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Using Personalized Spiking Neural Networks, Distinct Techniques for Self-Governing

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Abstract : Recently, there has been a lot of interest in the difficult task of applying reinforcement learning to autonomous mobile robots. Conventional reinforcement learning (TRL) techniques have many drawbacks, such as lengthy computation times, intricate control frameworks, a great deal of trial and error searching, and sluggish convergence. In this paper, a modified Spiking Neural Network (SNN) is used to offer a distinct method for autonomous mobile robot learning and control in unexpected surroundings. As a learning algorithm, the suggested model combines dopamine modulation with spike-timing-dependent plasticity (STDP). In order to create more computationally efficient, biologically inspired control systems that are adaptable to changing settings, this work uses the effective and physiologically credible Izhikevich neuron model. This study is primarily focused on creating an algorithm for target tracking in the presence of obstacles. Results show that the SNN trained with three obstacles yielded an impressive 96% success rate for our proposal, with collisions happening in about 4% of the 214 simulated seconds.

Keywords : spiking neural network, spike-timing-dependent plasticity, dopamine modulation, reinforcement learning
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