Neural dynamics and synaptic plasticity in a recurrent neural network for complex autonomous behaviors of a biomechanical walking robot

Poramate Manoonpong[1,2], Eduard Grinke[2], Christian Tetzlaff[2], Florentin Wörgötter[2]

[1]Embodied AI and Neurorobotics Lab, Center for BioRobotics,
The Mærsk Mc-Kinney Møller Institute, University of Southern Denmark,
Odense M, Denmark
(Tel : +4565508698; E-mail: poma@mmmi.sdu.dk)
[2]Bernstein Center for Computational Neuroscience (BCCN), Third Institute of
Physics, Georg-August-Universitaet Göttingen, Göttingen, Germany

Abstract: Walking animals, like insects, with little neural computing can effectively perform complex behaviors. For example, they can walk around their environment, escape from corners/deadlocks, and avoid or climb over obstacles. While performing all these behaviors, they can also adapt their movements to deal with an unknown situation. The versatile and adaptive abilities are the result of an integration of several ingredients including neural dynamics, plasticity, sensory feedback, and biomechanics. Following insects 'strategy, in this talk I will present our bio-inspired approach which can generate complex autonomous behaviors with versatility and adaptivity of a biomechanical walking robot through a sensorimotor loop. The behavior generation also involves neural dynamics, synaptic plasticity, sensory feedback, and biomechanics.