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On the Influence of the Metric Space in the Critical Behavior of Magnetic Temperature

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Abstract : In this work, a study of generic magnetic nanoparticles varying the metric space is presented. As the metric space is changed, the nanoparticle form and the inner product are also varied, since the energetic scale is not conserved. This study is carried out using Monte Carlo simulations combined with the Wolff embedding and Metropolis algorithms. The Metropolis algorithm is used at high temperature regions to reach the equilibrium quickly. The Wolff embedding algorithm is used at low and critical temperature regions in order to reduce the critical slowing down phenomenon. The ions number is kept constant for the different forms and the critical temperatures using finite size scaling are found. We observed that critical temperatures don't exhibit significant changes when the metric space was varied. Additionally, the effective dimension according the metric space was determined. A study of static behavior for reaching the static critical exponents was developed. The objective of this work is to observe the behavior of the thermodynamic quantities as energy, magnetization, specific heat, susceptibility and Binder's cumulants at the critical region, in order to demonstrate if the magnetic nanoparticles describe their magnetic interactions in the Euclidean space or if there is any correspondence in other metric spaces.

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