Optimal cutting and packing of the supporting rubber parts

PROBLEM DESCRIPTION

The production in the motivating firm is highly automatized, basically the only slow, human workforce heavy part of the workflow is the design, cutting and placing of the rubber parts supporting the cutting blades. Since the company is interested in timely delivery, they want to establish an edge in delivery times compared to their rivals in the country. Now this phase of the work requires a few hours of human work, and with the present tools it is often error prone, and it requires a restart, and mean unnecessary lost time.
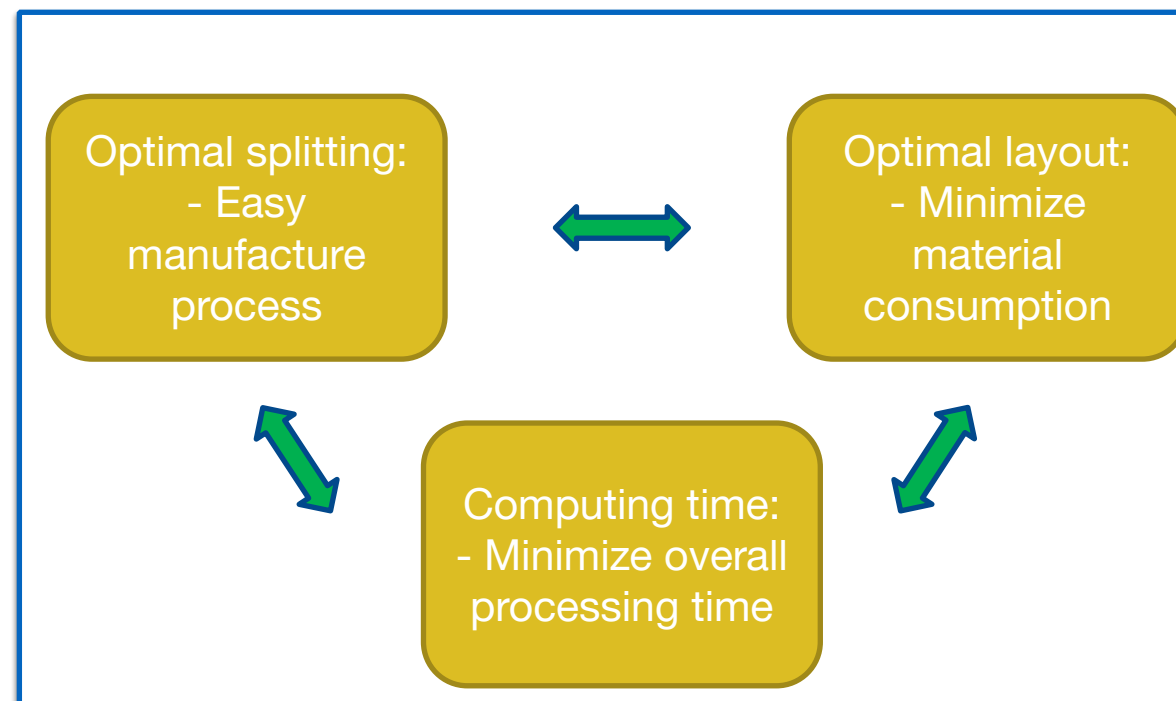
CHALLENGES AND GOALS

Our goal is to speed up and automate the design process the development of a software to automate the rubber splitting and layout processes

CHALLENGES: Productivity, efficiency

PRODUCTIVE SECTOR: manufacturing process

MATHEMATICAL AND COMPUTATIONAL METHODS

On the abstraction of splitting and merging algorithms, we build the cutting and merging algorithm. For the optimal packing, we construct a penalty function for pieces to determine the best glue. The result pieces we layout with GA based nesting algorithm.

Optimal splitting:
- Easy manufacture process

Optimal layout:
- Minimize material consumption

Computing time:
- Minimize overall processing time

The main problems in the productivity.

# Optimal cutting and packing of the supporting rubber parts

Results and Benefits

We developed an application that is capable of processing significant steps of the fabrication process automatically
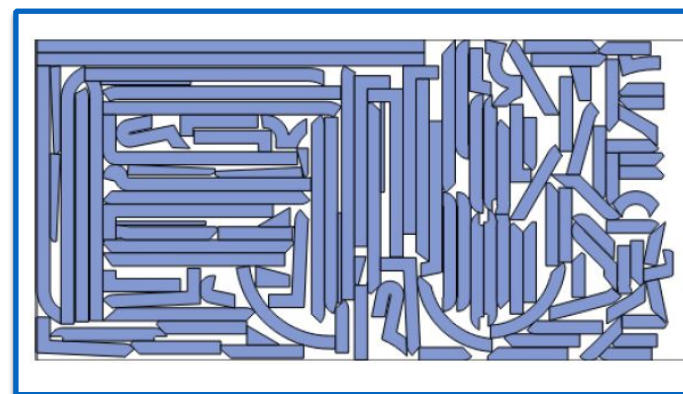
- Data import from the CAD files is implemented
- Splitting of the rubber parts is functioning
- Data export for the nesting algorithm is implemented
- Optimization of the layout is functioning
- Export of the layout is implemented
- Exporting the resulting layout in CAD format

Main benefits: decreasing the human processing time, competitive advantage for the company

Instead of 250 minutes human processing time per new order, ca. 50 minutes CPU time is necessary with the proposed algorithm.
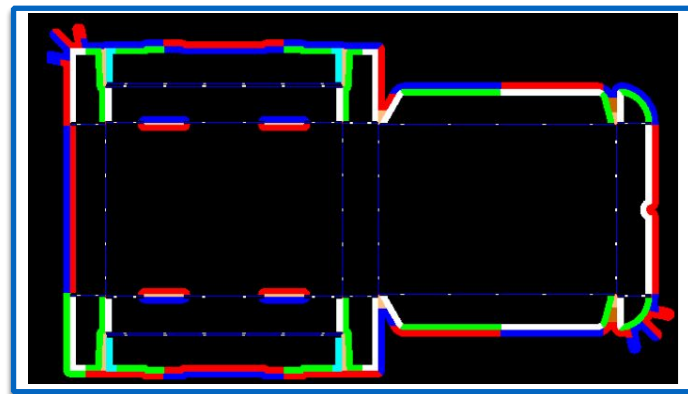
Splitting plan

The optimal layout