Preface

These two special issues (Vol. 79, Nos 2 & 3) of the *Journal of the Indian Institute of Science* comprise twelve papers, selected from among those to be presented at the Conference on Signal Processing and Communications (SPCOM) 1999. This conference, the fifth in a series of biennial conferences, is due to be held at the Indian Institute of Science (IISc), Bangalore, during July 21 to 24, 1999.

The special issues are very timely, because the area of digital signal processing (DSP) is growing by leaps and bounds and appears to touch everybody's life almost everyday, if not every minute. This is not surprising, given the generic character of the discipline, which deals with all types of real-life signals. But what surprises and gladdens most is the ability of DSP chips (ICs) to meet the challenges of complexity, power consumption and cost. The latest entries with VLIW (very long instruction word) architecture, teamed up with powerful software tools, are able to provide efficient implementation of DSP algorithms specified in high-level languages, such as C++ or MATLAB. The DSP industry visualizes every electronic object of tomorrow to have some embedded 'intelligence' and a role for DSP in that intelligence.

Equally surprising are the advances made in specific application areas such as telecommunication, multimedia processing, medical electronics, consumer products, etc. For example, digital signal processors are at the heart of megabit modems transmitting across cables, video compressors providing up to 1000:1 compression, magnetic disks storing gigabits of information; soon, satellite radios with audio/visual link information will be a reality. DSP and telecommunication technologies are mutually enabling, leading to many interesting innovations such as turbocodes, joint source–channel coding, multicarrier modulation, etc. Most of the mobile communication technology has a strong DSP component indicative of the mutual impact.

Extrapolating the trend in today's DSP research, we may expect to see more marvels in near future. DSP will tend to be cheaper and low-power, finding a place in everybody's pocket organizer-cum-cellphone. Newer applications in automobiles, home appliances, educational materials, toys, etc., will proliferate. The DSP algorithms will be more efficient. DSP will enable more bandwidth and reliability in communication (taking us closer to Shannon limit), more mobility, better access and security, more user-friendly instruments (with machine vision and speech capabilities), better quality from audio/TV/phone/fax, better medical monitoring/analysis, and so on. There appears to be no limit to the possible applications of DSP.

The papers in the twin issues are samples of the exciting research being carried out in the fields of signal processing and communication. It covers a wide range of applications from analysis of the blinking of a human eye to modelling of network traffic. The issues begin with a conventional application area, namely, image processing. Kaulgud and Desai use Markov random field for restoration of blurred images. Nandi and Kundu address a similar model, that of stationary random field, to obtain some theoretical results for the model parameters. A possible application of their work is in texture classification. Roomi *et al.* deal with image enhancement. Selvaraj *et al.* suggest a way to control the compression ratio, or rate, in an

image compression standard. Since such standards are widely used in the internet, this work will permit users to specify exactly the size of the compressed image. Subramanian and Ramakrishnan also deal with image compression, in proposing an extended wavelet to achieve compression.

Wavelet analysis is typically realized using filter banks. Jayasimha reports an algorithm to design filter banks having certain properties. The issue now focuses on another conventional application area, speech recognition, which is redefining the notion of user-friendliness. Avadhanulu and Sreenivas propose matched filtering to achieve recognition of speech in noisy environment. Chandra Sekhar and Rao develop a neural network for speech recognition. Lakshmipathi and Anand address another application area, namely, sonar signal processing. They address the issue of localizing a sonar source beneath the ocean surface. While sonar area is primarily for defence purposes, a more humane application in bio-medical area is reported by Kumaran and Devasahayam. They use wavelet analysis on the blinking of the eye for clinical diagnosis.

Scanning further through the twin issues, we come to the area of communication. Hiremath and Jayasimha address the design of a specific QPSK demodulator which finds application in satellite communication. Manivasakan and his co-researchers model the traffic pattern through a class of networks using a generalized Poisson process. Such work finds application in network planning.

We hope these twin issues will trigger many readers to explore the area of DSP in general and also the specific research areas of the papers. We have now reached a decade of successfully conducting these biennial conferences at IISc. We take this opportunity to acknowledge Prof. V U Reddy, who initiated this series and has nurtured it through. We thank Mr K Sreenivasa Rao, Assistant Editor of the *Journal*, for his meticulous efforts in bringing out these issues.

Department of Electrical Communication
Engineering
Indian Institute of Science
Bangalore 560012

ANAMITRA MAKUR AND T V SREENIVAS
GUEST EDITORS