

SIMULATION MODEL AND GENETIC ALGORITHM TO ASSEMBLY LINE BALANCING

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ABSTRACT

Assembly lines are flow-line production systems which are of great importance in the industrial production of high quantity standardized commodities and more recently even gained importance in low volume production of customized products. The assembly line involves many famous problems that is unbalancing cycle time among the workstations. Simulation Model (SM) is one of the most useful modelling tool for the design of many types of systems. It can combine with Genetic Algorithm system (GAs) to obtain the optimum solution in any type of issue area. In this study the SM and GAs will be applied to solve the unbalancing problem at the automobile manufacture system. This method will improve the efficiency of the assembly line through reduces the queuing among the workstation, increase the labor of working time then to increase the ratio of the productions.

Keywords: Assembly line, Genetic Algorithm, Unbalancing Problem, Simulation Model

INTRODUCTION

The automobile manufacturing is one of the most important industries which started in Germany in 1886. The industry has been relying on intensive labor since its inception. Due to the durability of product life cycles and fierce competition, the automobile industry has moved towards a cost-effective products i.e., such as producing different product types. Moreover, these automobile companies face tough challenges in automobile production such as reducing the time of the assembly line (Ana et al 2005, Andrews1997, Apha1998).

In the automobile manufacturing system, one of the areas under consideration is Assembly Line Balance Problem (ALBP) that is to distribute the total workload among manufacturing stages (Ana et al 2005). There are many researchers studied on ALBP to develop an efficient Assembly Line System (ALS) and to obtain a better solution (Minh and Soemon2008, Ali and Razman 2012). This problem presents the first major problem of the Assembly line.

In general, the problem of this study is concentrated Assembly line balancing. The problem causes an inefficiency of the production such as congestion on the assembly line and the resources are under utilized. This problem causes a high production cost (Afshin and Mansouri, 2005).

Simulation Model (SM) used to solve the ALBP is the imitation of the variables of a real-world to solve the problem and to make the new assembly line design using the computer technology without alteration in the real system. Moreover, It involves the generation and the observation of new systems to draw an assumption concerning the operating characteristics of the real world system. As it is used to describe and analyze the behavior of the real system. Therefore, both existing and conceptual systems can be modeled with simulation (Apha (2002, Ashikin 2010).

In this study, Simulation model is combined with a genetic algorithm to solve the unbalancing problem on the assembly line, that will improve the efficiency of assembly line and increase the ratio of products (Chowdhury and Ganesh 2006). In many common simulation optimization methods, the structure of the system stays the same and only the set of values for certain parameters of the system such as the number of machines in a station or the in-process inventory is varied from one evaluation to the next (Davis and McCuen 2005).