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# Management of Multiple Goals on the basis of Situational Urgency

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The functional studies have considered human beings with multiple goals as efficient problem solving systems. While this approach revealed the situated nature of cognitive architecture, it still leaves out some important issues concerning the everyday problem solving. One such issue is that of time, and another is that of the subjective values assigned to achieving each goal. In order to deal with the multiple goals, a person ought to be efficient in setting, concentrating, suspending, discarding, and achieving some of possible goals in accordance with the person's cognitive appraisal of the urgency with which each goal presents itself.

The urgency of a goal is an important situational cognition made by a problem solving agent with a limited temporal resource. When it manages multiple goals and may achieve some of possible goals, it should appraise the subjective value of each goal to be gained. Then it would make an effort to succeed in the achievement of the important goal, and allocate its own time over activities to do so. The urgency of each goal at a given time is defined by the following three parameter values: the subjective value to be lost if the goal is not achieved, the subjective probability of achieving the goal, and the available time for doing accomplishing the goal-achievement action.

The purpose of this research is to design an autonomous agent that is required to set and achieve multiple goals with various degrees of urgency in a simple world of a video game type. For the functional study of emotional architecture, Simon (1967) discussed an interruption mechanism of ongoing processes on a serially fashioned cognitive architecture. Frijda (1986) pointed out that there were a set of mechanisms ensuring personally valuable goal satisfaction. Sloman (2000) proposed their 'three layer' model and discussed the interaction of layers. This research employs a serially fashioned architecture for coping with situations in the simplified world, and intends to specify various functions for the management of multiple goals.

The agent embedded in the world is designed to have three phases in its course of problem solving. The first phase is planning to make a better plan searched as a solution path of operators in the problem space for achieving each single goal. The second phase is goal scheduling in the face of multiple goals, whose function is to schedule how to achieve the given set of goals in what order. Note that, while the target goal is being achieved, the urgency values of other goals in queue will increase due to the decrement in the available time for their achievements. The scheduling rule by a heuristics called urgency comparison is proposed. What it is aimed to do is to reduce the sum of urgency values of all the goals. The third phase, that of action mode selection, does the switching of its action mode between the execution

mode and the deliberation mode to be done in accordance with the urgency presented by the current goal. If this urgency value is very high, the agent should allocate its time for rush execution of some operators in a plan, despite of its limited plausibility. On the other hand, if the urgency is relatively low, the agent may be able to engage in a more deliberate appraisal of the global situation.

## Poster Summary

The design of our simple world will be introduced, first. A task given for the agent is to rescue as many falling objects as possible, which appear randomly in the world. Symbolic descriptions of states constituting the problem space and a plan that the agent would generate, based on the expected utility taking into account the success probability of operation, will be given (Feldman & Sproull, 1977). After the formulation of the urgency value for a goal (Toda, 1995), the two phases in the agent's problem solving, the goal scheduling and the action mode selection, will be discussed. The goal scheduling produces a quasi-optimal goal queue in a dynamic fashion in accordance with the urgency of the current goal (Minton et al. 1992; Zilberstein 1996). The action mode selection allocates limited time for actual execution and deliberate planning. High urgency value of the current goal may make the agent stay in the execution mode for a period of the available time. The final section will describe the current level of implementation and future directions of our research.

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