תכנית האנרגיה ע"ש גרנד מתכבדת להזמינך להרצאה סמינריונית שתינתן ע"י:

שיר בבלי-חדידה

התכנית הבין-יחידתית לאנרגיה

בנושא:

A MODIFIED APPROACH TO THE LATTICE BOLTZMANN MODEL (LBM) BASED ANALYSIS OF RADIATIVE HEAT TRANSPORT

Thermal radiative heat transfer is important in high-temperature and/or low pressure applications such as solar technology, combustion chambers, nuclear reactors and space applications. The Radiation Transfer Equation (RTE) is a nonlinear (with respect to temperature), integro-differential equation, which is sensitive to geometry. This typically leads to a level of complexity requiring almost all problems to be treated using numerical methods. Numerical solutions of realistic radiative heat transfer problems are often associated with a large computational expense. The Lattice Boltzmann Method (LBM) is a relatively new numerical method, based in a sense on the concept of macroscopic dynamics being a result of the collective behavior of many virtual microscopic particles in the system. The LBM has been applied in the literature for the direct solution of the RTE based on the similarity between the RTE and the Boltzmann Transport Equation. Using this idea, intensities of radiation play the part of the particle distribution functions in LBM. A drawback of this technique involves the need for a large number of directions (a high level of angular discretization) especially for the case of optically thin media (small values of the extinction coefficient). Achieving increased discretization in the angular direction in the accepted way is non-trivial, involves a loss of locality of calculation and is characterized by increased particle velocity values. First, we apply a modification, based on interpolation of intensities between nodes, in which high quality quadrature is used for the angular discretization, and locality, as well as magnitude of particle velocities, is not significantly affected. An alternative non trivial relaxation time based on an integrated RTE approach is also discussed; the relaxation time represents more efficiently the non-linear intensity distribution, especially problematic in one or two dimensional problems of the type we consider. In addition, in order to increase the accuracy, linear interpolation of the average intensity is also investigated. High accuracy results in a number of 1D and 2D test cases demonstrate the robustness and accuracy of our approach. Theoretical error analysis is applied and is shown to explain the behavior of the empirical error, as a function of discretization.

מנחה: פרופ' שמעון ברנדון, הפקולטה להנדסה כימית

במסגרת עבודת מחקר לתואר מגיסטר

ההרצאה תתקיים ביום ג', 9.10.18, בשעה 11:00, אולם 6, הפקולטה להנדסה כימית