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Title: A Parallel Monte Carlo Algorithm For Modeling Dense Stellar Systems On Hybrid Architectures

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Investigating the interactions between the stars within a dense stellar system is a problem of fundamental importance in theoretical astrophysics. While simulating realistic globular clusters containing about 10^6 stars is computationally intensive, galactic nuclear star clusters with about 10^9 stars are practically unachievable. In this talk, we will present a parallel version of a Monte Carlo algorithm for simulating the evolution of such very large stellar clusters on hybrid hardware architectures. We will discuss the numerical methods used in the algorithm, their time complexities, the strategies we used to minimize communication and how to efficiently use the computing power of GPUs in developing the parallel version. We will also talk about the performance of our implementation on a GPU cluster for various physical configurations, and discuss the scalability of the algorithm, and how optimally it uses the available computational resources.