The Open Video Project: A Research-Oriented Digital Video Repository

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ABSTRACT

A future with widespread access to large digital libraries of video is nearing reality. Anticipating this future, a great deal of research is focused on methods of browsing and retrieving digital video, developing algorithms for creating surrogates for video content, and creating interfaces that display result sets from multimedia queries. Research in these areas requires that each investigator acquire and digitize video for their studies since the multimedia information retrieval community does not yet have a standard collection of video to be used for research purposes. The primary goal of the Open Video Project is to create and maintain a shared digital video repository and test collection to meet these research needs.

KEYWORDS: Digital video, test collection, multimedia retrieval, open source, metadata

PROJECT OVERVIEW

The Open Video Project aims to collect and make available video content for the information retrieval, digital library, and digital video research communities [5]. The idea is to collect video that is in the public domain, or provided by owners who grant permission to use their intellectual property for research purposes, and make that video available in a variety of standard formats, including streaming, along with a set of accompanying metadata. Researchers can then use the video to study a wide range of problems, such as tests of algorithms for segmentation, summarization and creation of surrogates that describe video content; or interfaces that display result sets from queries. Because researchers attempting to solve similar problems will have access to the same video content, the repository is also intended to be used as a test collection that will enable systems to be compared, similar to the way the TREC conferences are used for text retrieval.

Digital Libraries, San Antonio, TX.

Although large collections of digital video do exist, such as the Informedia Project at Carnegie Mellon University [1], the video in these collections is not publicly available. The National Institute of Standards and Technology (NIST) has created a public domain digital video test collection [4], but it is of limited size and scope. The Internet Archive intends to make public 1000 hours of video [2], but none is yet available. We are actively collaborating with each of these groups.

CURRENT PROJECT STATUS

The Open Video Project began in 1998 with the development of a basic framework and the digitization of the initial content. The project Web site (http://openvideo.dsi.internet2.edu) went online in the Fall of 1999, providing public access to the existing video content and metadata.

Initial Set Of Video Content

The project repository currently contains more than 40 hours of video from 16 different video programs obtained from U.S. government agencies such as the National Archives and NASA, primarily in MPEG-1 format. To optimize the usefulness of the repository to a wide variety of researchers, the content of the repository will ultimately reflect a much broader range of video attributes and genres, including news, entertainment, and even home videos. Figure 1 summarizes some characteristics of the video currently in the repository; we will continue to seek segments with a variety of characteristics in terms of compression schemes, amount of motion, language, sound and color.

Number of video titles:	20
Number of video segments:	225
Number of hours:	43
Range of segments, in duration:	10 sec. to 1 hour

Figure 1. Summary of video currently in repository

In addition to a variety of video content, the repository will be enriched if video surrogates are provided or developed for a portion of the content. The existence of video surrogates of various forms (keyframes, storyboards, composites) can help researchers in several areas, including video browsing and multimedia retrieval interfaces, and we hope contributions to the repository include video surrogates as well.

Content Metadata

The quality and comprehensiveness of the metadata describing the video and surrogates in the repository is important for several reasons. First, the metadata can be used as search criteria, enabling researchers to find video segments and surrogates most appropriate for their research purpose.

Comprehensive metadata will also provide researchers with as full a description of the video they are working with as possible. Providing this data as part of the repository means it only has to be determined and recorded once, and thus reduces the burden on researchers to extract relevant metadata detail from the video content themselves.

Finally, we intend to use the Open Video repository as a testbed for our continuing research on user interaction and interfaces. Quality metadata will be required to implement our techniques for providing flexible, alternative views of data collections. Other researchers may utilize the metadata for similar purposes.

Community Contributions

Establishing the first phase of the repository is important, however with collaboration from a community of researchers much more can be achieved. To promote cooperation between researchers, a repository was discussed at the SIGIR workshop on video retrieval in Berkeley in August of 1999 and a symposium was hosted in October of 1999 in Chapel Hill to discuss video retrieval evaluation and a test repository. To encourage active community involvement, we have posted the metadata schema to the Open Video Project Web site for feedback and suggestions, and intend to add a form contributors can use to add video and metadata to the repository, enabling the project to evolve more quickly.

We will also encourage the community to supplement the repository by undertaking two essential tasks. First, help us develop new metrics that will be useful in evaluating video-related systems. Second, begin building query collections that consist of user-supplied queries and relevance judgments that can be used to study aspects of searching video.

Retrieving Video From The Repository

The Web site provides an interface from which a researcher can search the contents of the repository by several attributes. The results of the search are presented in a summary form, with access to both complete details about the segment (all metadata) and the segment itself one mouse click away. The query interface is currently quite simple, but we believe that the repository will grow more quickly if researchers are able to actually start using the repository. Both the search and results display of the interface will be refined as suggestions are gathered from the research community.

RELATED GOALS

While the intent of the Open Video Project is to provide a much-needed resource to the information retrieval, digital library, and digital video research communities, the nature of the repository will enable it to facilitate several other interesting research areas.

Distributed storage and replication. Digitized video makes for sizeable files; a digital video collection of the size anticipated by this project necessitates large capacity storage. The Open Video Project files are currently stored on high-capacity servers provided by the Internet2 Distributed Storage Infrastructure project (I2-DSI). The I2-DSI project is experimenting with architectures for robust, scaleable replication services to enable performance-enhanced delivery of data shared among research and academic partners connected by the Internet2 backbone network. The Open Video Project serves as a prototype "community application" for exploring issues in the I2-DSI project.

Alternative user interfaces. In addition to the Open Video Project, the authors are developing a user interface framework called Agileviews [3], which attempts to improve information seeking through the use of alternative views. The video repository is expected to provide a rich source of content with which we can experiment with providing the overviews, previews, peripheral, and shared views that we believe will help a diverse range of users effectively access video content.

Open source community. Finally, the "open" and distributed nature of the repository will provide an on-going testbed for researchers interested in studying the development of an open source community effort, in this case one centered on digital content rather than software.

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REFERENCES

1. Informedia @ CMU: Introduction [Web Page]. Available at: http://www.informedia.cs.cmu.edu/.

2. Internet Archive: Projects [Web Page]. Available at: http://www.archive.org/content/projects/moveimage/moveimage.html.

3. Marchionini, G., Geisler, G. and Brunk, B. (2000). Agileviews: A Human-Centered Framework for Interfaces to Information. School of Information and Library Science, University of North Carolina at Chapel Hill Technical Report, TR-2000-01.

4. Schmidt, C. & Over, P. (1999). Digital Video Test Collection. In proceedings of the Twenty-Second Annual International ACM SIGIR Conference, Berkeley, California, USA.

5. Slaughter, L., Marchionini, G. and Geisler, G. (in press). Open Video: A Framework for a Test Collection. Journal of Network and Computer Applications, Special Issue On Network-Based Storage Services. San Diego: Academic Press.