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A THEORETICAL DEDUCTION FROM THE HUBBLE LAW BASED ON A MODIFIED NEWTONIAN DYNAMICS WITH FIELD OF YUKAWA INVERSE

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At cosmic scales the dynamics of the Universe are almost exclusively prescribed by the force of gravity; however the assumption of the law of gravitation, depending on the inverse of the distance, leads to the known problems of the rotation curves of galaxies and missing mass (dark matter). The problem of the coupling of gravity to changes in scale and deviations from the law of the inverse square is an old problem (Laplace, 1805; Seeliger 1898), which has motivated alternatives to Newtonian dynamics compatible with observations. The present paper postulates a modified Newtonian dynamics by adding an inverse Yukawa potential: $U(r) \equiv U_0(M)(r-r_0)e^{-\alpha/r}$ is the the potential per unit mass (in N/kg) as a function of the barionic mass that causes the field, r_0 is of the order of $50h^{-1}$ Mpc and $alpha$ is a coupling constant of the order of $2.5h^{-1}$ Mpc. This potential is zero within the solar system, slightly attractive at interstellar distances, very attractive in galactic range and repulsive at cosmic scales. Its origin is the barionic matter, it allows to include the Milgrow MoND theory to explain the rotation curves, it is compatible with the experiments Eovos type, and allows to deduce the law of Hubble to cosmic scales, in the form $H_0 = 100h\ km/s\ Mpc \approx U_0(M)/c$, where $U_0(M) \approx 4pi \times 6.6710^{-11}\ m/s^2$, is obtained from the Laplace's equation, assuming that the gravitational force is the law of the inverse of the square plus a non-linear term type Yukawa inverse. It is concluded that the modification of the law of gravity with non-linear terms, allows to model the dynamics of the Universe on a large scale and include non-locality without dark matter. (See Falcon et al. 2014, International Journal of Astronomy and Astrophysics, 4, 551-559).

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CHALLENGES AND RESULTS OF THE APPLICATIONS OF FUZZY LOGIC IN THE CLASSIFICATION OF RICH GALAXY CLUSTERS

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The fuzzy logic is a branch of the artificial intelligence founded on the concept that everything is a matter of degree. It intends to create mathematical approximations on the resolution of certain types of problems. In addition, it aims to produce exact results obtained from imprecise data, for which it is particularly useful for electronic and computer applications. This enables it to handle vague or unspecific information when certain parts of a system are unknown or ambiguous and, therefore, they cannot be measured in a reliable manner. Also, when the variation of a variable can produce an alteration on the others The main focus of this paper is to prove the importance of these techniques formulated from a theoretical analysis on its application on ambiguous situations in the field of the rich clusters of galaxies. The purpose is to show its applicability in the several classification systems proposed for the rich clusters, which are based on criteria such as the level of richness of the cluster, the distribution of the brightest galaxies, whether there are signs of type-cD galaxies or not or the existence of sub-clusters. Fuzzy logic enables the researcher to work with "imprecise" information implementing fuzzy sets and combining rules to define actions. The control systems based on fuzzy logic join input variables that are defined in terms of fuzzy sets through rule groups that produce one or several output values of the system under study. From this context, the application of the fuzzy logic's techniques approximates the solution of the mathematical models in abstractions about the rich galaxy cluster classification of physical properties in order to solve the obscurities that must be confronted by an investigation group in order to make a decision.

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