Software Construction Environment using a Multiagent

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Abstract
We propose a new software construction environment using a multiagent. Agents cooperatively understand the specification and produce the application automatically. We also make a base communication environment by extending distributed object technology.

Introduction
In the field of software construction environments (SCE), construction and development methods which use object-oriented technology have been attracting attention. There are however the following problems with these SCEs. (a) Expertise regarding business applications (AP) is required. (b) The construction and maintenance efficiency is not very good. To solve these problems, we propose a new SCE using a multiagent and distributed object technology.

Software Construction Technology
Our proposed SCE consists of agents distributed throughout the network. “Agent” is defined as a communicable AP which possesses expertise. The process for constructing an AP is outlined below (Fig.1). (1) A user orders a desired AP by specifying the final output image. (2) Agents analyze the order cooperatively and produce part-objects (POs). (3) When all the POs are prepared, agents construct an AP from them and offer it to the user.

There are two problems in realizing this SCE: (a) The formation of a communication environment. (b) Establishing a method for the agents’ cooperation and a way to express expertise in an agent.

Communication Environment
We established a communication environment with a widespread network by expanding “NextStep DO” and adopting the concept of Domain Name Service. This environment consists of hierarchical management agents (Fig.2): management agent in host (MAH), in sub network (MAS) and in widespread network (MAW). This environment has two characteristics: (a) A name service for a widespread network, (b) Managing the life-cycle of objects.

Application Construction Method
We classify the agent into the following 3 categories. (a) AP Construction Agent (AP-A) employs the expertise and function to decide which POs are needed and can construct an AP from POs. (b) Part Producing Agent (P-A) which has the expertise and function to produce POs, responds to requests from other agents and can produce POs if the request is acceptable. (c) Client Agent (CL-A) covers the interface between a user and other agents.

The construction process consists of 4 stages and employs the Contract Net Protocol.
1. The CL-A shows the user all the AP-A functions. Then the user sends an AP specification order to the AP-A. The AP-A divides the order into sub problems using its expertise. Next it announces the sub problems to all P-As and asks if they can produce the POs.
2. If a P-A can produce any of these POs by referring to its expertise, it will bid for the relevant sub problem.
3. Depending on the results of the bidding, the AP-A contracts with the P-As and places an order. The P-As produce the POs and transfer them to the AP-A.
4. When all the POs have been transferred, the AP-A constructs an AP and offers it to the user.

Summary
We proposed a new software construction environment and implemented a communication environment.

References