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Towards Automated Scheduled Nesting for Flexible Manufacturing

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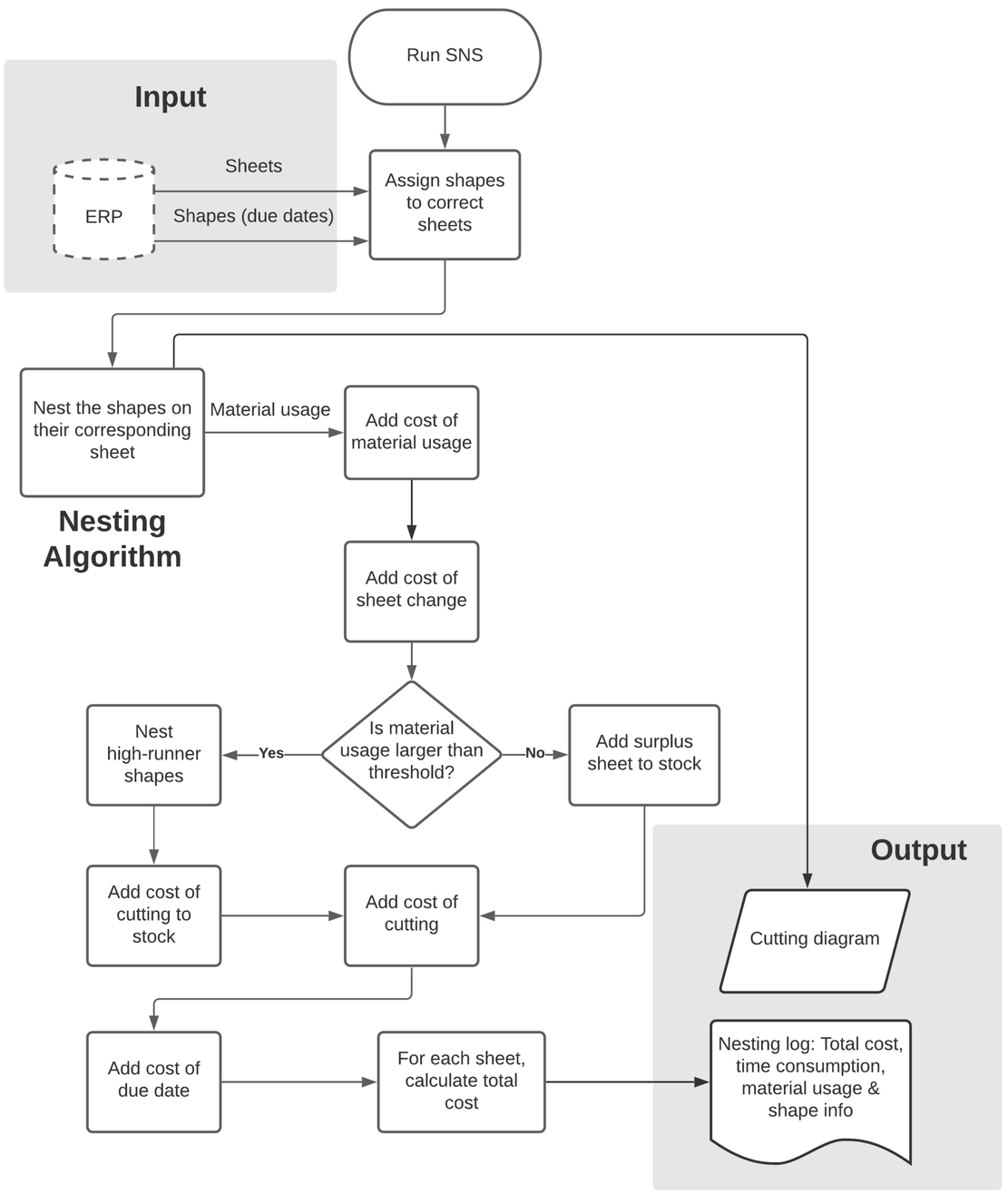
1. Introduction

Companies in the sheet metal industry rely on nesting, which is the process of creating cutting patterns to reduce material waste. In many cases, nesting and production scheduling must be addressed simultaneously, due to a trade-off between high material utilization and effective production planning. This is especially true for ETO companies, where the production is both complex and flexible, making processes difficult to automate. The proposed framework, called Scheduled Nesting System (SNS), aims at automating the nesting process at flexible manufacturing companies.

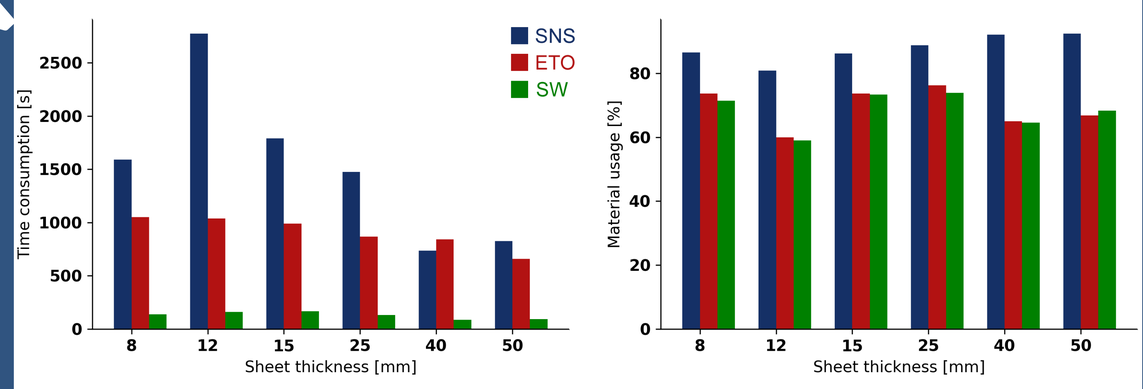
2. Scheduled Nesting System

The SNS consists of two separate parts. The first part is the scheduling algorithm, which is composed by several cost functions, based on the manufacturing processes within ETO companies. The second part is the nesting itself, where a genetic algorithm is used for generating an optimal cutting layout.

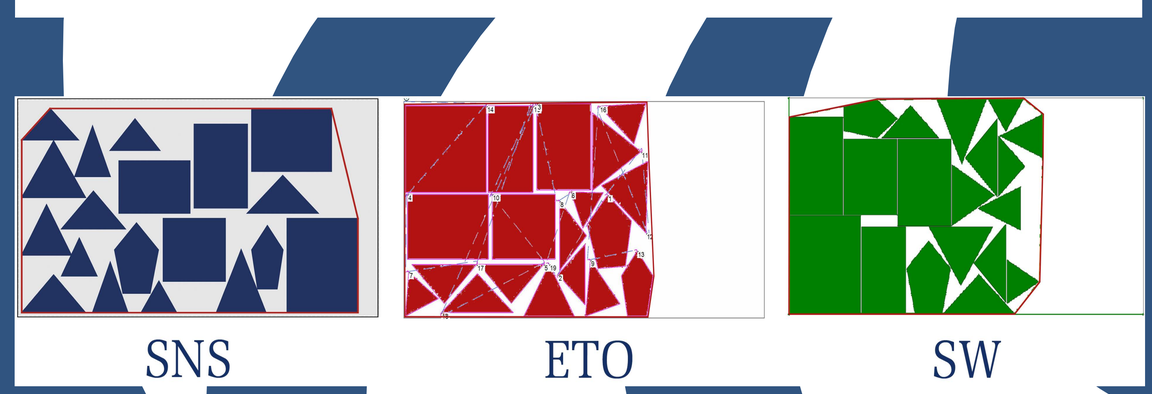


3. Results

The performance of the SNS is compared to the performance of a nesting expert at an ETO company and a commercial nesting software (SW) for automated nesting, i.e., the software computes the optimum placement of the shapes. Each must perform nests with the same shapes on the same six sheets, and their performance is measured in terms of material usage and time consumption.



The ETO company and the commercial nesting software are close when comparing material usage, while the SNS is higher for all six nests. The total time consumption is highest for the SNS, lowest for the nesting software, with the manual nesting at the ETO company in between. The nesting software spent approximately 13 minutes computing the six nests, which the ETO company and the SNS exceeded by 60 and 140 minutes, respectively.



4. Conclusions

The performance of the SNS was unable to keep up with the performance of the two other methods, shown in the results. The performance was measured in terms of material usage and time consumption, which are parameters that are not optimized on in the SNS. However, as many different aspects of the manufacturing processes are considered in the SNS, i.e., in the form of the costs, it is believed that the use of it will lead to improved competitiveness due to cost savings as well as a reduced lead time. In addition, the SNS can aid in automating the nesting process, as well as serving as a decision-making tool for nesting workers.

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