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The Integro-Differential Scheme - A New Approach for Solving the Conservation Laws for Fluid Flow GAFAR ELAMIN, FREDERICK FERGUSON, North Carolina A&T State University, CENTER FOR AEROSPACE RESEARCH TEAM — A new numerical scheme for solving the equations that govern fluid dynamics problems is developed. The new numerical innovation is based on a smart integration of the traditional finite volume and finite difference schemes and is so-called the Integro-Differential Scheme, (IDS). The strength of IDS rests on the implementation of the mean value theorem to the integral form of the conservation laws. This process transforms the integral equations into a finite difference scheme that lends itself to efficient numerical implementation. In this paper the new scheme is employed to solve the viscous flow over a flat plate problem and the shock/boundary layer interaction problem. In both cases, the results showed very good agreement with the physical expectation of the flow, the empirical formulas, and the experimental data. This agreement solidified the belief that the scheme is robust, efficient, and capable of solving a variety of complex fluid dynamics problems.

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