Abstract Submitted
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Space-Time Splitting and the Newtonian Limit in General Relativity Theory[1] MAIK REDDIGER, Texas Tech University — Is there a well-motivated, mathematical separation of space and time in general relativity? Common approaches are either coordinate-dependent, require additional constraints and geometric structures, or are physically unjustified. As a remedy, we motivate an approach via individual observers and their past light cones, leading to the definition of 'observer mappings'. The concept of a frame of reference is defined mathematically, tying sensibly to the general theory. Results include statements on the domain and smoothness of observer mappings, the relation between 'actual' and 'observed' causality, as well as the question of how the 'observer spacetime' relates to the actual one. As the employed concepts of space and time need to reduce to the Newtonian ones in an approximation, the theory provides a natural framework for the Newtonian limit. For mass points, this translates to expanding an 'equation of observed motion' in inverse powers of the speed of light. In this equation 'actual' forces and pseudo-forces can generally be distinguished. For 'inertial frames' in Minkowski spacetime, a pseudo-force exists due to the change of clock rate of the accelerated 'observed observer'. In the zeroth order, the pseudo-force disappears and Newton's second law is indeed obtained.

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