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EXTENDED BODY DYNAMICS IN GENERAL RELATIVITY

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This research analyzes and describes the movement of extended N-bodies endowed with an internal structure which interact gravitationally in an isolated and self-gravitating system. For it is made use of the Newtonian and Einsteinian theories, understanding Newton's theory as a limit of the general relativity theory.

For this we make a mathematical approach to the equations that describe the movement in each case. For the Newtonian case we approach the problem from two points of view, the first we study the external problem, where is determined the movement of the centers of mass of each body in relation to the global center of mass, in the second one we study the internal problem, in which is determined
the movement of the body in relation to its own center of mass. In the relativistic case, we make use of the formalism Damour, Soffel and Xu (DSX). This consists of taking N+1 charts on the manifold, first N local charts, which describe the problem for each body in a local way, this is called Geocentric System and a global chart that describes the dynamics of the system with a whole, which is called Barycentric System, and finally the relationship between the local charts and the global chart is established.

This study allows us to identify the relationship that exists between these two theories, as well as to determine the elements that cannot be extended from one theory to another. The importance of this research lies not only in the establishment of a relationship between Newtonian gravitation and general relativity, but also in its applications in the design of space missions, effects in cosmological spacetimes as well as in technological development.

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