

Chapter 18

Robotic Cell Scheduling Problems and Their Solution Procedures: A Survey and Future Research Directions

Arindam Majumder

National Institute of Technology, Agartala, India

ABSTRACT

The chapter presents an extensive review of existing literature on robotic cell scheduling. In the first part of this chapter, the classification of the robotic cell problems has been described from the machine environment, processing characteristics and objective function point of view. The next part deals with the classification of solution approaches used in robotic cell scheduling problems. Both exact and approximate approaches are discussed in this part. Later, the chapter showed the directions on which future research work of robotic cell scheduling can be carried out. Finally, the gaps found in previous research activities related to robotic cell scheduling are highlighted in the conclusion.

INTRODUCTION

Now a day's incorporation of automation and repetitive processing in manufacturing systems is very much essential to fulfill increasing market requirements. Due to this, modern manufacturing systems consist of human workers and robots and automated material handling systems to produce products efficiently. Many industries apply automated material handling systems for transporting materials through various stages. One of the most common forms of automated material handling systems is the implementation of robotic cells in modern manufacturing systems.

A robotic cell contains single or multi robots to convey the parts within the cell, an input buffer, several processing stages, and an output buffer. Each stage consists of single or multiple machines to complete the processing of that stage. Suppose the robotic cell has only one robot which can handle one part at once, one machine per stage, and no buffer between two adjacent stages for intermediate

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storage. In that case, the configuration of that robotic cell is treated as the default configuration. As in such robotic cells, a machine can process a part at once; therefore, these can be considered a flowshop with blocking. In robotic cells, all the processes are carried out by computer-controlled machines; hence, there is no involvement of a human-tended workstation. In most cases, the robotic cells have one of the two following layouts: circular (see figure 1) and linear (see figure 2). For circular robotic cells, the machines are placed in a circular path, while in a linear layout, the robots are placed in a straight line.

Figure 1. Circular layout robotic cell

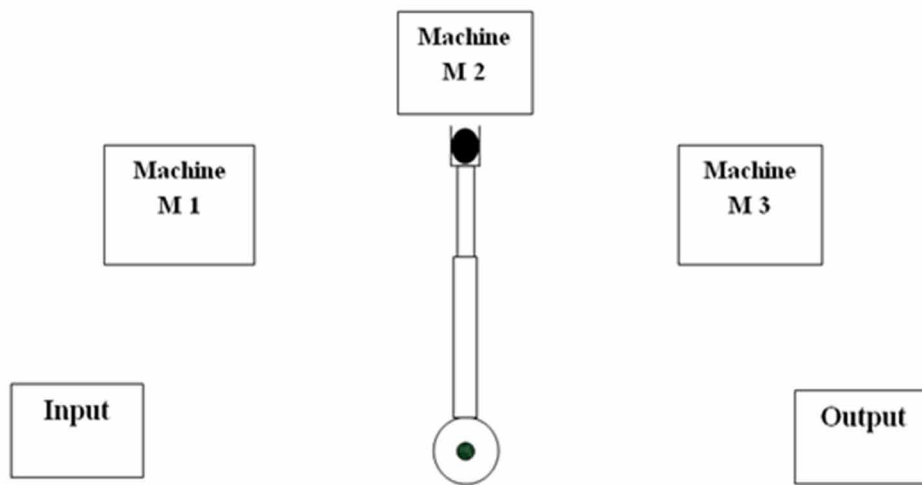
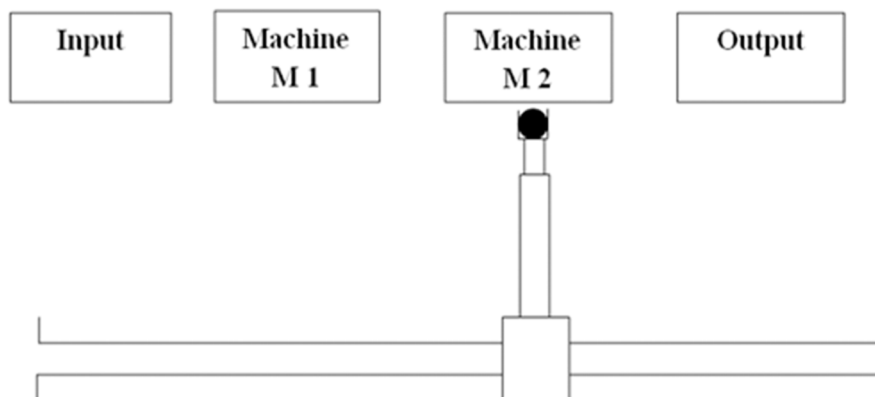


Figure 2. Inline robotic cell layout



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