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A Deterministic Large Deviation Model Based on Complex N-Body Systems

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Abstract : In the previous efforts, we constructed N-Body Systems by an extended Blaschke product (EBP), which represents a non-temporal and nonlinear extension of Lorentz transformation. In this construction, we rely only on two parameters, nonlinear degree, and relative momentum to characterize the systems. We further explored root computation via iteration with an algorithm extended from Jenkins-Traub method. The solution sets demonstrate a form of σ+ i [-t, t], where σ and t are the real numbers, and the [-t, t] shows various canonical distributions. In this paper, we correlate the convergent sets in the original domain with solution sets, which demonstrating large-deviation distributions in the codomain. We proceed to compare our approach with the formula or principles, such as Donsker-Varadhan and Wentzell-Freidlin theories. The deterministic model based on this construction allows us to explore applications in the areas of finance and statistical mechanics.

Keywords : nonlinear Lorentz transformation, Blaschke equation, iteration solutions, root computation, large deviation distribution, deterministic model
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