

Multiobjective assembly line optimization

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Abstract - Poster aims at my up-to-date status of my dissertation. Introduction into the topic and main goals of my PhD. thesis are defined, followed by methods of assembly lines' modelling, multiobjective decision making and multiobjective optimization. Also, partial results of my work are shown, as well as expected scientific and technological contribution of my dissertation.

Keywords — assembly line, multiobjective decision-making, multiobjective optimization

Introduction

Main motivation in my research is definition of the complex methodology in the field of multiobjective assembly lines' optimization for solving tasks connected with assembly lines' optimization. In order to solve this problem, tasks dealing with modeling of assembly lines ,configuration of assembly lines and scheduling the orders by using multiobjective decision making methods, and last but not least, optimizing of production process realized by multiobjective optimization methods.

Goals

Define complex methodology of multiobjective assembly lines' optimization process

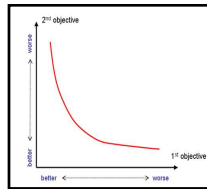
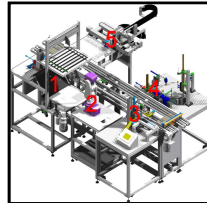
- Optimize the functionality of assembly line with focus on time and profit optimization
- Define the multiobjective decision-making and multiobjective optimization methods

Model the processes in assembly lines

- Create simulation models of assembly lines within DCAI
- Use them for definition of the mathematical assembly line model

Apply the methodics on DCAI assembly line models

- Solve tasks of optimal configuration and optimal production process using MoDM and MoO methods



Parts of research

Methodology of multiobjective optimization process

- Synthesis of MoDM and MoO methods

Modelling the processes in assembly lines

- Stateflow models of assembly lines and queuing systems

Multiobjective decision making tasks (MoDM)

- Optimal configuration of assembly line

Multiobjective optimization tasks (MoO)

- Optimal production process

Methods and approaches

MoDM

- ELECTRE methods
- TOPSIS
- AGREPREF
- AHP
- PROMETHEE

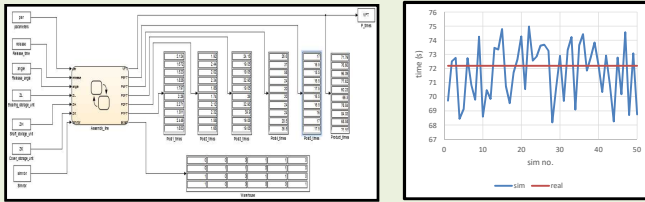
MoO

- Methods of defining the set of non improving elements
- Compromising methods
- Hierarchical order methods
- AI algorithms

Results

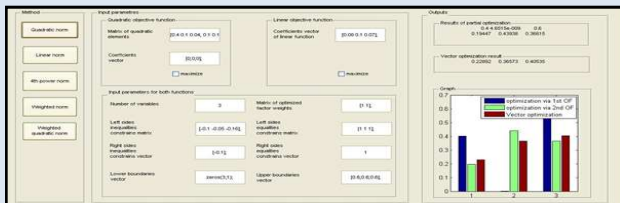
Modelling

- Simulation models of two assembly line model within DCAI were designed and their functionality was compared with real model
- Simulation model of m/m/C queueing system was designed



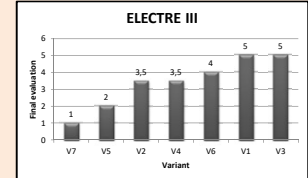
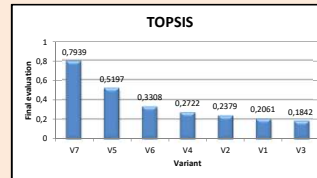
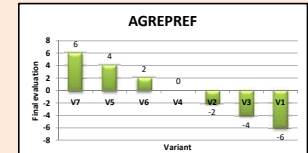
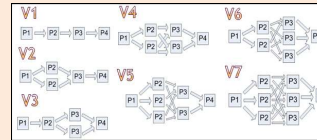
Multiobjective Optimization

- Algorithm for MoO, which uses methods of defining the set of non-improving elements and compromising methods, was implemented in MATLAB
- Application for solving MoO tasks with linear or quadratic objective functions was designed



Multiobjective Decision Making

- Algorithms for ELECTRE methods, TOPSIS and AGREPREF were implemented in MATLAB
- Implemented MoDM methods were used for solving model task of assembly line configuration



- Variants on graphs are sorted from best to worst one according to every method

Expected contribution

- Definition of the complex methodology of MoO of assembly lines
- Synthesis of various methods of MoDM

Scientific



- Designing models of assembly line production process
- Developing applications and scripts for solving MoDM, MoO and queuing system tasks

Engineering



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