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SITUATION ASSESSMENT AND SITUATION-SPECIFIC CONTROL IN INTELLIGENT CONTROL NETWORKING

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Abstract

Situation as an object of awareness and control present a new challenge of intelligent control theory for such application as intelligent robotics and multi-robot cooperative behavior, transportation systems, smart energetic grids, some another cases. In a robotic environment, this typically includes updates on the relevant static and dynamic states of entities-objects, persons, spaces with which the robot may or may not be interacting at the time. In a danger industry – chemical, power nuclear station, transport the situation assessment provides for an awareness of emerging situations to predict the alarm or pre-alarm events. Most important problem is the emergency situation – an immediately hazardous situation that needs to be ended or averted quickly in order to prevent injury or damage.

In situation control theory situations are defined as results of actions or interactions between active system and environment or another systems which reveals as certain combinations of events, which could be true or false at the same time, and which present logical terms consisting of the initial situations

and all situations that are generated by applying an actions to a situation. Specific feature of situation as object of control consists in fact that the sequence of actions which needs to achieve the best outcome is can't be determined before. Situation-specific control in this case may be formulated as goal-directed actions to change or to expand the current situation or the current state into desirable direction in which the goal is satisfied. Therefore, the situation control task (control under situation uncertainty) is reduced to operational planning of control actions (laws), which leads to achieve the goal state under uncertainty of temporary fast developing situations. This control strategy can be defined as goal based planning – may be done on base of information or knowledge about situation development.

The problem of situation awareness and control may be formulated via intelligent automation and robotics technique. The control task we formulate and analyses as part of intelligent control theory which close to rational agent behavior paradigm. Control policy is formulated via conception and principles of rational behavior or rational goal-based behavior or cognitive agents which oriented to achieving the goal state under environment uncertainty of temporary fast developing situations. In this approach it is possible to focus on goal-based control technique of cognitive agents, which acts to achieve the final goal state on base of operational planning of control laws and knowledge-base actions which leads to achieve the desire goal state.

We offer a goal-based behavior algorithm which is realized on base of recurrent model of hierarchical decomposition of general strategic goal and scenarios knowledge base control laws. (Recurrent) Method of hierarchical task network decomposition is proposed as basis for hierarchical control networking for rational goal-based planning and searching through the aiming state space.

The recurrent model of hierarchical decomposition of goals and targets of states using / forming topology is proposed.