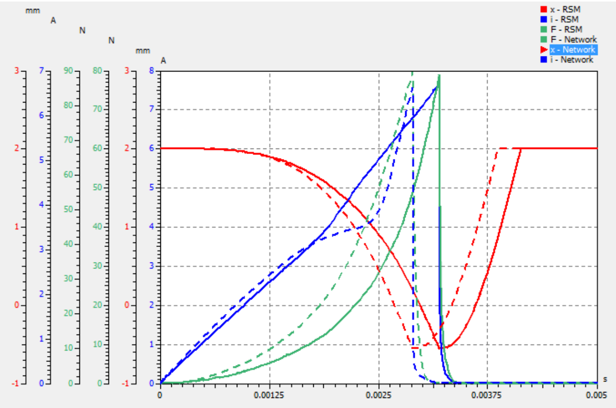

Fig. 6: Dynamic behavior of the Braille printer simulated by a network model (dashed) and a surrogate model (solid); x - printer needle displacement, i - coil current, F - magnetic force

5 Conclusions

Modeling technical systems with network elements is an adequate approach, however, challenging and time-consuming if performed manually. The adaptive Gaussian process is an approach that allows an efficient and automatic generation of precise component models for system modeling. It requires only few support points of the black box system. With additional support points, the accuracy of the computed meta model can be improved step by step if necessary. The mathematical meta model can be written as Modelica code. The algorithms which are needed for this procedure are implemented in the multidisciplinary design software OptiY®. It provides generic and direct interfaces to many specialized commercial CAD/CAE-software tools and also in-house codes. Within, user can easily create fast surrogate models and export them as Modelica code automatically.

The study case shows that the meta modeling process is very fast and useful. The amount of identified parameters is smaller in comparison to the network model. The system behavior is more accurate. The application of a Braille printer with an electromagnetic actuator has been demonstrated. Simulation results of a network model and a surrogate model have been compared. The use of fast meta models allows computationally intensive optimization and test procedures, e. g. robust design optimization.

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