Review of: "Recovering the relativistic kinetic energy"

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Potential competing interests: No potential competing interests to declare.

The paper provides a rigorous and elegant derivation of relativistic kinetic energy using the work-energy principle, offering a pedagogical approach that complements traditional methods. While the lack of novelty and minimal discussion of broader implications limit its impact, the work is a valuable resource for teaching and understanding the mechanics of relativistic systems. Expanding the physical context and addressing practical applications could significantly enhance the paper's relevance and appeal. The paper provides a derivation of the relativistic kinetic energy formula based on the work-energy principle. It starts from Newton's second law adapted to special relativity and computes the kinetic energy as the total work done by a force on an object initially at rest. The derivation confirms the established relativistic kinetic energy formula:

KErel=(γ−1)m0c2KE_{\text{rel}} = (\gamma - 1)m_0c^2KErel=(γ−1)m0c2

where γ=11−v2/c2\gamma = \frac{1}{\sqrt{1 - v^2/c^2}}γ=1−v2/c21 is the Lorentz factor, m0m_0m0 is the rest mass, vvv is the scalar velocity, and ccc is the speed of light.

Additionally, the paper explores the evolution of velocity for a particle subject to an external force, offering explicit expressions for velocity under relativistic conditions.

Suggestions for Improvement:

1. Include a discussion of how the work-energy principle applies in relativistic contexts and why it remains valid despite the departure from Newtonian mechanics.
2. Provide examples of real-world systems (e.g., particle accelerators or relativistic astrophysics) where the derived formulas are directly applicable.
3. Offer an appendix or supplementary material for detailed derivations, allowing the main text to focus on intuitive explanations.
4. Discuss experimental validations of relativistic kinetic energy, such as those observed in particle physics experiments or high-speed collisions.
5. Expand on the mention of inertia and gravitational force, offering insights into how the derived results might inform ongoing debates in fundamental physics.