150 – 200ms). Since actions often need to be performed as quickly as possible, this delay can make the system unstable. To overcome this issue, the CNS is hypothesized to learn an internal model (also known as forward predictive model) that predicts how the body will react to the motor commands from the CNS or in other words it provides a rapid prediction of sensory consequences which can be used to control movement. In order to do this, the CNS must learn to represent the nonlinear dynamics of body motion. To understand how the CNS might do this, we are developing a biologically plausible neural network model that can learn the movement dynamics of a virtual arm. The neural network models are implemented in Nengo and the virtual arm is implemented in OpenSim.