Air Force Research Laboratory|AFRL

Science and Technology for Tomorrow's Air and Space Force

Success Story

AFOSR-FUNDED SCIENTIST WINS PIONEER PRIZE

Dr. Stanley Osher, an Air Force Office of Scientific Research (AFOSR)-funded scientist, was awarded the International Congress on Industrial and Applied Mathematics Pioneer Prize for his outstanding contributions to applied mathematics and computational sciences. Dr. Arje Nachman, an AFOSR program manager, said Dr. Osher's research could aid the US military in developing a high-quality simulation tool, resulting in the design of a multi-use warhead that would explode in a variety of patterns such as anti-armor and antipersonnel.

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Accomplishment

Dr. Osher, director of applied mathematics at the University of California, Los Angeles was recognized for his pioneering work on shock-capturing schemes, pulse detonation engine (PDE)-based image processing, and the level-set method. This research will help track shock waves within the solid explosive, which is initiated by micro-detonators for multiuse warheads.

Background

Dr. Osher's work on shock-capturing schemes for conservation laws was extremely influential in computational fluid dynamics (CFD). In the late 1970s and early 1980s, he and various collaborators developed monotone and total-variation-decreasing schemes, which quickly became very popular. Dr. Osher's collaborative work later introduced essentially non-oscillatory schemes that found widespread use in compressible CFD.

Dr. Osher's collaborative work on total-variation-based image restoration was among the first applications of PDE methods to image processing. This work has been very influential, stimulating mathematical research on PDE-based image analysis and leading to the development of related methods for various inverse problems.

His work on level set methods represents a fresh, very powerful approach to the numerical solution of evolutionary free-boundary problems. In the late 1980s, Dr. Osher addressed the propagation of co-dimension-one fronts with curvature-dependent speed. Since then, with various collaborators, he has addressed a wide variety of related problems, developing techniques for handling nonlocal velocity laws, triple junctions, and higher-co-dimension sets. He has, moreover, demonstrated the value of these techniques by applying them to problems from materials science, geometry, and fluid dynamics.

Office of Scientific Research
Awards and Recognition

Additional information

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