**ABSTRACT** *(Maximum 200 words)*

Under the sponsorship of Office of Naval Research, an international conference on multimedia processing and systems (ICMPS) was held at Indian Institute of Technology, Chennai, India in August 2000. This report presents a summary of the conference.
Progress Report

Technology developments in computers and communication are enabling us to handle large amount of data for processing, storage, retrieval, distribution and interpretation. In most cases the volume of data correspond to multimedia data. It is indeed a fact that human interpretation of this data shows that information content is significantly lower than what is inferred from the binary representation of data. The main reason for this is that significant and useful information is in the interaction among the individual components of multimedia data, and we do not yet known how to capture this interaction. Hence there is lot of activity around the world on how to process multimedia data for effective storage and retrieval, communication and interpretation.

It was about two years ago Dr. Rabinder Madan of the office of Naval Research (ONR), USA, had suggested to us that a conference to address some of the issues in multimedia signal processing be arranged at IIT Madras. The venue to IIT Madras was chosen as we wanted to have this conference in India to provide interaction among a large number of Indian and US scientists working in these areas.

We were able to persuade several distinguished scientists active in this area to present plenary and invited talks. Prof. Alan C. Bovik gave the plenary talk. Prof. Shankar K. Pal, Prof. Narendra Ahuja, Prof. V. Subrahmanian and Prof. Shree K. Nayar gave invited talks. In addition we received papers from leading researchers in this field from India as well as abroad.

About 50 papers covering the important areas of multimedia namely, multimedia databases, signal processing, human machine interface and communication were presented. The papers were organized in oral and poster sessions. In the beginning of each poster session, the authors made a brief oral presentation to highlight the ideas in their posters.

Many participants from industries attended and some of them even came forward to exhibit their products at the conference. We wanted students to take advantage of this unique opportunity of listening to the distinguished speakers in the area of the multimedia processing. With this in view, only a nominal registration fee was charged for student participants. Student participation was also made possible by generous contribution from leading industries in the county. In particular, Satyam Computers, Philips software and Intel readily came forward to provide support for this conference.

As many first time participants may not be familiar with the background operation for understanding issues in multimedia processing and systems, we organized a tutorial on August 13, 2000 on topics related to conference. The tutorial speakers are: Prof. Alan C. Bovik, Prof. Rama Chellappa, Prof. B. Yegnanarayana, Prof. V. Subrahmanian and Prof. S.V. Raghaven. All the tutorial speakers are well known in their respective fields of specialization. And we hope that their lectures benefited the participants.

There are many who have helped us in making this conference possible. Dr. Rabinder Madan of ONR is responsible for taking this initiative and supporting this conference. The Director of IIT Madras, Prof. R. Natarajan has readily accepted our proposal for holding the conference at IIT Madras and provided all the facilities through the ICSR, Public Relations and estate wings of Indian Institute of Technology Madras.
The advisory committee and program committee and reviewers were very helpful throughout to give us inputs on various matters. The entire conference was activity planned and supervised by the convenor Dr. Sukhendu Das of IIT Madras. He along with his colleagues and students looked after all the arrangements including the preparation of proceedings and tutorial notes. We hope all the participants will enjoy and benefit from this conference.

We have attached the table of contents and abstracts of Plenary and invited talks.
Contents

Plenary Talk: AM-FM Models: New Image Representation for Multimedia Applications
Prof. Alan C. Bovik, University of Texas, USA. 1

Invited Talk 1: Algebras for Multimedia Databases
Prof. V. Subrahmanian, University of Maryland, USA. 2

Invited Talk 2: Interactive Object selection in Images
Prof. Narendra Ahuja, University of Illinois, Urbana, IL, USA. 3

Invited Talk 3: Machine Intelligence, Data Mining and Soft Computing: Concepts, Features and Challenges
Prof. Sankar K. Pal, ISI, Calcutta, INDIA. 4

Invited Talk 4: Unconventional Vision Sensors
Prof. Shree K. Nayar, Columbia University, New York, USA. 5

Session 1: Multimedia Communication and Databases

1.1 Modified hybrid decision feedback equalizer for wireless communications
K. Ravi Sankar and K. Giridhar 9

1.2 FEC based packet recovery techniques for real time speech over internet
Pramod Immaneni and Devendra Jalihal 13

1.3 Design patterns in multimedia databases
S. Kuppuswami, R. Geetharamani, J. Srividya, S. Sanker and Paul Rodrigues 18

1.4 A Rough set framework for content based image classification and retrieval
Vamsi K. Vutukuru and Santanu Chaudhury 22
Session 2: (Poster)

2.1 Wavelet based lossless image compression system
V. Prithviraj, Nigel Joseph Johnson, Ramanan N and Ramasubramaniyan S

2.2 A new fractal and wavelet based image compression approach
A. S. Chatterjee, P. K. Biswas and R. N. Pal

2.3 Edge preserving DCT algorithm for higher compression ratio
M. A. Joshi, M. B. Khambete and S. L. Tatuskar

2.4 Embedded wavelet packet image coder
Mihir N. Mody, K. R. Ramakrishnan and S. H. Srinivas

2.5 Adaptive resource allocation for prioritized call admission in wireless networks
G. Sivaradje, P. Dananjayan and V. Audishehaiah

2.6 A New architecture for ATM traffic controller using VHDL
N. R. Alameli, A. Shanmugham and P. Bhanu Prakash

2.7 A DCT based approach to estimation of pitch
K. Suresh and A. G. Ramakrishnan

2.8 Swaranjali: Isolated word recognition for hindi language using VQ and HMM
Tarun Pruthi, Sameer Saksena and P. K. Das

2.9 Implementation of speaker verification systems using BPNN, DTW and GTW techniques and extracting results for tamil and english languages.
P. T. Vanathi, Maddi Vikram and P. Kirupa

2.10 Utilizing the potential of world wide web : librarians' Perspective
K. Nageswara rao and R. N. Biswas

2.11 Application of design patterns in multimedia applications
S. Kuppuswami, K. Palanivel and Paul Rodrigues
2.12 Content-based retrieval in multimedia databases by spatial 
Similarity  
Archana Kulkarni and R. C. Joshi  

2.13 Concurrency of operations on IB-Trees  
S. Kuppuswami, Paul Rodrigues, R. Geetharamani and 
V. Manikanthan  

2.14 2D surface modeling CAD/CAM based floor design  
T. Gnana Sambanthan  

Session 3: Video Processing  

3.1 Fast retinex computation for video sequences  
Jayanta Mukherjee, R. Parthasarathi and S. Goyal  

3.2 Active routers for selective packet discard of streamed 
MPEG video under the conditions of low bandwidth  
Ravindra G, N. Balakrishna and K. R. Ramakrishnan  

3.3 Video compression for Telerobotics  
E. M. Lalitha, P. J. Narayanan and C. V. Jawahar  

3.4 Mosaic based characterisation of video sequences using 
fuzzy inferencing  
Pranav Bhushan, R. S. Jadon and Santanu Chaudhury  

3.5 An Object State transition Model for Echocardiogram 
Video Data  
A.K.Majumdar, Jayanta Mukherjee, 
Biswajit Acharya and P. K. Singh  

3.6 A multiresolution approach video zooming  
Narasimha Kaulgud and U. B. Desai  

3.7 Tracking humans in video  
A. N. Rajagopalan and R. Chellappa
Session 4: Human and Machine Interface

4.1 Automatic generation of annotations of text data
   S. Raman, B. Vijayalakshmi and S. Sankaran

4.2 Generating linguistic descriptions of events from soccer video
   Deepayan Chakrabarti and Amitabha Mukerjee

4.3 A Natural language interface for generating video animation
   Amitabha Mukerjee, Mahim Mishra and Rajat Bhattacharjee

4.4 Robust Pitch detection using DCT based spectral autocorrelation
   R. Murali Shankar and A. G. Ramakrishnan

Session 5: (Poster)

5.1 A Word spotting scheme for Devanagari documents
   Lipika Dey and Deepak Jassal

5.2 Context sensitive multimodal interactions for Robot Teleoperation
   Tamhant Jain, Sambit K. Dash, Nishant Agarwal, Susmita Sen and Amitabha Mukherjee

5.3 Fuzzy clustering and layered neural network for face recognition
   Sabhapati Singh, Manoj Kumar Singh, Ashish Khare and Abhay Krishna

5.4 Iterated convolution Back-Projection reconstruction using Wavelet transform
   Ashish Khare and Abhay Krishna

5.5 Disparity estimation from a sequence of image frames - A neural network approach
   P. Ananth Raj and G. Parthasarathy

5.6 Texture classification in the JPEG Domain
   C. Borpujari and P. K. Bora
5.7 Efficient implementation of hierarchical queues for morphological image processing
Gomathi Sankar

5.8 Content-specific low-bandwidth video reconstruction for distance training
Sudipta N. Sinha, Soumyadeep Paul and Amitabha Mukerjee

5.9 An adaptive feature matching based approach for visual target tracking
B. Yogiraj Mohan and P. K. Biswas

5.10 Hand written Tamil text recognition using neural network
P. Thangavel

5.11 A new approach to the connected digit recognition problem using minimum phase group delay functions
V. Kamakshi Prasad, Hema A. Murthy and C. Chandra Sekhar

5.12 Online text-independent speaker verification system at IITM
S. P. Kishore and B. Yegnanarayana

5.13 One-Dimensional processing of images
P. Kiran Kumar, Sukhendu Das and B. Yegnanarayana

5.14 Precision skew detection through principal axis
Kaushik Mahata and A. G. Ramakrishnan

5.15 A human visual system-based objective video distortion measurement system
A. C. Bovik and Zhou Wang

Session 6: Image Processing

6.1 An adaptive DCT domain visible Watermarking technique for protection of publicly available images
Saraju P. Mohanty, K. R. Ramakrishnan, and Mohan Kankanhalli
6.2 Efficient image retrieval technique:  
An indexing approach  
*R. C. Joshi* and *Shashikala Tapaswi*  

6.3 Fuzzy based multilevel median filter  
*Kh. Manglem Singh* and *P. K. Bora*  

6.4 Spatially adaptive image estimation in redundant  
Wavelet transform domain  
*Mala John* and *P. V. Ramakrishna*  

6.5 Content-based lossless-lossy coding of face  
images using S-Transform and H.263+  
*Jayashree Karlekar* and *U. B. Desai*  

6.6 Line scratch removal from digitized motion picture  
frames  
*James Mammen, Subhasis Chaudhuri* and  
*Shankar Chatterjee*  

6.7 An automatic segmentation algorithm for object  
region and boundary extraction  
*H. Tian, T. Srikanthan* and *K. Vijayan Asari*
PLENARY TALK

AM–FM Models: New Image Representation for Multimedia Applications

Prof. Alan C. Bovik,
Univ. of Texas, USA

This talk describes AM-FM models, which are applicable for several multimodal signals like speech, images video and sound. Emphasis will be on studies of applying AM-FM signals to various image applications such as, shape from FM, stereo from FM and fingerprint analysis. Other successful applications using AM-FM models are speech signal analysis, image compression, texture synthesis and biomedical image analysis.
Invited talk 1

Algebras for Multimedia Presentations

Prof. V. Subrahmanian, University of Maryland, USA.

Over the last few years, there has been a tremendous increase in the number of interactive multimedia presentations prepared by different individuals and organizations. These run the gamut from PowerPoint presentations to sophisticated presentations built using tools like Director and/or ToolBook. Yet, to date, the need to query archives of such multimedia presentations has barely been recognized. This talk describes an algebra called multimedia presentation algebra (MPA) for querying databases consisting of multimedia presentations created by individuals as well as for constructing new presentations from existing ones. In contrast to the relational algebra, MPA must operate on trees whose branches reflect different possible playouts of a family of presentations. We define selection, projection, join, merge, union, intersection and difference operations for such databases, and develop sound and complete algorithms for implementing these operations. We prove a host of equivalence results for queries in this algebra which may be used to build query optimizers for interactive presentation databases.
Invited talk 2

Interactive Object selection in Images

Prof. Narendra Ahuja,
University of Illinois, Urbana, IL, USA.

This talk is concerned with user-friendly selection of image regions that correspond to objects of interest to a user. There are two stages to such selection. First, a multiscale image segmentation is performed that identifies all salient regions present in an image regardless of their geometry and contrast. These regions are viewed as primitives from which any object of interest in the image could be composed. Second, a user friendly interface is developed that involves specification of the desired object by the user drawing a rough sketch around the object. This evokes an initial object selection as the union of those image segments best matched with the user sketch. If necessary, the user then improve the precision of the selection by drawing a sequence of refinement sketches that iteratively add or subtract parts from the initial selection. The interface also allows simultaneous selection of multiple objects that are not connected. The result is that the user can delineate objects having intricate boundaries without requiring much skill or dexterity with pointing devices.
Invited talk 3

Machine Intelligence, Data Mining and Soft Computing: Concepts, Features and Challenges

Prof. Sankar K. Pal,
ISI, Calcutta, INDIA

A core concept of grouping various advanced technologies with the task of pattern recognition and machine learning is, first of all, explained. The need for data mining, embedded in knowledge discovery process, in terms of pattern recognition components is then illustrated. This includes the task of rule generation, and rule evaluation criteria. The relevance and characteristics of various soft computing tools, e.g., fuzzy logic, neural networks, genetic algorithm, rough sets, both individually and in combination, are stated in this regard. A way of integrating them for efficient modeling is described. This is followed by a discussion on various challenging research problems. The lecture concluded with explaining the role of case based reasoning in the said framework.
Invited talk 4

Unconventional Vision Sensors

Prof. Shree K. Nayar,
Columbia University, USA.

What can be perceived by a human or computed by a machine from an image is fundamentally restricted by the captured data. Current imaging systems are limited in spatial resolution, field of view, and dynamic range. In this talk, we present new vision sensors that provide unconventional forms of visual information. The first part of the talk focuses on the use of catadioptrics (lenses and mirrors) for capturing unusually large fields of view. We describe several methods for obtaining single viewpoint and multi-viewpoint images. The second part of the talk addresses the problem of acquiring high dynamic range images using a low dynamic range detector. We present two approaches for extracting the desired extra bits at each pixel; the first one uses multiple images while the second uses just a single image. Several interactive demonstrations of our results will be shown. These results have implications for digital imaging, immersive imaging, image based rendering, 3D scene modeling, and advanced interfaces.