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Modeling Sensitivity to Initial Conditions of Rotational Dynamics JOSEPH GUTHEINZ, MADELINE CARTER, JAMES CLARAGE, University of St. Thomas — Classical Dynamics, although simplistic in its elegance, has posed countless questions, many of which have yet to be answered. One such problem pertaining to this sub-field of Physics begs the simple question: why does a book wobble erratically in flight when rotated in the presence of drag forces? In light of this phenomenon, our research group has conducted research concerning the nature of a parallelepiped's rotation in three-dimensional space, including the integration of dynamic drag effects and the manipulation of initial conditions to plot the motion of a book-shaped object in space. This model was then compared to accelerometer data we collected from a sensor-enabled Pasco Smart Cart with identical geometry to the computational model. Comparison with our experimental data sets ultimately led to the development of a realistic computational model for the motion of a parallelepiped in three-dimensional space, further explaining the erratic motion of a book-shaped object in flight. Additionally, this model has proven to be a potential instance of chaotic motion as a result of drag forces upon a rigid, rotating body in space, as exhibited by unexplained perturbations in the latest computational models upon changing the initial kinematic parameters for the object.

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