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Neural networks with dynamic simulations

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ABSTRACT

In Finnish industry, the utilization of physics based simulation has been active. With the recent advancement in the theme of digital twins, the interest of utilization of already existing simulation models with the actual product through its lifecycle has been active. Especially, real-time capable simulation tools are attractive, as they can be utilized in cases where human is operating the machine, e.g. in mobile heavy machinery applications. [4]

While, the neural networks have also been active in the focus of research, the need for labelled data is the main core for accurate and efficient neural network creation. The physics based simulation models can produce data for that purpose. Especially including non idealities and faults in the datasets can be created with ease. [1]

The combination of physics based simulation and measured data enables for computationally efficient methods for creating neural networks, e.g. for fault identification tasks and the transferral of the developed neural networks are of essence, i.e. not solely for single purpose utilization but also beyond it to other similar type of products. [3]

The research related to efficient and accurate simulation techniques is active, which is beneficial for the labelled data generation with the computer. [2, 5] Therefore it is expected that the simulation is capable of merging tighter with the real world more effectively. By this the benefits of both approaches can be used for the generation of understanding about the applications.

Keywords: Physics based simulation, neural networks, transfer learning, computational efficiency

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