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USING HYBRID GENETIC ALGORITHMS FOR MULTI-PERIOD PRODUCT CONFIGURATION CHANGE PLANNING

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Abstract. *Supplier selection is a key issue of problems related to product configuration changes in manufacturing systems. In this study, we emphasize the selection of suitable component suppliers to enhance productivity taking into consideration product assembly sequences in configuration change. This study takes various criteria into account when evaluating suppliers in different configuration change scenarios. It then utilizes the Analytic Network Process (ANP) to evaluate the weight of each criterion, and constructs an optimal multi-period supplier evaluation model on the basis of assembly sequences by using a Guided genetic algorithm to effectively simulate the assembly procedural relationship and determine the optimal solution sequences. It also employs the Pareto Genetic Algorithm to search for global optimums, and integrates the above two algorithms into a Guided-Pareto genetic algorithm (Gu-PGA). Through building a decision-making system with a hybrid genetic algorithm for solving a series of problems after configuration changes, the optimal production decision could be obtained.*
Keywords: Configuration changes, Assembly sequence, Supplier selection, Analytic network process, Guided-Pareto genetic algorithm

1. **Introduction.** In face of changing customers' demands, optimization for production planning is desired in manufacturing industry to ensure efficient productions that fulfill customer demand under increasing global competition. Tominaga et al. [1] proposed a production planning model for multiple companies to satisfy customer demand. Barzizza [2] suggested that competition and changes in customers' demands would lead to product configuration change; in addition, frequent changes in product components would shorten product life cycle. With shorter product life cycle, troubleshooting for configuration changes must be performed rapidly and efficiently. Li et al. [3] indicated that product configuration during manufacturing is comprehensive and complicated; thus, an efficient decision-making system is needed to resolve such complicated problems quickly. Rouibah and Caskey [4] argued that if a manufacturer could control the changes during the R&D stage, it would be able to reduce cost, shorten R&D time, and improve product quality. Hence, an efficient decision-making system not only could solve problems quickly, but could also result in more competitive products.

Since configuration change involves numerous problems, and has extensive impact, it requires efficient methods and systems. Zhang et al. [5] proposed, using the Configuration-oriented Modeling Method and knowledge management, to consolidate and manage complex product data. Wan and Liu [6] divided component reassembly limits into two types, namely simple reassembly limits and composite reassembly limits, and developed an optimal combination strategy of component reassembly by a heuristic algorithm. Wang and Che [7] proposed a configuration change method for TFT-LCD products, which utilized