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Physical Based Simulations of Mechanical Watches and Clocks

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Mechanical watches and clocks are intricate mechanical devices that fascinate millions of people around the world. In general, a mechanical watch is made of some 100 components. Among these components, the escapement plays a vital role in controlling the timekeeping accuracy. An escapement usually consists of an escape wheel, which receives energy provided by the mainspring through the gear train, and a pallet fork, which controls the oscillation. Owing to its complex nature, few have built a mathematical model for the escapement. In this paper, we present a physical-based simulation model for the Graham Escapement (the oldest and the most common escapement for clocks), and a model for the Swiss Lever Escapement (the most popular escapement for mechanical watches). The models are developed based on a commercial software system RecurDyn® [1]. The simulation helps to understand the kinetics as well as the dynamics of the escapements.

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