

Applying hybrid reinforcement and unsupervised weightless neural network learning algorithm on autonomous mobile robot navigation

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Abstract

An autonomous system constructed using written computer programs based on human expert knowledge only handles anticipated and verified states. On the other hand, a self-learning algorithm allows an autonomous system to instinctively acquire knowledge, learn from experience and be more prepared to expect the unexpected. A novel hybrid self-learning algorithm which combines reinforcement and unsupervised weightless neural network algorithm learning was formulated. The self-learning algorithm was applied to an autonomous mobile robot navigation system in simulation and physical world. The result shows that the simulated and physical robot possesses the ability to self-learn by acquiring knowledge, learn and record experience without having prior information on the environment. The mobile robot was able to distinguish different types of obstacles i.e. corners and walls; and generate complex control sequences of actions in order to avoid these obstacles.

Author keywords

Reinforcement Learning; Q-learning; AutoWiSARD; Autonomous Navigation; Unsupervised Learning; Weightless Neural Network; LeJOS; Lego Mindstroms