

TASK SCHEDULING OF AGV IN FMS USING NON-TRADITIONAL OPTIMIZATION TECHNIQUES

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Abstract

Flexible Manufacturing System (FMS), which is equipped with several CNC machines and Automated Guided Vehicle (AGV) based material handling system is designed and implemented to gain the flexibility and efficiency of production. After the implementation of FMS, in practice, the scheduling of the resources, such as frequent variation in the parts, tools, AGV routings, becomes a complex task. This is being done traditionally using various mathematical programming techniques. In recent years, random search algorithms have been attempted for scheduling. Most of the research has been emphasized only on single objective optimization. Multi objective problems in scheduling with conflicting objectives are more complex and combinatorial in nature and hardly have a unique solution. This paper addresses multi objective task scheduling of AGV in a flexible manufacturing environment using non-traditional optimization algorithms. In this paper the authors made an attempt to find the near-optimum schedule for two AGVs based on the balanced workload and the minimum traveling time for maximum utilization. The proposed methods are exemplified with illustrations.

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Key Words: Flexible Manufacturing System, AGV, Task Scheduling, Genetic Algorithm, Ant Colony Optimization Algorithm

1. INTRODUCTION

In the present day automated manufacturing environment, flexible manufacturing systems (FMS) are agile and provide wide flexibility. FMS are well suited for simultaneous production of a wide variety of part types in low volumes. FMS is a complex system consisting of elements like workstations, automated storage and retrieval systems, and material handling devices such as robots and AGVs [1]. The FMS elements can operate in an asynchronous manner and the scheduling problems are more complex. Moreover, the components are highly interrelated and in addition, contain multiple part types and alternative routings etc. FMS performance can be enhanced by better co-ordination and scheduling of production machines and material handling equipment [2]. Scheduling is concerned with the allocation of limited resources to tasks overtime and is a decision making process that links the operations, time, cost and overall objectives of the company.

Scheduling of the material handling system in FMS has equal importance as of machines and is to be considered together for the actual evaluation of cycle times. Automated guided vehicles (AGVs) are widely used in flexible manufacturing systems due to their flexibility and compatibility [3]. AGVs can be integrated with the computer controlled production and storage equipment in the shop floor and the entire shop floor operations can be controlled through a computer system. Most of the real world-scheduling problems involve simultaneous optimization of multiple objectives. Dealing with multiple objectives has received much attention over the last few years, where as scheduling is still dominated by the unrealistic single objective approach. The main goal of a multi-objective optimization problem is to

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