An Agent Approach to Case Adaptation

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Abstract

This article delineates an agent system whose structure and control are based on spatial principles. The agent system is used to adapt a retrieved case to a problem domain. This work is part of the FABEL project which aims to integrate model-based and case-based approaches.

An interactive human-agent problem solving scenario is assumed where the human observer activates various agent systems, continuously accepting, modifying or rejecting the suggestions by agents.

Agent Definition

Agents are defined with a default order of generic spatial actions (Bhat 95). Examples of spatial actions in a default sequence are look, align, group, create, delete, move, resize and evaluate. Each action has a guard and can be disabled. Behavior of agents is customised by reordering or taking a subset of these actions and imposing an order. In general, spatial actions are modified by an agent's domain knowledge.

Each agent has a spatial area-of-interest, or scope, over which it has influence. There are three cases of interest, when groups of agents interact - disjoint scope, nested scope and intersecting scope. Accordingly three modes of flow of control are defined - parallel, sequential and non-deterministic transfer of control. Agents themselves have guards and can be disabled. In general, the default flow of control among groups of agents can be modified according to the domain.

Domain

A particular domain, that of conflict free layout of supply air pipes is chosen, using the knowledge provided by the ARMILLA system (Haller 85). The knowledge base consists of the elements of this system and functional and spatial relations between the components. A knowledge base provides possible functional relations between design components, while a case provides the actual components and their spatial relations. Various methods exist for case retrieval (Voss 1994) in FABEL. The representation scheme is the A4 (Hovestadt 93) scheme, which assigns every object a location in a multidimensional design space.

Approach

The retrieved case matches the current task and shows an elaboration. The retrieved case is analysed to extract the subtask types and the spatial relationships of containment and adjacency among the components are extracted. Each object in the case is tagged with this information. The case is then directly copied to the current problem situation, and all objects in the scope of the current problem instantiated into software agents. These agents use domain knowledge and the extracted spatial knowledge to adapt themselves in the new situation.

Adaptation here means creation of new instances, deletion of instances according to domain knowledge and their correct spatial alignment according to the derived spatial relations. The result of this is a design layout, an elaboration of the current task, which is similar to that of the retrieved case.

References

Haller, F. 1985 ARMILLA - ein installations modell. IFIB, University of Karlsruhe.