AutoMates: Automating With Self-Learning Intelligent Agents

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AutoMates presents a novel intelligent solution for multiple intelligent agents to self-learn performing complex, hard-to-optimize, and unpredictable tasks. It does this using a) a novel iterative two-phase multiagent reinforcement learning (MARL) approach enabling homogeneous agent groups to learn and continuously optimize complex tasks and b) a novel multi-agent pathfinding (MAPF) navigation algorithm. In MARL phase one, agents refocus by analyzing pending task activities and optimizing task distribution by selecting the best agent for each activity. In phase two, agents refine activity execution by using the best policy learned from their collective past intelligence. By reinforcing best and worst trajectories back to this policy, agents optimize shared learning, allowing the system to continuously evolve. Many MARL algorithms need extensive coordination and lack scalability. With iterative refocus and refinement, AutoMates significantly mitigates these issues, enabling novel and versatile use of proven RL algorithms for large-scale, dynamically evolving environments not possible today. Moreover, Automates avoids collisions as agents navigate with novel MAPF techniques like highway detours, relative velocity, and peer negotiation using a self-adapting spatiotemporal constraint network. AutoMates novel approaches were tested with simulated and actual self-created drone replicas for fighting forest fires. It performed extremely well, and with the two-phase approach, AutoMates was quickly operational, evolving continuously and autonomously adapting to new environments. These breakthrough paradigms can handle challenging unpredictable environments and power numerous revolutionary future applications, like drone-assisted medical response and disaster recovery.

Awards Won: