

Motion Planning of Multiple Robots Considering Robot Fatigue (Prof. T. Arai)

Recently, robot manipulators used in automated lines at plants are expected to keep working long term. In order to make a stable system with robots, actuator heat must be considered as an important factor. Each actuator gets heat as a robot moves, and because of high-speed and continual motion of the robots, the actuator heat causes line stop eventually. Therefore it is required to optimize robot motions and a task assignment algorithm in order to reduce the torque generated at the actuators and give the robots a rest for radiation.

In this research, we consider a handling system that consists of a conveyor and multiple robots used to pickup parts on the conveyor (Fig. 1) and optimize robot actions in order to control robot fatigue and improve the efficiency of the system. We use a state-action map, which determines a robot action for each state, since the intervals of robot motions are very short. The state-action map can be made beforehand so that robots just refer the map to decide their actions while operating. We generate a state-action map using reinforcement learning in simulation of the handling system. Fig. 2 shows the obtained map. The efficiency of the system was improved with this map.

Keywords: Robot fatigue, State-action map, Reinforcement Learning, Motion Planning

References

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- 2) Koki Kakamu, Natsuki Yamanobe, Tamio Arai, Atsushi Watanabe, Tetsuaki Kato, Koji Nishi: "A State-action Map for Handling Operations with Plural Robots Considering Robots' Fatigue," The 2005 Spring Meeting of The Japan Society for Precision Engineering, 2005. (In Japanese)



Fig.1 Handling system with multiple robots

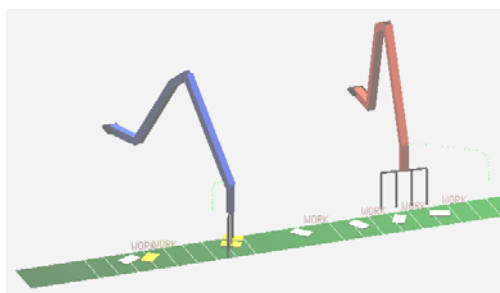


Fig. 2 Simulator of handling system

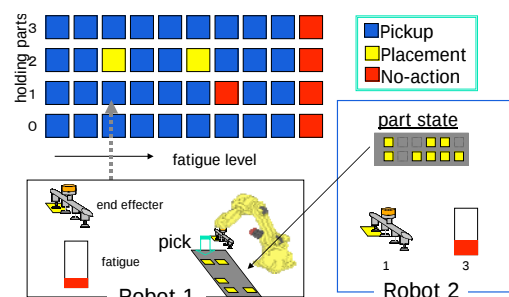


Fig. 3 Obtained state-action map system