PHYSICS COLLOQUIUM

Monte Carlo Simulations for Radiotherapy

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In radiotherapy for cancer treatment, the clinical goal is to maximize the dose to the tumor while minimizing radiation exposure to the organs at risk. In radiotherapy, statistical nature of the interaction of radiation with tumor and its surroundings makes it a good candidate for Monte Carlo (MC) method - an embarrassingly parallel simulation. Typical runtime of an accurate MC simulation for radiotherapy using charged particles, such as protons, is in the order of weeks to months in a serial computing environment. Grid computing - distribution of computational tasks to a network of computers - is an emerging technology and is particularly suitable for radiotherapy simulations. In addition, grid computing supports an excellent data security across the network domains and fast data movement capabilities. Ideally, integration of these technologies with the clinical treatment planning systems would be beneficial for better understanding the treatment strategies, new research directions, and training the future workforce in cancer radiotherapy. With this vision, we have conducted proof-of-concept studies1 on the promise of grid computing for proton therapy for prostate cancer. For this study, a medical grid was established between Texas Tech University, Rice University, and M D Anderson Cancer. We used GEANT4 simulation environment for these studies. Our preliminary results and future directions will be presented. Ongoing efforts and opportunities for taking us step closer to the clinical integration of these studies will be discussed.

Thursday, September 23, 3:40pm --- Sci 234

Refreshments served at 3:00 pm in Science 103