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Estructuras Algebraicas y Geométricas de la Relatividad Especial

Special relativity - which deserves more attention than it is normally granted in courses in mechanics and electrodynamics - is the gateway to the study of fundamental physics and the technological use of information networks, global positioning systems (GPS) and different information technologies that also embrace condensed matter. Observing the broad panorama of work posed by relativity, it is considered that it is essential to explore diverse mathematical and physical areas immersed in relativity with the purpose of actively participating in all this universe of knowledge that, for this case, includes the study of space- time and its potential scientific application.

This paper studies algebraic and geometric structures that involve some aspects of group theory to describe the Galileo, Lorentz, Poincaré and Lie groups, which help analyze properties of symmetry and translation in different physical contexts. It is necessary to describe algebraic behavior through algebras such as linear and Lie, which helps to show that the previous structures are groups, allowing to generalize principle and laws of conservation that can be studied in mechanics or electromagnetic theory. These fundamentals are basic in the understanding of classical and quantum field theory, which substantially influences diverse physical properties of light behavior and its interaction with matter, such as photonic materials that exhibit exotic properties when analyzed in media different to vacuum.

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