Rule Generation for Multi-agent System

The system, which is composed of decision-making entities (agent) and completes difficult problem by not an action of one agent but cooperation of some agents, is called “Multi-agent System.” Multi-agent system exists in many scenes. For example, in a restaurant, some clerks cooperate and cope with many customers for a purpose of the whole system like improvement of customer satisfaction. Many examples of multi-agent system modeled by researcher exit, and these systems were analyzed how these system work when the action rule of each agent is defined. However, a few studies to inquire into how each agent should work for accomplishing purpose of the whole system exist. Especially, There are few studies to generate rule which is simple for people to understand and robust to accomplish purpose in unknown environment. Scheduling problem, in which the process some agent observe environment and determine their action is repeated, are target in this research. And generating simple and robust rule for multi-agent system is defined as the purpose of this research.

In this research, rule of agent is dealt with divided into condition part (what each agent should do in how is the environment) and combination (what a kind of order some condition parts should be considered in). Condition parts are optimized using SAP, and Combination is optimized using PADO. SAP and PADO are one of simulation-based evolutionary computation algorithms. However, in former studies, the problem which computation time becomes enormous happens when robust solution are tried to be calculated using simulation-based algorithm. Therefore, in proposed method, the algorithm which extracts constrains of solution from simulations repeating in a computation and generates candidate solutions using these constrains is proposed. this algorithm can reduce the number of simulation.

Proposed method is evaluated using the problem of taxiing control at a large airport. Figure 1 express perspective of simulation, and solutions which does not generate dead-lock like Figure 2 but total taxiing time of aircrafts is not so much are calculated using proposed method. In addition, the algorithm extracting constrains can make computation time lessen one twentieth

Keywords: Rule Generation, Simulation-based optimization

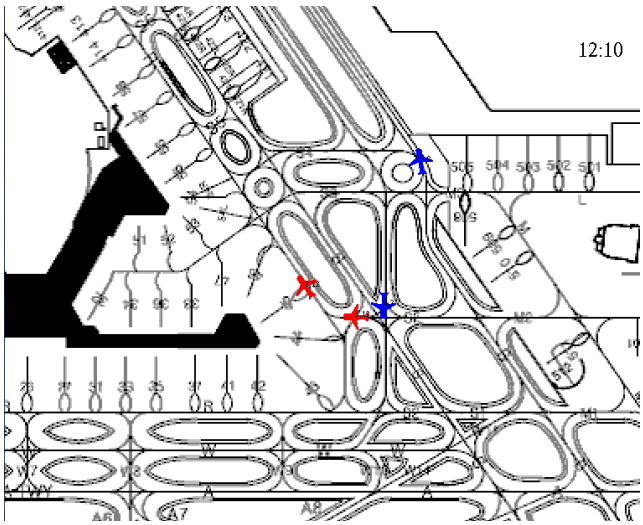

Fig.1 Perspective of simulation

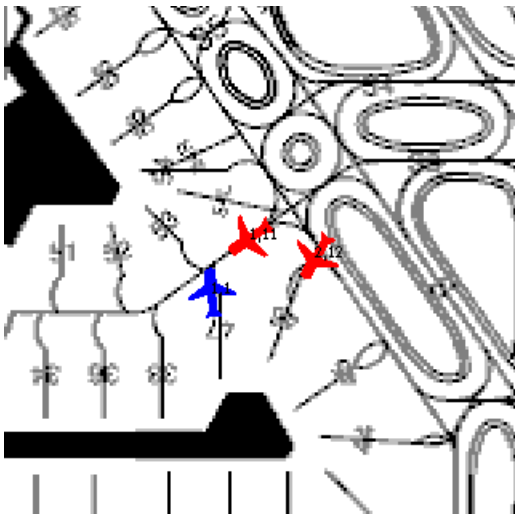

Fig. 2 Dead-lock