

Guest-editorial

Telemedicine and Applications

As we roll in a new millennium year, this special issue appears as the first issue of the *Journal of High Speed Networks*. It serves as two particular missions. One is to expand the scope of the journal's current coverage to include image and video communications, in which high speed networks have become an indispensable and integral part of data transmission. In order to promote this initiative, the second mission of this special issue is to select one area that can substantially benefit from high speed networking. Telemedicine seems to best fit our goal to fulfill these two missions. As will be witnessed in the years to come, telemedicine will play a significant role in future health care systems where high speed networks will provide quality of service, information security, and fast and reliable data transmission. The availability of Next Generation Internet (NGI) and Internet-2 has advanced telemedicine into a new era, and which also presents many issues and challenges.

This special issue is dedicated to such issues and challenges. Toward this end, four papers were invited and are presented in this issue. Each paper was written by a leading group in the area of telemedicine. The first paper, by Fan, Hwang, Gill and Huang, addresses some connectivity and security issues of NGI in medical imaging applications. It uses a case study to demonstrate the inadequacy of the current Internet and the need for Internet-2 to require better service in medical care. Using the environment of the Laboratory for Radiological Informatics at the University of California at San Francisco as an example, the authors focus the connectivity and security issues resulting from using Internet-2 at a local level and provide their preliminary findings. The second paper, by Lee, Mun, Jha, Levine and Ro, also addresses the issues and challenges of future development in telemedicine. It gives a brief but excellent review of the emergence of telemedicine and provides five diverse applications in telemedicine: Deployable Radiology involving three hospitals in Bosnia, Hungary and Germany, a Multi-Center Digital MRI Network involving Johns Hopkins University, a Video Teleconferencing System (VTC) Based Global Patient Care in a joint effort with the Office of Medical Services in Washington, DC, Home Health Monitoring over the Internet, and DBMS Based Medical Conferencing with Seoul National University Hospital, Seoul, Korea. All five of these projects are currently either managed by or in corporation with the Imaging Science Information System (ISIS) Center at Georgetown University Medical Center. The third and fourth papers fall in another category; each proposes a pilot system in a specific application. Mammography screening is currently the most effective and most widely used means to detect breast cancer in its early stage. In order to extend this service to rural areas and remote sites, a telemammography system is highly desirable. The third paper, by Lo, Yang, Chung, Ouyang, Lee and Liao, develops a mammography tele-consultation system in TaiChung Veterans General Hospital (TCVGH), Taiwan. It discusses their Picture Archiving and Communication System (PACS) with specific diagnostic tools and collaboration awareness tools particularly designed for mammography screening. The architecture is designed based on a distributed system and implemented in a top-down high speed network hierarchy with communication security and will be connected to the next generation of Taiwan Academic Network (TANet-2). The Maryland State Shock Trauma Center in Baltimore deals with all types of emergency situations on a daily basis. The last paper, by Xiao, Gagliano, LaMonte, Hu, Gaasch, Gunawadane and Mackenzie, teams up the experts in the University of Maryland Hospital and BDM, Inc. to design a real-time mobile telemedicine system for ambulance transport. It takes advantage of multiple public wireless cellular phones to transmit video and patient biosignals from a moving ambulance to a hospital where a physician at the receiving end is on-line for consultation. A clinical evaluation of the system was also conducted using the task model of diagnosis of acute ischemic stroke. The preliminary results have demonstrated the flexibility of the system and its user-friendliness. Of course, there exist many other applications

in telemedicine which are not covered in this issue. The paper selection for this special issue only reflects a small part of this important area. Future advances in telemedicine will continue to provide better service for health care and Medicare, and improve quality of service. This is an exciting area and I am looking forward to seeing more work appear in the *Journal of High Speed Networks* in the future.

Finally, I would like to take this opportunity to express my appreciation for the authors who contributed papers for this special issue.

Chein-I Chang
Guest Editor



Chein-I Chang received his BS, MS and MA degrees from Soochow University, Taipei, Taiwan, 1973, the Institute of Mathematics at National Tsing Hua University, Hsinchu, Taiwan, 1975 and the State University of New York at Stony Brook, 1977, respectively, all in mathematics, and MS and MSEE degrees from the University of Illinois at Urbana-Champaign in 1982 respectively and Ph.D. in electrical Engineering from the University of Maryland, College Park in 1987. He was a visiting assistant professor from January 1987 to August 1987, assistant professor from 1987 to 1993, and is currently an associate professor in the Department of Computer Science and Electrical Engineering at the University of Maryland Baltimore County. He was a visiting specialist in the Institute of Information Engineering at the National Cheng Kung University, Tainan, Taiwan from 1994–1995. Dr. Chang has a patent on automatic pattern recognition and several pending patents on techniques for hyperspectral imaging and detection of microcalcifications. His research interests include information theory and coding, data compression, signal detection and estimation, multispectral/hyperspectral image processing, neural networks, pattern recognition. Dr. Chang is a senior member of IEEE and a member of SPIE, INNS, Phi Kappa Phi and Eta Kappa Nu.