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Preface

The ability to actively/passively manipulate a flow field to achieve a desired change is of great technological importance. Lately, scientists and engineers have pursued this subject more intensely than any other topics in fluid mechanics. The precise definition of flow control could be the statement offered by Flatt (1961): "Boundary layer control includes any mechanism or process through which the boundary layer of a fluid flow is caused to behave differently than it normally would were the flow developing naturally along a smooth straight surface." Even this applied originally to wall-bounded flows but could be easily extended to free-shear flows. Flow control involves passive and active mechanisms to result in a beneficial change in wall-bounded or free shear flows. Among examples of flow control are the automobiles, sea vehicles, airplanes, space shuttles, tall buildings and large structures, off shore drilling platforms, turbo-machines, nuclear reactors, and other fluid machinery. Flow control can be used to achieve transition delay/advance, separation postponement/promotion, force enhancement/reduction, and turbulence augmentation/suppression. Numerous methods of flow control have been successfully implemented in practical engineering devices.

The 5th Asian-Pacific Conference on Aerospace Technology and Science (APCATS 2006) was held in Guilin, China, from 30 October to 3 November 2006. A symposium on Flow Control was organized and attached to this conference. This special issue of the Journal of Mechanical Science and technology devoted to this symposium and conference includes thirteen selected papers focusing on active and passive flow control and numerical technique development. There are seven papers on the passive flow control: drag reduction by wavy cylinders (Lam & Lin), fluid-structure interaction for four cylinders in a cross flow (Lam & Zou), wake suppression behind two slightly non-coplanar cylinders (Li et al.), the aerodynamic forces of a plunging airfoil (Young and Lai), control of cavity-induced pressure oscillations using sub-cavity (Alam et al.), elastic square cylinder in a cross flow (Su et al.), and force reduction on a cylinder using tripping rods. There are four papers on the active flow control: fish motion simulation (Shu et al.), flow induced vibration on a tensioned membrane (Choy et al.), airfoil separation control using synthetic jet (Kim et al.) and vortex-induced vibration control by micro actuator (Li et al.). There are also two papers on the development of numerical technique: gas-kinetic discontinuous Galerkin method (Liu & Xu) and multiple temperature model for near continuum flows (Xu et al.).

The guest editor would like to thank those referees who have helped to review the papers in this special issue. The guest editor would also like to thank the organizers of APCATS 2006 to provide the opportunity to make this symposium successful.

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