

ACOUSTICS2008/2721 **A complex model for piano action**

José Lozada^a, Xavier Boutillon^a and Moustapha Hafez^b

^aLaboratoire de Mécanique des Solides, Ecole Polytechnique, 91128 Palaiseau Cedex, France

^bLaboratoire des Interfaces Sensorielles, CEA-LIST, 18 route du Panorama, BP 6, 92265
Fontenay-aux-Roses Cedex, France

Available mechanical models of piano action are extremely simplified in view of the complexity of an actual mechanism. Several arguments will be presented which indicate that more dynamical complexities than those offered by the current models are considered as intrinsic properties of good piano actions. A more complete model of a grand piano action during the attack of a note will be presented which includes the six degrees of freedom of the action, all considered as rigid bodies: the key, the damper, the whippen, the repetition lever, the jack, and the hammer. In this model, coupling features are represented by lumped elements: Coulomb friction, linear and nonlinear springs. Methods for characterizing each element of the model will be presented. The final result will be given in terms of dynamical equations, coupling equations, and geometrical constraints.