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Mass-spring-damper dynamic system modeling for predicting drop-pair interaction outcomes PAUL VAN NOORDT, MICAH BERGMAN, CARLOS HIDROVO, The University of Texas at Austin — In the present study, we investigate both theoretically and experimentally the process of two drops interacting through a head-on collision and the various outcomes that may result. The relationship between kinetic and surface energy of the colliding drop pair, as well as the viscosity of the intervening gaseous medium, are considered as factors that govern the outcome of the collision. A theoretical model is derived, which treats the collision process as a squeeze-film problem involving both planar and non-planar geometries. Based on the various mechanisms that influence the collision dynamics, an analogy is made between the fluidic system of liquid drops and a mechanical mass-spring-damper system. Examination of the analogous mechanical system yields an equivalent damping ratio, which is used to predict the outcome of the drop-pair collision. Our experimental setup allows drops of varying speed and size to interact with each other in a mid flight collision. The collision process is captured using high-speed photography, and the results obtained are used to validate our theoretical model and the effectiveness of our damping ratio in predicting the outcome of drop-pair collisions.

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