

Fractional Mechanics

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We give an overview of fractional derivatives within the generalized function framework. We then examine the use of fractional derivatives in classical mechanics. The main problem that will arise is that the variational principle used to derive the equations of motion relies on the integration-by-parts formula. We will see that an integration-by-parts reverses time which leads to a causal equations of motion. We speculate on ways to overcome this difficulty including the Wheeler-Feynman absorber theory and Cramer's transactional interpretation of quantum mechanics, and Tonti's convolution approach to mechanics. We will also examine path integral solutions to the quantization of Lagrangians containing fractional derivatives.