

Revised and Improved Implementation of the Spur Involute Gear Dynamical Model

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An improved model having new, more realistic, properties is constructed with use of previously implemented approach for building up a model of the spur involute gear dynamics. First of all, an algorithm for contact tracking of cylindrical surfaces directed by involutes was rearranged. This algorithm is “simply” reduced to tracking the two involutes. A result is that common line normal to these contact curves always coincides with the line of action. This property permits obtaining direct simple formulae for contact computations.

A backlash in gearbox is also taken into account in the model under consideration. This means that a loss of contact between the teeth is possible as gearwheels rotate. This may then cause an appearance of a contact patch during the reversal. Furthermore, a dynamical reasons may force the mesh process to return to the former mode of the forward stroke and so fourth. All such scenarios for switching modes are implemented in the model in a unified way.

A time overlapping of contacts between teeth pairs is used to ensure the mesh reliability. This property is also implemented in the described dynamical model. New contact of the next pair of teeth arises and starts its motion along the line of action before the old contact leaves this line at the point of teeth disengagement.

The project under presentation is based on the original development of the multibody dynamics simulation class library [2]. Modelica templates being applied to the teeth contact model implementation initially were developed in [3].

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References

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