The role of cellular neural homeostasis in agent learning and adaptation

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Abstract. We study the dynamics of an autonomous agent that is managed by a simple biological neural network consisting of neurons with homeostatic properties. Each neuron reproduces intracellular adaptive processes in biological neural cells. Neuron properties of memory, selection, and self-organization aimed at maintaining cellular homeostasis are studied. It is shown that the simulated agent is able to maintain homeostasis in a dynamic environment. The agent has two motivations: phototaxis and nutrition. Switching between motivations is due to homeostatic dependence of the damaging input of the neuron. The switching is based on the synaptic control of neurotransmitter receptors traffic.