

CapBasED-AMS: A Capability-based and Event-driven Activity Management System*

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A *Problem Solving Agent* (PSA) is either an hardware or software system or a human, with an ability to execute a finite set of tasks in an application domain. An activity consists of one or more tasks which can be executed by one or more PSAs. Activity management consists of decomposition of activities into tasks, coordination and data sharing among multiple PSAs executing the activity, and monitoring, scheduling and controlling the execution of multiple tasks of an activity. The CapBased-AMS [KYH95] (based on cooperative problem solving paradigm [CKNT93]) is composed of an activity specification and decomposition module and an activity execution and monitoring module.

Capability-based activity specification and decomposition [Hun95]: Each PSA has its competence defined by a set of capabilities it has to execute tasks, and a task requires a certain competence (i.e. has needs) from the PSAs for its execution. Each activity is decomposed into a set of tasks by using the property that each task must be executed by exactly one PSA. Further, each task is matched to a PSA by selecting a PSA that has the capabilities to meet the needs of the task. Tokens are used to model the capability/need of a PSA/task, respectively. The specification of activities, sub-activities, tasks and PSAs are all user-driven. All of the knowledge and information extracted from the real world is stored in the knowledge base for future reuse.

Event-driven activity execution [Yeu95]: An activity consists of multiple, inter-dependent tasks that need to be coordinated, scheduled and executed. The dependencies between tasks can be one or more of data/control dependency, temporal dependency, and external dependency. These dependencies are expressed

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by events (system, external, temporal). Each task has two types of events associated with it, namely in-events (the situations in which the task is initiated to execute) and out-events (the effects after the execution of the task). Therefore, the execution and coordination of tasks of an activity are orchestrated by the occurrence of events.

The novel features of the CapBasED-AMS are:

- the specification, and decomposition of activities into tasks is independent of the execution and monitoring of the activities;
- evaluation of activity can be done at activity specification level to determine whether the activity can be executed, or not, and if the activity can be executed then which PSAs can execute the activity;
- the coordination among PSAs executing the activity is event-driven and hence independent of how each PSA executes a particular task, this is useful in an evolving activity management system where PSAs are added in to the environment; and
- the protocols used by human PSAs to communicate can be automatically initiated, monitored and executed by using the event-driven approach to activity execution.

References

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