

The V³ Video Server – Managing Analog and Digital Video Clips

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1. Description

The *V³ Video Server* is a demonstration showing a multimedia application developed on top of the *VODAK* database management system. *VODAK* is a prototype of an object-oriented and distributed database management system (DBMS) developed at GMD-IPSI. The *V³ Video Server* allows a user to interactively store, retrieve, manipulate, and present analog and short digital video clips. A video clip consists of a sequence of pictures and corresponding sound. Several attributes like author, title, and a set of keywords are annotated. The highlights of the demonstration are as follows. (1) It is shown that an object-oriented database management systems is very useful for the development of multimedia applications. (2) The video server gives valuable hints for the development of an object-oriented database management system in direction to a *multimedia database management system*.

The picture and sound data of a video clip are stored in a database in digitized form or on a laser disc as analog streams respectively. The *VODAK* DBMS hides the distinction of digital and analog video clips from the application and allows a homogeneous access to the clips. Conventional properties of database systems as queries, multi-user access, and recovery are supported (see the demonstration description of *VODAK* Open Nested Transactions in this volume). Furthermore, *VODAK* allows to send object-oriented methods as messages to remote sites. Video clips are stored on a database server and are presented at connected clients under control of *VODAK*. Digital and analog data are transported via a digital and an analog network respectively (Fig 1).

The video clips are modelled in an object-oriented database schema with *VML*, the *VODAK* Model Language. Clips can be accessed by methods to initialize, present, and control them. For example, the presentation of a clip can be started by a method “play” and interrupted by a method “stop” sent to the actually presented clip. Due to the storage of analog video clips on laser discs and their write-once read-many characteristic, analog and digital video clips are modelled differently. Thus, a video clip references a corresponding playing device: analog and digital player respectively. An analog player operates between the start and end frame of a video clip. The

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implementation of presentation methods ensures that a clip is presented only between these limits. Note, the picture and sound data of an analog clip cannot be edited.

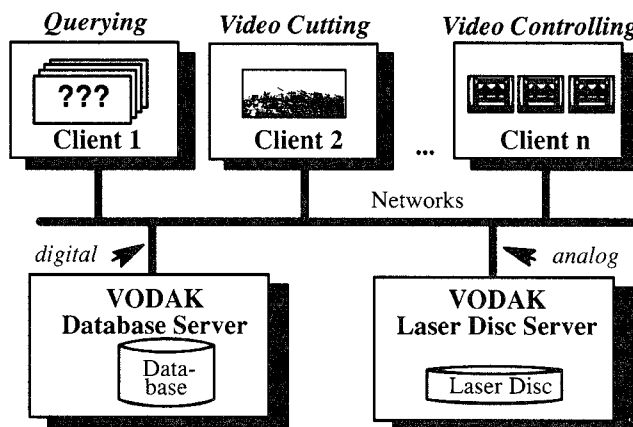


Fig. 1: Example Architecture of the V³ Video Server.

The video data of a digital clip is modelled as a sequence of pictures. A sequence can be manipulated by inserting, cutting, and moving parts of it. Additionally, single pictures could be manipulated by external image systems. Due to restrictions in the implementation of *VODAK* which currently does not support multimedia applications specifically only short video clips (a few seconds) can be presented continuously at this point of time.

The user interface of a client allows the user to pose queries against attributes of video clips like title, authors, and keywords (Fig. 2). These queries are composed by using “and” and “or” operators. Besides that, the actually existing attribute values of all video clips can be queried at once. For example, all existing keywords can be shown and used for further queries. The result of a query is presented to the user in a stack oriented way. An element of the stack is a window containing the description of a matched clip. Besides the textual attributes a characteristic picture gives the user an impression of the corresponding video clip.

The user can decide to play one video clip out of the result stack at a time. Operations like play backward/forward in slow/normal/fast velocity are available. Additionally, a slider provides direct access to every position in the video. Simple editing functionality is supported by the copy/paste metaphor. A part of a video can be copied or cut and pasted into another video.

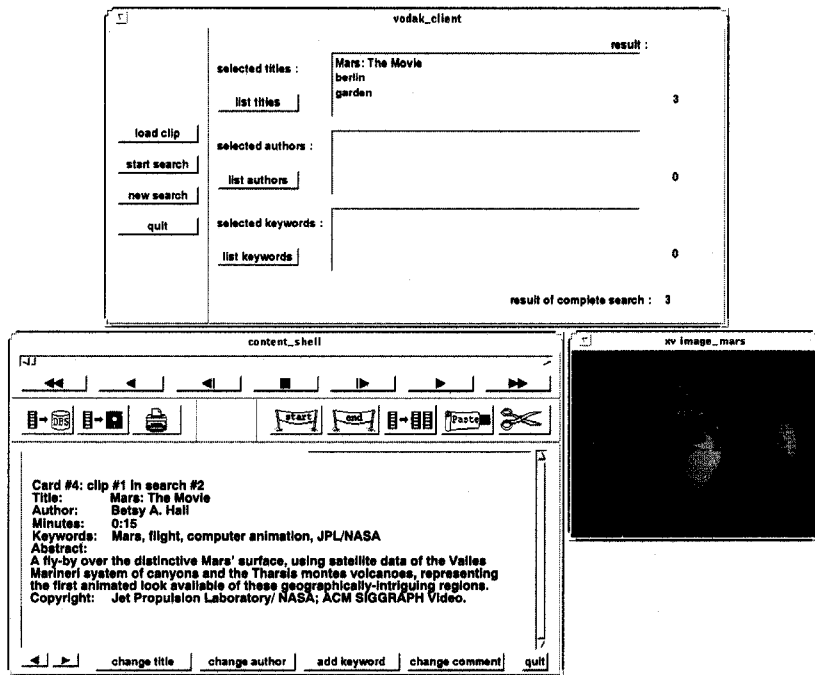


Fig. 2:
User Interface Screenshot.

2. Background

The V³ video server is an enhanced development of the first version of 1990. This version was based on the relational database management system Sybase. The V² and V³ prototypes of 1991 and 1992 were developed on the basis of the object-oriented database management system VODAK. This evolutionary development allows us to take advantage of object-oriented techniques. Especially, the access to laser video discs was encapsulated by methods. Hence, the applications can access video clips homogeneously despite of their analog or digital form.

In the future, the VODAK DBMS will be enhanced in three directions. First, new built-in functionality will be developed for multimedia datatypes. Therefore, existing components of VODAK must be changed and new ones must be added to support time dependencies, high data volumes, and user interaction. Second, an object-oriented query language combining descriptive access with object-oriented method calls is under development. Third, transaction management will support the integration of distributed heterogeneous and autonomous database systems.

3. Hard- and Software Platforms

The demonstration of the V³ Video Server is running on two SUN Sparcstations 2 or 10 with SunOS 4.1.x (20MB shared memory, 20 semaphores, 100 MB swap). The communication between distributed VODAK processes is based on UNIX sockets and the TCP/IP protocol. Analog video and audio streams are transported via an analog network (in the demonstration simulated by a direct connection). The presentation of compressed digitized video and analog

video is done via a PARALLAX XV-24SVC-VIO video board with a JPEG compression chip. The equipment for laser video discs consists of a laser video disc processor SONY LVS 6000P and a recorder SONY LVR 6000. The user interface is built using Motif.

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4. References

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