Genetic algorithm-based multi-criteria approach to product modularization

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Abstrak

Modularization is one of the key strategies for increasing responsiveness to customers. In modular product architecture a wide variety of product configurations can be generated by altering a limited number of modules and components. Product modules are identified by grouping highly coupled components in the same module. A Design Structure Matrix (DSM) is a compact presentation of the interaction between the components. In this paper, Analytical Hierarchy Process (AHP) and Genetic Algorithm (GA)-based methodology is proposed for the clustering of highly coupled DSM components in modules. Multi-criteria DSMs are proposed, which are aggregated by using weights generated by AHP. A genetic algorithm is designed to change the order of components in DSM and to bring highly coupled interactions near the diagonal. An illustrative case study is also made to validate the proposed algorithm. Two large sized and two small size modules are identified by selecting high density clusters around the diagonal. The clustered DSM also shows independent components and loose coupling between the two modules.