THESIS INFORMATION

Title:	Research on cutting optimization of nesting material in some industries
Major:	Manufacturing Engineering
Code:	62.52.04.01
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Abstract

In the mass production of sheet metal parts, saving of material is very important as material cost is the major portion of overall production cost. Pattern nesting refers to the process of arranging a set of predefined shapes to occupy the least amount of space.

This thesis discusses an optimal pattern for translational parallel system developed for the layout of complex, irregular, two-dimentional identical parts on a rectangular sheet as a roll of fixed width and length. The development of lean line, lean line function, godograph, godograph funtion, … is fundamental to formulate mathematical models, algorithms and softwares for solving nesting problems aiming to minimize the material waste and save time in production of some industries such as mechanical, footwear and furniture, etc.

Research objectives

The objective of this research is to develop a system of algorithms for cutting optimization of nesting of complex, irregular, two-dimentional identical shape on a rectanggular sheet and to formulate a nesting software applying in mechanical, footwear, furniture industries.

Contents

1. Develop mathematical fundaments to solve cutting optimization of nesting problems.
2. Digitize contuor of complex irregular two-dimentional shape.
3. Build up a system of algorithms and models for optimizing nesting problems in some industries.
4. Design and programming a nesting software applying in mechanical, footwear and furniture industries.

Main results

1. Automation the process of digitizing the contuor of the shape by application of stained and scanning algorithms to extract the coordinates of points.
2. Development of mathematical fundaments such as lean line, lean line function, godograph, godograph function, basic parallelogram, … to solve nesting parts cutting from sheet materials.
3. Building up a system of algorithms and models for optimizing nesting problems in some industries.
4. Formulation BK-Nesting software on Delphi language version 7.0. The nesting layuout and its database can connect to the stamping die machine for integrating CAD/CAM/CNC. This software has been applied successfully in 5 companies.

Scientific and practical contribution of the thesis

The thesis scientific and pratical contribution such as the development of lean line function and godograph function and the system of algotrithms for BK-Nesting software.

Suggest for the continued studies

- Develop algorithms to solve nesting problem of cutting a set of complex, irregular, 2D parts from any shape sheet material applied to industries such as garment and footwear.
- Research on cutting optimization of complex, irregular, 3D parts.

Advisors PhD. Student

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