

Combined simulation and machine learning for process optimization in wood industry

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Context and objectives

The wood industry is one of the major industries in the Nouvelle Aquitaine and the lands of Gascogne region, the dominant species in this region is maritime pine. Sawmills are the main industrial process that transforms wood from its original form -wood logs- into products, such as pallets, wood boards, etc. However, most of these sawmills are old, equipped with machines from the 1970s, and their condition varies depending on the renovations carried out. Some of them have even had to close their doors due to insufficient income, due to the low capacity of their machines to optimize wood sawing, resulting in losses of raw material and therefore revenue. The objective is to create a simulation-based decision support tool that is capable of giving the managers an idea of the effect of investing in new machines not only but the detection of bottle necks and the crucial machines that needs to be replaced (Opacic 2010, Opacic et al. 2018). Not only but also calibrate the rate and speed of production in each line to have a smoother production flow.

Material and methods

By using the production monitoring and the data of the Gascogne bois saint symphorien sawmill for the year 2022, including the machine's production capacity, speed, stops and breakdowns and number of wood logs treated per day, a simulation model will be created. After analysing these data, a distribution laws will be used to feed the model to simulate and act as a digital twin for the sawmill. AnyLogic software is used for simulation (Borshchev 2013). Before the simulation comes the basic step of modelling using a general modelling language called HiLLS (Samuel et al. 2019). These tools: AnyLogic and @Risk software which is used to data fit production monitoring data, have been successfully used in a study for engineered wood products mill (Opacic et al. 2018).

References

- Borshchev A. (2013) The big-book of Simulation Modeling Multimethod Modeling with AnyLogic-6.
- Opacic L. (2010) Developing simulation models to improve the production process of a parallam mill.
- Opacic L., Sowlati T., Mobini M. (2018) Design and development of a simulation-based decision support tool to improve the production process at an engineered wood products mill. *International Journal of Production Economics*, 199, 209–219. <https://doi.org/10.1016/j.ijpe.2018.03.010>
- Samuel K.G., Maiga O., Kaba Traoré M., Traoré M.K. (2019) Formal verification with HiLLS-specified models: A further step in multi-analysis modeling of complex systems. *International Journal of Model-Ing*, 10(05). <https://doi.org/10.1142/S1793962319500326>
- Sokovic M., Jovanović J.Š., Krivokapic Z., Vujovic A. (2009) Basic Quality Tools in Continuous Improvement Process. <http://www.rebusproject.net>