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(57) Abstract :

Multi-Agent Reinforcement Learning System for Autonomous Network Management ABSTRACT: At now, multi-agent reinforcement learning (MARL) has been utilized across diverse fields like communications, network management, power systems, and autonomous driving, demonstrating extensive application possibilities and considerable research potential. In complicated decision-making environments, agents that depend exclusively on temporal value functions frequently fail to identify and extract concealed characteristics and dependencies within extended sequences in multi-agent contexts. The increasing complexity of IoT networks, driven by their extensive usage in smart cities, industrial automation, and healthcare, necessitated the development of advanced, resource-efficient, and scalable network management solutions. Centralized systems are conventional in architecture, resulting in increased latency and bottlenecks, whereas decentralized systems can distribute tasks; nevertheless, their disadvantages include a lack of real-time adaptability and challenges in optimizing resource utilization. As Connected and Autonomous Vehicles progress, Autonomous Intersection Management (AIM) solutions are developing to facilitate safe and efficient traffic flow at urban crossings devoid of traffic lights. Nonetheless, current AIM systems, whether utilizing conventional optimization control techniques or machine learning, exhibit low computing efficiency and insufficient resilience in guaranteeing safety, respectively. Multi-agent reinforcement learning (MARL) has shown considerable applicability in solving cooperative control, policy optimization, and task allocation issues inside intricate systems. This paper examines the applications and advancements in aquatic environmental systems, offering a thorough examination of the theoretical underpinnings of multi-agent systems and reinforcement learning, while outlining three prominent categories of mainstream MARL algorithms.

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