Chain of Action (CoA): LLM-Powered Multi-Agent Hexapod-Drone System

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Multi-Agent Systems (MAS) have demonstrated exceptional potential in task planning and optimization. However, little research has explored MAS integration across both hardware and software. This project aims at expanding such horizon by developing a novel LLM-MAS cooperation framework with a chain of action (CoA) architecture, combining a Large Language Model (LLM) and visual AI with a hexapod-drone system for autonomous task execution. In my previous research, I addressed adaptability challenges in extraterrestrial exploration robots using a tactile AI-driven legged robot that enables gait change. However, multiple concerns and issues regarding automation and navigation remained unaddressed. Building on last year's project, this research expanded the scope of application and focuses on implementing MAS into the robots' control, with an LLM and visual AI managing commands while a drone-legged robot duo executes tasks. The system processes natural language via LLM, identifies targets with visual AI, and enables the legged robot to perform necessary tasks, integrating MAS in both hardware and software. Similar to LLM's chain of thought (CoT) optimizing reasoning, my chain of action (CoA) architecture links subtasks performed by different agents via LLM to achieve a globally optimal solution, enhancing coordination and interaction in the control system. Achieving an 80% accuracy in a comprehensive deployment test requiring environment analysis, target recognition, and dynamic response, it is evident that the collaboration allows the hexapod-drone system to complete complicated tasks with better precision and efficiency, showcasing its potential as a versatile tool for a wide range of applications like logistics, search-and-rescue, and extraterrestrial exploration.

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