CERIAS Tech Report 2001-108
Video and Image Databases: Who Cares?
by E Delp
Center for Education and Research
Information Assurance and Security
Purdue University, West Lafayette, IN 47907-2086

Video and Image Databases: Who Cares?

Edward J. Delp*
Video and Image Processing Laboratory (*VIPER*)
School of Electrical and Computer Engineering
Purdue University
West Lafayette, Indiana
USA

Keywords: Image and Video Databases, MPEG-7, applications models.

ABSTRACT

In this paper I will *not* discuss the research frontiers of image and video databases but who will be the users of these systems. Questions that have not been adequately addressed by the research community is who are the users and what do they really want these systems to do? The purpose of this paper is to be controversial and to engage a debate within the research community as to where the real applications of our work lie. It should be noted that the author does not agree with every point made in this paper.

1. INTRODUCTION

There has been a tremendous interest in recent years in the problem of how does one manage large amounts of image and video data. In particular, how does one acquire, store, query and display information in an image or video database. Applications often cited include digital libraries, medical images, geographic information systems (GIS), and consumer applications.

The purpose of this paper is to be controversial and to engage a debate within the research community. I feel that the image and video database research community has not examined the real issues relative to what applications we should be addressing. In essence, who is really going to use this stuff!?

In this paper, I will present my views on the issues of whether some of the work in image and video databases has been directed at solutions in search of a problem. The three application models often evoked are the consumer model, the video-on-demand model, and the digital library model. I feel that the only viable model for image and video databases is the digital library. Based on studies that have been done on how consumers interact with images, I feel that consumers really do not want or need image and video database management systems in their homes. These systems will also only have limited applications in the video-on-demand system used for entertainment such as motion pictures. I further believe that all real applications (where someone can make money) will be isomorphic in the digital library model.

I also feel the MPEG-7 activities happily do not suffer from similar mis-directed applications.

2. APPLICATION MODELS

In this section I will discuss typical application models found in much of the literature on image and video databases. These models include the consumer model, the video-on-demand model and the digital library model. I will argue that many of the applications really do not exist.

* Address all correspondence to E.J. Delp, ace@ecn.purdue.edu, http://www.ece.purdue.edu/~ace, +1 765 494 1740.

2.1 The Consumer Model

The logic of this model is the following. With the advent of relatively cheap digital still cameras more consumers will acquire digital images and hence will want to be able to mange these images in a database in their homes or perhaps on the Web. As more consumers have Internet access and personal web pages there will be a market for consumer-based image management systems. A user may want to be able to search their image database to see pictures of their children as they have grown or be able to find images of special events in their lives, e.g. weddings. It is envisioned that consumers will be also want to do this with digital video obtained with the new digital camcorders that are now arriving on the market. In the next ten years more than half the images/video that touches a consumer's life will be digital.

I feel that above could not be further from the truth.

Each year more than 60 billion photographs are taken by consumers. The average photograph is looked at *less than once*. Most consumers put them in boxes in their closets and never look at them again. The same applies to home videos. How many people do you know currently organize their photographs in nice neat photo-albums? I believe that most consumers will not change this pattern when they have lots of pixels running around their homes. The payoff is just not there. The argument that as people become more techno-savy they will want to be able to have tools to manage their pixels is absurd. The industry will not be able to sell enough of these systems to the techno-geeks among us to make any money.

2.2 The Video-On-Demand Model

This model says that consumers will want to use a video database to search for entertainment videos. The scenario is the following: a user decides to watch a movie or television program and queries the database system for the video. This database system can show previews/synopsis of the video and provide information about clips or produce a storyboard of the video. The database system will then be able to deliver the video to the consumer's home. The system will have many advanced features such as the ability to tailor the type of preview it shows the consumer based on some preference information supplied to the database.

I believe this scenario is a dream and will never happen.

The average consumer currently decides which movie to see based on things such as the topic, actors, directors, previews, advertising and film reviews. This type of information, excluding the preview, can simply be supplied in a text-based synopsis of the movie. Most consumers will not judge whether to see a movie or not based on querying the database with: "I want see an Arnold Schwartznegger movie where 20 people are killed in the first 11 minutes and 7 seconds. Please show me all the clips of the deaths." As far as the preview is concerned, the one prepared by the production company is good enough for me.

What I believe is needed is an advanced program guide that contains a simple text-based description of the video. This could be Web delivered or embedded in the digital video stream delivered to the home such as the program guide used in RCA's DSS. The system could have a method by which one could see a preview of the video either through a low bit-rate stream delivered by the Internet or as a separate program channel.

When I watch a movie I want to be entertained and not have to think or program the device that provides the video.

2.3 The Digital Library Model

In this model, image and videos exists in a database so that they can provide educational value to a user and/or capitalistic advantage to a company. This model differs from the above models in that professionals manage the database and the way it is used. The model is identical to a university or corporate research library. The database will probably be accessed via the Internet. The system may provide entertainment value to a user but is not solely organized for this purpose.

These systems will be owned by large organizations that may charge service fees for their use. A consumer may use these systems but will use it in what I consider to be a "research mode." This research mode scenario does not have to be driven by lofty scholarly needs on the part of the user.

For example, the NBA may organize a video database that consists of all NBA games from the last several years. This system could be used by sportscasters to extract clips to be shown during a future game, by the players to help them diagnosis problems they may be having with their play, by the NBA to make and sell "highlight videos" of the playoff games. A consumer may also want to use this system for entertainment. The user may want to see "all the clips of Michael Jordan doing a reverse slam-dunk where he pushes off on his right foot." I would argue that a user here is acting more in a "scholarly" mode when using this type of system than in an entertainment mode.

This model will, of course, work with databases designed for more scholarly pursuits such as a database of university lectures, a database of Civil War photographs, a database of silent motion pictures, and others. This model also extends to other scenarios such as Web shopping, surveillance systems, dating services, tourist information and many other systems that at first blush may not seem to be a "library." Hence, most people will be users of these systems and not managers of image and video databases.

The point I am trying to make is that the digital library model has the most payoff for both the user and the research community.

3. IS THE RESEARCH COMMUNITY PART OF THE PROBLEM?

One observation that I have made at many of the technical conferences I have attended in the area of image and video databases is that the researchers are willing to predict the application of their work, particularly in the consumer area, but have no experience at using the technology themselves. I have ask several researchers how many of them have digital cameras or camcorders and which of them are assembling databases of family images and video. I often get very strange answers that they are too busy to do such things. If fact many of them brag that they do not watch television because they are too busy or too important. It is interesting that while they do not have the time to manage a database of digital images and video they expect that the average consumer will have the time, money, and expertise to do this. The "marketing people" are the ones who us tell which applications are important!

I find these attitudes to be odd at best and arrogant at worst.

4. MPEG-7

There has been a great deal of noise made about the new standardization efforts in image and video databases, namely MPEG-7. MPEG-7 will provide for a " Multimedia Content Description Interface" and will "specify a standard set of descriptors that can be used to describe various types of multimedia information." It is refreshing when one examines the applications described in the *MPEG-7 Context and Objectives* document that all of them (except one) fit into my digital library model. Perhaps there is hope that this time MPEG will produce something useful.

5. CONCLUSIONS

In this paper I have presented some comments on the where the applications of image and video databases lie. While I feel that some of the applications that have been discussed in the literature are ludicrous and ill-conceived, there are many important applications in the area of media-based digital libraries that will enhance the human experience. I feel that this area of research is exciting and challenging. I hope the community will continue to attract some of the best minds in the world.

The author invites comments and criticisms of topics covered in this paper. If I got you angry while reading this paper, then I have succeeded at my goals.

This paper is a work in progress. I will continue to add my comments and ideas as time goes by. The latest version of this paper will be available via anonymous ftp to skynet.ecn.purdue.edu in the directory /pub/dist/delp/who-cares.