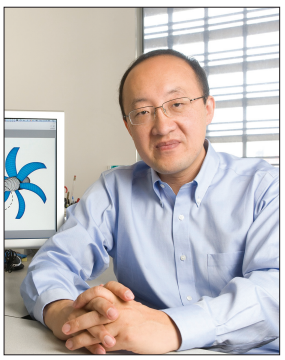
Flow Physics and Engineering

Dong Hyun You



Education

Ph.D. 2004 Stanford University
M.S. 1998 Seoul National University
B.S. 1995 Yonsei University

Experience

2012 - Associate Professor, POSTECH
2008 -2012 Assistant Professor, Carnegie Mellon University
2010 Visiting Professor, Stanford University
2005 - 2009 Senior Research Scientist, NASA-Stanford Center for Turbulence Research
2004 – 2005 Postdoctoral Research Fellow, NASA-Stanford Center for Turbulence Research

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Prof. You's research is concentrated on high-fidelity simulation and design of thermo-fluid systems that are innovative in the energy conversion and energy utilization processes. In addition to conventional energy conversion and propulsion systems, Prof. You is also interested in renewable and sustainable energy conversion systems such as thin-film solar cells and wind- and hydro-turbines for electricity and/or hydrogen production and hydrogen conversion systems such as combustors and fuel cells.

For innovative energy utilization, Prof. You is interested in developing flow control and optimization methods especially for enhancing energy efficiency, performance, and stability, and reducing pollutants, acoustic noise, and other unfavorable features of (i) energy conversion systems (solar cell, fuel cell, and flow battery) and propulsion systems (combustor, compressor, propeller, and turbine); (ii) aircraft high-lift systems and wind turbine blades; and (iii) micro-scale thermo-fluid systems (applications of hydrophobic surfaces and synthetic jets). Recently, Prof. You extends the computational capabilities to discover bio-fluid dynamics in red-blood cell rheology and cardiac flow.

Prof. You and his research team are approaching the research goal with the work focusing on the following areas:

- **Computational Flow Physics and Engineering**

Development and utilization of new subgrid-scale models (e.g.,global-coefficient eddy-viscosity model) and advanced numerical methods (geometrically-flexible, accurate, and stable methods based on discrete conservation principles) for large-eddy simulation of turbulent flows in complex configurations, global-coefficient subgrid-scale model for compressible turbulence and scalar transport in complex configurations, and grid- independent large-eddy simulation employing explicit filtering techniques.

- **Integrated Multiphysics Simulations**

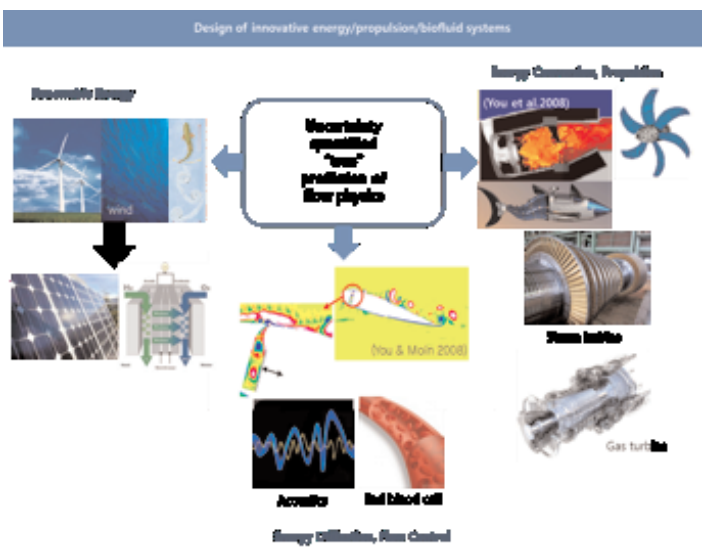
Integrated simulation and analysis of multi-physics (turbulence, combustion, spray dynamics, heat transfer, pollutants formation) in energy conversion /propulsion systems (especially combustors in aircraft jet engines and industrial gas turbine engines) using multiple code (large-eddy simulation, Reynolds-averaged Navier- Stokes simulation, Lagrangian spray dynamics, chemical reaction) coupling techniques. Integrated simulations of fluid-structure interaction, flow-induced noise and vibration in engineering as well as biological systems.

- **Flow Control and Optimization for Energy- and Environment-Compatible Thermo-Fluid Systems**

Development of efficient flow control and optimization methods for (i) enhancing efficiency and performance and reducing pollutants and acoustic noise of energy conversion systems (combustor, compressor, propeller, turbine, diffuser); (ii) enhancing performance and stability and reducing noise of high-lift systems (aircraft wing, wind turbine wing); and (iii) enhancing mixing and heat transfer in production of thin-film solar cells and operation of fuel cells, and reducing form/skin-friction drag in micro-scale thermo-fluid systems (hydrophobic surfaces, synthetic jets).

- **Renewable and Sustainable Energy Systems**

Design, simulation, and analysis of renewable and sustainable energy conversion systems such as thin-film fuel cells and wind- and hydro- turbines for electricity and/or hydrogen production and hydrogen conversion systems such as combustors and fuel cells aiming at high efficiency, performance, and durability, and low emission and acoustic noise.



Major Publications

- Lee, J. & You, D., 2013, Study of Vortex-Shedding-Induced Vibration of a Flexible Splitter Plate behind a Cylinder. Physics of Fluids, Vol. 25 (11), 110811.
- Lee, J. & You, D., 2013, An Implicit Ghost-Cell Immersed Boundary Method for Simulations of Moving Body Problems with Control of Spurious Force Oscillations. Journal of Computational Physics, Vol. 233, pp. 295-314.
- You, D., Ham, F. & Moin, P., 2008, Discrete Conservation Principles in Large-Eddy Simulation with Application to Separation Control Over an Airfoil. Physics of Fluids, Vol. 20 (10), 101515.
- You, D., Wang, M., Moin, P. & Mittal, R., 2007, Large-Eddy Simulation Analysis of Mechanisms for Viscous Losses in a Turbomachinery Tip-Clearance Flow. Journal of Fluid Mechanics, Vol. 586, pp. 177-204.
- You, D. & Moin, P., 2007, A Dynamic Global-Coefficient Subgrid-Scale Eddy-Viscosity Model for Large-Eddy Simulation in Complex Geometries, Physics of Fluids, Vol. 19 (6), 065110.