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BI SOLUTIONS AND MULTI-AGENT PLATFORMS FOR MODELING EDUCATIONAL PROCESSES

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Abstract

Modern educational systems require the development of effective approaches to the management of educational processes and resources. In this regard, modeling and simulation based on multi-agent systems is becoming increasingly relevant for creating solutions in the field of decision support and educational process management. This article proposes a solution for processing simulation model data, namely output data and real data used to optimize educational routes and interactions between educational modules.

Keyword: Multi-agent systems, educational technologies, optimization of educational processes, modeling and imitation, agent coordination.

DESIGNING A MULTI-AGENT SYSTEM

Real-world systems require the ability to accurately measure the impact of different coordination strategies of multi-agent systems in an unpredictable environment. A significant advantage of multi-agent systems over traditional designs is that the system is distributed. The decentralized, partially autonomous, and redundant nature of such a system makes it less sensitive to certain types of errors or attacks. However, this decentralization also makes such systems more difficult to analyze, since many interacting agents with different goals and strategies must be taken into account.

Multi-agent systems consist of autonomous, interacting, more or less intelligent entities. The agent metaphor has proven itself as an effective tool for creating complex and adaptive software applications. It allows solving key problems of complexity management already at the conceptual level, for example, in the context of educational technologies, where interaction of many different participants (students, teachers, educational materials, etc.) is required. Collaboration in multi-agent systems can take different forms depending on the system in which it is used. In educational systems, collaboration is a mechanism that allows agents (students, teachers, educational resources) to work together to achieve certain educational goals. This implies the availability of tools for information exchange, knowledge sharing, and local methods of action. Collaboration can help agents effectively cope with uncertainty in the educational process, providing flexibility and adaptability.

Models of communication between agents can be represented as maps or networks consisting of nodes that are connected by route lines. In the context of an educational system, each node represents a learning resource or an element of the learning process, while communication channels symbolize the interaction between different learning modules or participants in the process. Each agent can only interact with those agents with which a communication channel exists. This corresponds to real educational practice, where students and teachers interact only through certain learning materials or within the framework of specific educational tasks.

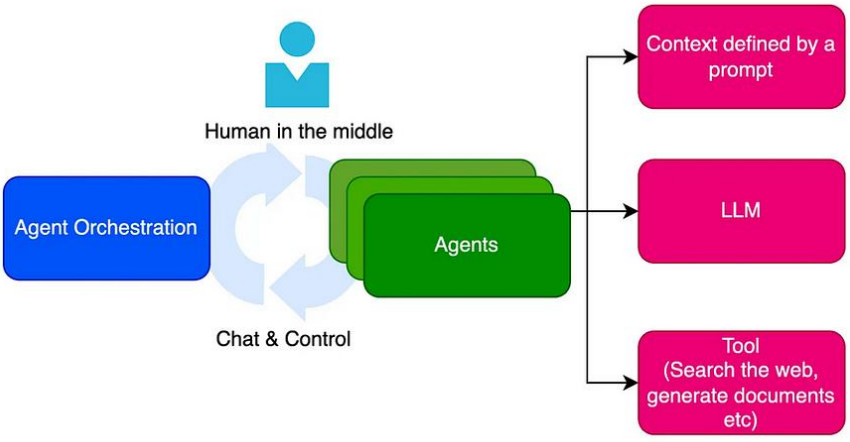

Figure 1. Architecture of a multi-agent application

Multi-agent applications are revolutionizing the approach to solving complex problems. These applications use multiple intelligent agents that collaborate to perform tasks that require diverse expertise. Orchestrating these agents allows for a division of labor, with each agent specializing in a specific aspect of the task. For example, in a typical Multi-Agent RAG setup, a user request is broken down into smaller, manageable tasks. Each agent, such as a searcher, researcher, or writer, is assigned a specific role that matches their strengths. This collaborative effort not only improves efficiency, but also increases the accuracy of the solutions provided. The study proposes a model that uses multi-agent systems to optimize educational processes.

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