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NUMERICAL SIMULATION OF RADIATIVE HEAT TRANSFER BY SOLVING INTEGRO-DIFFERENTIAL EQUATIONS

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Estimation of radiative heat transfer is an important aspect to be considered during the analysis of high speed and high temperature flows. Radiative heat transfer has a strong impact on the design of the thermal protection system and its material, especially in the hypersonic re-entry environment. The radiative heat transfer is governed by an integro-differential equation, which can be written as

where S is the source term and is defined as

: the position vector, : the direction of heat transfer, : the scattering coefficient, : the absorption coefficient, 61542; : the scattering phase function,, 61527;61602; : the control angle, I : the intensity of radiation.

This equation needs to be solved for each gray gas in the mixture and for all directions for an accurate prediction of heat transfer. A generalized mesh based Finite Volume Method (FVM) will be presented for solution of the radiative heat transfer equations. This numerical method has been validated with several benchmark problems, including two and three dimensional cases. The details on the numerical approach and results from the validation of the developed solver will be presented at the conference.

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