An effective common product structure mining method

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ABSTRACT

It is obvious products with simple shapes or functions cannot satisfy customer needs. To increase competition ability, enterprises must provide varied products to fulfill the customer requirements. Product variation and customization is the trend in current market-oriented manufacturing environment. Although product variety is the key factor for enterprises to survive in the global market competitions, how to mange the ever-increasing number of variant products becomes a critical challenge for enterprises.

To address this problem, this research proposes an effective common module mining system to derive common module from various product structures. The proposed system consists of three main procedures, including the single-level tree (SLT) generation procedure, SLT similarity calculation procedure, and common module mining procedure. In the SLT generation procedure, each product is decomposed into a set of SLTs. All SLTs in a product structure can be extracted by starting from the root node of the product structure and traveling the branches in the structure with the breadth-first-search way. In the SLT similarity calculation procedure, a SLT similarity measurement is developed to evaluate the similarity between any pair of two SLTs. With the SLT similarity, finally, a component matching method is developed to find similar modules in the common module mining

procedure. There are some findings during executing the experiments. First, modules generated when minimum component diversity number ( ) is two contains several modules generated when is one. Second, the number of common modules decreases dramatically when the minimum support ( ) and minimum quantity similarity value ( ) increases. The reason is, when minimum support is higher, the frequent SLT will be less. Third, when minimum quantity similarity value is three and minimum support and quantity similarity is any value, there will be no common module generated. In this experiment, we can set different , , combination to find appropriate module according to customers' need.

Keyword: Bill of material (BOM), Single-Level Tree (SLT), Modularity

共通性產品結構探勘之研究

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摘要

　　隨著顧客的消費能力大幅提昇，以往單一產品已經不能滿足顧客多變的需求。企業為了增加本身的競爭優勢，並開發少量多樣或大量客製化的產品來滿足不同顧客的需求，產品多樣化與客製化已成為製造業的趨勢，因此發展產品多樣化已成為重要的競爭優勢。產品多樣化的崛起，使得產品與零件數量大幅增加，造成企業在管理上成了一大挑戰。

　　因此，本研究以 SLT (Single-Level Tree) 的結構為基礎，發展一套共同性模組探勘系統，以探勘出多樣化產品結構中的共同性組件模組。此系統包含三個主要的步驟：一、SLT 的產生，使用優先寬度搜尋法將所有的產品拆成一組 SLT 的結構。二、SLT 相似性的計算，將每一對 SLT 做零件和零件量相似性的衡量並能找到相似性高的 SLTs。三、共同性模組探勘，將相似性高的 SLTs 運用共同模組探勘系統探勘出 SLTs 裡的共同性組件模組。

關鍵詞：物料清單、單階樹、模組化