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An approach and technique for acoustic modelling of contact

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Vibration of solid objects can often be modelled by modal description, which exists when certain operators in a differential equation are linear. Discrete-time algorithms can represent the behaviour of "modal objects" without artefacts, *exact* (with precision of finite computer architecture), if based on analytical solution, *not* numeric approximation. In particular, the energy associated with the state of the system is then preserved and the algorithm stable.
A scenario of two objects interacting only during contact, however, is non-linear: a non-zero linear function cannot be zero in a half-space of the system's state-space. Existing computational models are based on *approximate*, numeric solution and cannot guaranty stability in situations with longer contact phases, such as rolling or sliding.
General principle of our approach is: although any possible term for the interaction force must be non-linear, it may be *piecewise-linear*, and during each linear phase the whole system (of interacting solids) may be simulated by modal description. The question of "switching" between the different phases is here critical but may be solved in a way that assures control over the system's energy. Our implemented new contact model is stable in any condition and overcomes artefacts found with previous techniques.