Estimation of Extraterrestrial Intelligent Civilizations and Attributes per Exoplanetary Continuum through Algorithmic Simulation and Civilization Modeling

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Abstract

In the field of Astrobiology, a quantitative approach has not been made to predict the number of extraterrestrial intelligent civilizations that may have existed on a habitable exoplanet as well their corresponding properties, such as intelligence, lifespan, and recovery time. Prior research indicates that numerous planetary systems within the Milky Way Galaxy are of over six billion years in age, implying many exoplanets, if sustainable to life, may have had several cycles of civilizations emergence and self-destruction, suggesting the ruins of advanced civilizations should be commonplace within the galaxy. We investigate this problem by utilizing statistical algorithmic simulations to predict and estimate the number of civilizations (both future and extinct) that may arise within an exoplanetary continuum, further generating the accompanying characteristics of said civilizations. Within the model, factors such as self-induced extinction/destruction, natural civilization decay, planetary disasters, and civilization rediscovery have been incorporated to examine the pathways a civilization can encounter. Our results corroborate the notion that on many of the older exoplanets in our galaxy, civilizations may have existed, however most have ultimately died out within a short period, further limiting the search for current extraterrestrial intelligence, but strengthening the approach of interstellar archeology.