

Imaging at the MIT Media Laboratory

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Abstract

The MIT Media Laboratory is investigating novel applications of imaging and image processing ranging from new recognition, compression, and indexing algorithms, to unique display devices. In this talk I give an overview of our research, and point toward several trends that we think will drive the field in coming years.

Introduction –The Media Laboratory

The Media Laboratory at the Massachusetts Institute of Technology is home to a variety of investigations into technologies that enable expression and communication. Inasmuch as visual communication forms such a large part of human life, it might well be expected that a significant amount of effort addresses relevant technologies. In the limited time allotted for my talk, I shall have time to point out only a few very recent examples, and therefore urge those with more interest to look to the laboratory's main Web site at <http://www.media.mit.edu>.

Processing

The Object-Based Media Group, headed by the author, seeks to represent video in terms of more physically and semantically meaningful elements than the traditional pixels and frames. As part of this work, the group has pioneered alternative architectures for video coders which self-organize and incorporate machine vision techniques.¹ Earlier work in the use of multidimensional classifiers for tracking objects in video has proven effective in the authoring of hyperlinked television programming in which objects are made clickable.²

Rosalind Picard's Affective Computing Group develops technologies such that devices can estimate the affective and physical states of their users. Applications range from user interface adaptation to detecting stress in vehicle drivers. Most recently the group has begun to analyze video of faces as part of this work.³

While image library work has been ongoing in many laboratories for many years, Henry Lieberman, *et al.* have developed a system called ARIA that through an agent integrates annotation and retrieval into other activities.⁴ The initial version of ARIA continuously monitors typing, and performs searches for relevant images in the user's library; these can be inserted with a single click. Conversely,

descriptions of images typed into documents are integrated into the library as annotation input.

Walter Bender's group has extended techniques for information hiding in electronic images to include novel multiple-bit techniques and to use midlevel-vision features of images such as object shape in order that changes in low-level pixel statistics do not affect the hidden data.⁵

Display

The Spatial Imaging Group, headed by Stephen Benton, has for many years been working on various forms of three-dimensional displays; electronic examples include autostereoscopic video displays and holographic video displays, while hardcopy developments include full-parallax synthetic holograms and a 'laser printer' for rapid image recording.⁶

Joseph Jacobson's work looks into extending the idea of hardcopy to include electronic elements. Initial work on electronically-addressable displays on paper (sometimes called 'electronic ink') has led to research into desktop printing technologies that can deposit active circuitry such as logic, memory, sensors, and actuators on paper and paper-like substrates.⁷

References

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Biography

V. Michael Bove, Jr. holds an S.B.E.E., an S.M. in Visual Studies, and a Ph.D. in Media Technology, all from the Massachusetts Institute of Technology, where he is currently head of the Object-Based Media Group at the Media Laboratory. He is the author or co-author of over 50 journal or conference papers on digital television systems, video processing hardware/software design, multimedia, scene modeling, and optics. He holds patents on inventions

relating to video recording, hardcopy, and medical imaging, and has been a member of several professional and government committees. Boston Magazine has named him one of the "People Shaping Boston's High-Tech Future." He is on the Board of Editors of the Journal of the Society of Motion Picture and Television Engineers, and served as general chair of the 1996 ACM multimedia conference. He is a founder of and technical advisor to WatchPoint Media, Inc.