

THE SUMMARY OF Ph.D. DISSERTATION

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Title A Study on Design Evaluation Method for Manufacturing Cost Reduction		
Abstract <p>Attaining a product structure that is easy to manufacture is an important step toward improving productivity. However, it is not easy to judge whether or not a product is easy to manufacture. Developing a product in a short period is also essential. These make it important to make producibility of the design visible, especially in the early design stage on a desktop without prototyping. A quantitative scale available in the design stage showing producibility including both processing and assembling that designers can manage themselves would help to effectively accomplish this goal. The objective of this research, therefore, is to realize accurate and simple-to-use quantitative evaluation of ease of processing and assembling individually and comprehensively of a product and parts in the design stage, hence making it possible to carry out producibility design effectively and efficiently.</p> <p>Chap. 1 describes the background and the necessity of this research.</p> <p>Chap. 2 describes the outlines of work previously carried out, and the goals, approaches, overview of evaluation scheme and development steps of this research.</p> <p>Chap. 3 describes the Machining-producibility Evaluation Method (MEM) for cutting and grinding parts developed as the basis of the entire processability evaluation. Initially, the processing time estimation method is developed based on the modeling of the machining process as the basis of the evaluation. The calculation formula adopts a method to reflect the design factor and shop capability factor independently. Then, the MEM score developed to express the degree of ease of machining of a part and a product is described.</p> <p>Chap. 4 describes the MEM extended to welding, sheet metal working, molding, die-casting, and casting. Initially, the processing time estimation method is developed. Input information is defined so that it maintains compatibility among the various processes. Then, the MEM score is described which is extended so that ease of various processes can be expressed, comprehensively from blank manufacturing to finishing, with relative ease of processes properly reflected.</p> <p>Chap. 5 describes the Extended Assemblability Evaluation Method (AEM) developed to assess ease of assembling. The assembly time estimation is made by reflecting the design factor and shop capability factor by constructing the data structure similar to that of MEM. The input for the former factor is elemental operation symbols, and the latter factor is obtained from present product data. The accuracy of time estimation was confirmed. Then, the AEM score is developed in which downward attachment is given 100 points.</p> <p>Chap. 6 describes the Producibility Evaluation Method (PEM) that comprehensively assesses producibility (ease of processing and assembling) quantitatively. The PEM score expresses the producibility of a product and a part by projecting the individual shop rates. The utilization of the developed methods and application examples are also introduced. The developed methods have been utilized effectively for various products and have achieved remarkable cost reduction.</p> <p>Chap. 7 summarizes the entire work.</p>		