Preface

This is the second part of the special issue for the JBSE emanating from the 4th APAB Conference held in Christchurch, New Zealand in April 2009. The four papers describe two important areas of research, that of providing tools for disabled persons and of modelling for surgical or diseased states. In the former case this special issue looks at the development of a finger Braille system and a remote mouthpiece for disabled people.

A finger Braille recognition system using small piezoelectric accelerometers has been developed by Matsuda et al. and is presented. The results seem to indicate that an accuracy of the recognition of dotted fingers was above 90%, indicating the recognition system could recognize sentences accurately. Further work of course is required but this work shows the potential utilisation of technology and science in what has been a somewhat neglected area.

As noted by Terashima et al. severely disabled people such as tetraplegics have a significant number of issues in terms of their daily living. In this study, the authors have tried to develop a mouthpiece type remote controller for those severely disabled people utilising wireless technology. With specific tongue movements it seems possible to operate an electrically powered wheelchair. Developments such as this make the quality of life considerably better for those unfortunate to suffer spinal injuries. As in the previous paper further work will be done with the possibility of substantial increases in the activities available to the severely disabled.

The final two papers investigate surgical issues. Al-Atabi et al. report a performance model for determining fluid flow in the mitral valve. Cardiovascular disease has become a major concern amongst the developed, and developing, world providing substantial health (financial) burdens on the population. Repair of the mitral valve is becoming a common occurrence in the operating theatres around the world and investigations into the relationships between complex flow in the left ventricle and the opening characteristics of the mitral valve will provide beneficial support for surgeons.

The final paper in this issue concerns the investigation of cooling cuffs for controlling the temperature of the brain during surgery. It is shown that one of the therapies for lowering the brain temperature in the case of serious wound injuries to the head, severe cerebrovascular disorders, or brain ischemia was a reduction in tissue temperature. Patients were found to have a good neurological outcome. The low-temperature brain therapy that is described in this paper enables a control of both brain temperature and intracranial pressure in the case of patients with severe brain damage. This therapy has been introduced to repair nerve cells damaged during the initial brain damage, and to prevent the development of secondary brain damage.

This issue gives credence to the fact that bioengineering, the development of new technologies for both patient quality of life and complex surgical techniques are a strong and expanding area of research. As noted in the first part of this special issue this is an area where we should encourage the career aspirations and skills of our young academic research personnel. We hope that these papers will encourage others to follow what is a most important path, helping those who for one reason or another do not have the quality of life that we are lucky to have.

Guest Editors

Timothy DAVID, PhD, Professor
Director of the Centre for Bioengineering
University of Canterbury

Masao TANAKA, PhD, Professor
Department of Mechanical Science and
Bioengineering
Graduate School of Engineering Science
Osaka University