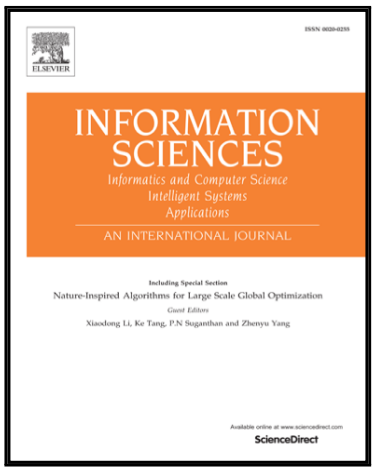

Intelligent Rule-Based Sequence Planning Algorithm with Fuzzy Optimization for Robot Manipulation Tasks in Partially Dynamic Environments

Changman Son

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Intelligent Rule-Based Sequence Planning Algorithm with Fuzzy Optimization for Robot Manipulation Tasks in Partially Dynamic Environments

Changman Son

DanKook University, School of Electronic and Electrical Engineering, 152 Jukjeon-ro, Yongin-si, Gyeonggi-do, South Korea 448-701

cmson@dankook.ac.kr

Abstract

An intelligent rule-based sequence planning algorithm with fuzzy optimization for robot manipulation tasks is introduced, using robot path planning for part-bringing as an example. The proposed approach is a rule-based method that requires specified rules for used in generating a feasible path which is not defined in a traditional way. A part-bringing task associated with a robot part assembly is described; a part-bringing task brings a part from its initial position to an assembly hole or a receptacle (target) for the purpose of part mating in partially dynamic environments that have moveable obstacles. The part-bringing task is accomplished using the rule-based sequence planning algorithm combined with a fuzzy optimization. Comparisons and discussions are presented. The proposed algorithm utilizes knowledge processing functions such as machine reasoning, planning, and decision-making. A fuzzy entropy is introduced because it is employed as a useful tool that can measure the degree of uncertainty associated with an overall performance of the part-bringing task. Through a decision-making procedure, a final plan that satisfies the required criteria is determined to overcome a confronting path planning problem for part-bringing. The proposed algorithm is applicable to a wide range of the robot tasks, including choosing and placing operations despite of moveable obstacles, etc.

Key words Rule-based sequence planning algorithm; machine intelligence; fuzzy optimization; fuzzy entropy; part-bringing; partially dynamic environments.