Chapter 2

Two-Sided Assembly Line Balancing Optimization With Spider Monkey Optimization

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ABSTRACT

Growing interests from customers in customized products and increasing competition among peers necessitate companies to configure and balance their manufacturing systems more effectively than ever before. Two-sided assembly lines are usually constructed to produce large-sized high-volume products such as buses, trucks, automobiles, and some domestic products. Since the problem is well known as NP-hard problem, a mathematical model is solved by an exact solution-based approach and spider monkey optimization (SMO) algorithm that is inspired by the intelligent foraging behavior of fission-fusion social structure-based animals. In this chapter, the proposed mathematical model is applied to solve benchmark problems of two-sided assembly line balancing problem to minimize the number of mated stations and idle time. The experimental results show that spider monkey optimizations provide better results.

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INTRODUCTION

An assembly line is a production process where raw material transfer through conveyer, different workers and machine perform work on it and finally raw material converted into finished produced.

A two-sided assembly line is a type of production line in which different assembly tasks are performed in parallel at both sides of the line as shown in figure 1. In this situation, some of the assembly operations should be performed at strictly one side of the line (right or left side) and the others can be assigned to either side of the line. This type of lines is very important, especially in the assembly of large-sized, heavy products, like automobiles, trucks. There are several advantages of two sided assembly line balancing that is very helpful to increase the effectiveness and efficiency like shorter line length, reduced throughput time, lower cost of tools and fixtures, less material handling, saves some spaces on the assembly lines, increased line efficiency with reduced operator requirement., increased skill levels of operators, increased motivation of operators due to operation enrichment at combined workstations between two lines (Simaria et al, 2009; Wu et al, 2008).

The main difference in one-sided lines and two-sided lines is the sequence of the tasks within a workstation is not important on the other hand in two-sided assembly lines, this is a crucial factor for an efficient assignment of tasks. Tasks at opposite sides of the line can interfere with each other through precedence constraints which might cause idle time if a workstation needs to wait for a predecessor task to be completed at the opposite side of the line. This phenomenon is called interference (Yuan eta l, 2015; Taha et al, 2011).

LITERATURE REVIEW

Although researchers have focused on Two-sided ALB problems and, the literature review suggests that none of researchers focus on two-sided assembly line balancing problem (TALB) with spider monkey optimization the objective minimize idle time.

Figure 1. Configuration of two sided assembly line
Services and Monitors for Dependability Assessment of Mobile Health Monitoring Systems
Alessandro Testa, Antonio Coronato, Marcello Cinque and Giuseppe De Pietro (2015). Recent Advances in Ambient Intelligence and Context-Aware Computing (pp. 22-38).
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