

A Study on BDI Agent for the Integration of Engineering Processes

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Abstract. Integration of product design software and automation of their execution can greatly reduce design cycle time and manufacturing cost, and significantly improve product performance, quality, and reliability. The previous approaches are control-driven integration which cannot deal with dynamic change of the environment because the controller executes a sequence of tasks according to the pre-defined workflow. In this paper, we propose a data-driven integration of engineering processes. Each BDI(Belief-Desire-Intention) agent acts autonomously according to the change of the shared data, so the proposed agent architecture can deal with dynamic change of the environment such as user's input parameters.

1 Introduction

Product design organizations use computer software required to execute simulation-based design processes, including commercial CAD/CAE software, internally developed programs, and other design programs. Integration of these programs and automation of their execution can greatly reduce design cycle time and manufacturing cost, and significantly improve product performance, quality, and reliability. Model-Center of Pheonix Integraion[14] and iSIGHT of Engineous Software[15] are the most widely used tools for these purpose.

The previous approaches are control-driven process integration and automation which cannot deal with dynamic change of the environment because the controller executes a sequence of tasks according to pre-defined workflow, as shown in Fig. 1. For example, when the output parameters of task B are set up initially by the user, as shown in Fig. 2, the original workflow is changed to a new one where task C is executed immediately without the execution of task B, and the execution of task A and D are parallel to that of task C. The control-driven process integration approach is not flexible to such a dynamic situation.

To solve this problem, we propose a data-driven process integration and automation architecture, as shown in Fig. 3. An agent takes charge of each task, monitors the change of the shared data, and executes its engineering software when it detects input parameters of its task in the shared data. In this approach, the system does not control

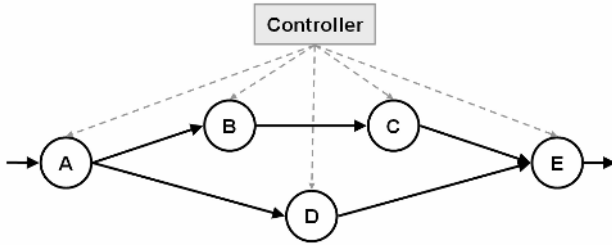


Fig. 1. Control-driven process integration and automation

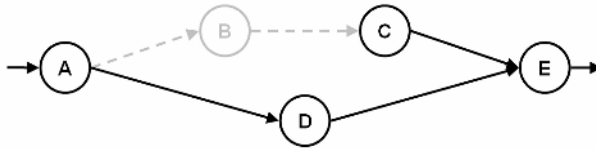


Fig. 2. Workflow changed by user's input

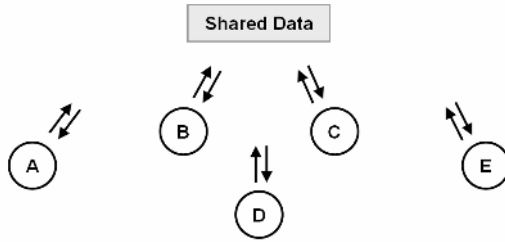


Fig. 3. Data-driven process integration and automation

the execution of tasks directly, but the change of the shared data leads to the execution of tasks. This architecture is flexible to dynamic change of the environment.

2 Agent System for Engineering Process Integration

2.1 BDI Agent

A Belief-Desire-Intention(BDI) agent is a particular type of rational software agent having certain mental attitudes of Beliefs, Desires and Intentions[10]. The beliefs represent the informational state of the agent. An agent can store this information using a database, a set of variables or some other data structure. Desires (or goals) represent the motivational state of the agent. The desires represent the objectives that the agent aims to accomplish or, more generally, the priorities associated with them. The intentions represent the deliberative state of the agent.

VivAce(Vivid Agent Computing Environment)[5] is a BDI agent architecture which is implemented in Java. Fig. 4 shows the internal structure of VivAce agent.