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Structures of self-interacting dark matter originated from embedding theory

An approach is developed in the embedding theory, which considers the theory from a position close to the mimetic gravity. In this approach, there is a class of solutions in which the equations of motion of the theory in the nonrelativistic approximation describe general relativity with additional matter, which is close in properties to dust-like matter but has some complex self-interaction. The self-interaction of matter depends on the choice of a specific surface in the ambient space, which is a special embedding of the three-dimensional Euclidean space into the nine-dimensional space with a non-degenerate second quadratic form.

Using the recently obtained explicit embedding, which has the necessary properties, it is possible to investigate the behavior of self-interacting dark matter. Using additional assumptions about the magnitude of the curvature of the surface in the flat ambient space, one can obtain a significant simplification of the contribution of self-interaction to the equations of motion of additional matter and pose the problem of studying the process of formation of stationary structures from the matter of this type. To solve this problem, one can also apply the method used earlier for the analytical study of the core/cusp problem, in which the density profile is related to the distribution function of moving matter particles along stationary orbits.

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