

디지털 미디어 검색 시스템 및 응용

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정보검색연구팀

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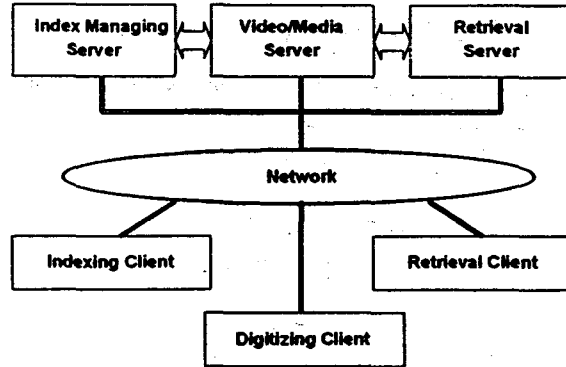
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목차

- 기능
- 설계 시 고려 사항
- 연구 개발 동향
- 웹에서의 효율적인 멀티미디어 정보검색을 위한 과제

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기능



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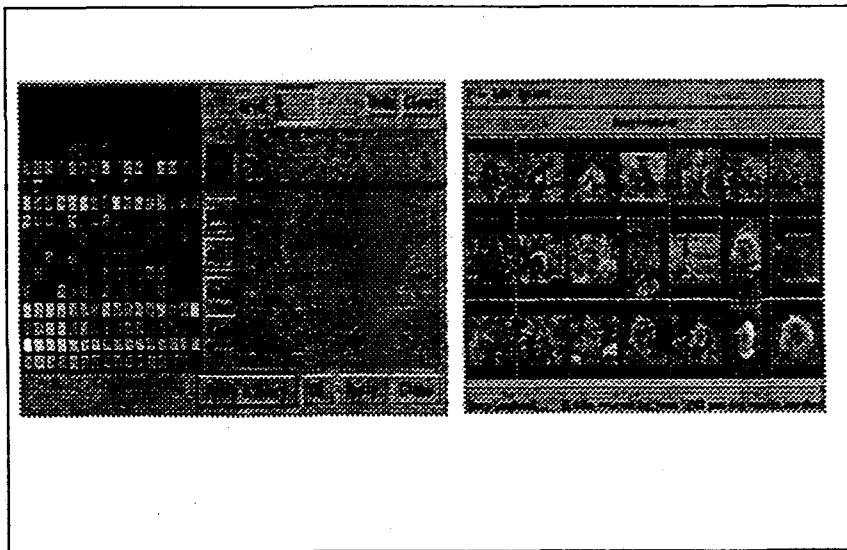
End User 입장에서 본 기존 정보 검색과의 차이점

□ Multimodality

- 텍스트 기반 질의(음성에 의한 질의도 포함)
- 이미지, 스케치, 음향에 의한 질의(Query by sketch, Query by Humming, 영화의 배경 음악과 관련된 장면 질의)

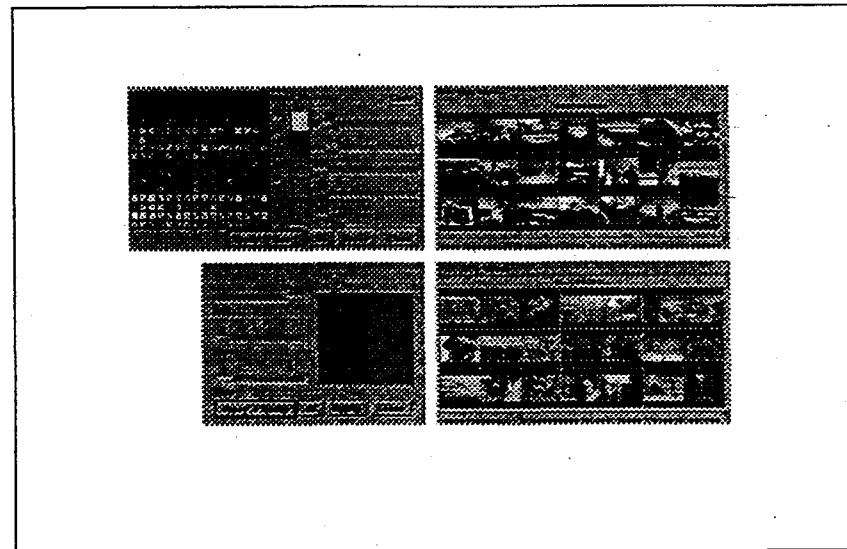
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Feature Based Query(1)



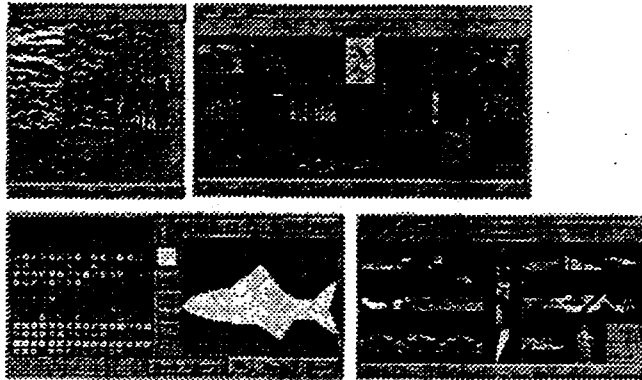
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Feature Based Query(2)



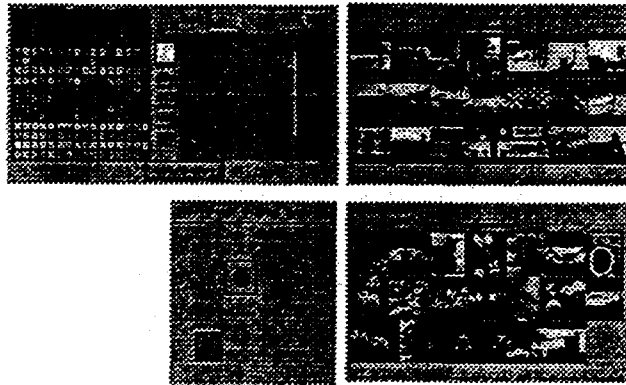
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Feature Based Query(3)



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Feature Based Query(4)



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설계시 고려 사항(1)

- 검색 정보의 종류
- Data Input
 - Automation
 - Categorization
- Indexing
- Data Modelling
 - Adaptability
 - Abstraction
- Storage

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설계시 고려 사항(2)

- Query Interface
 - Cross Modality
- 출력
- Video Server
- Network
- Compressed Domain Processing
- MMDBMS
- Multimedia Description Standard: MPEG-7

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디지털 미디어 정보 검색 엔진

□ 실험 시제품

- MMVIS, VIMSYS, Chabot, VideoStar, Photobook, WebSEEK, VisualSEEK, VideoQ, Informedia

□ 상용 제품

- QBIC, IBM Digital Library, Ultimedia, Virage, MediaKey, Exculibur, Magnifi, IMAGINE

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실험 시제품

- MMVIS: U of Michigan
- VideoStar: 노르웨이 공대
- Chabot: U. of Berkeley
- Photobook: MIT
- WebSEEK, VisualSEEK, VideoQ: 미국 콜롬비아대
- VIMSYS: Virage의 전신
- Informedia: CMU, MediaKey의 전신

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상용 제품

- IBM
 - QBIC
 - Ultimedia
 - IBM Digital Library
- Virage
- MediaKey
- Exculibur
- Magnifi
- IMAGINE

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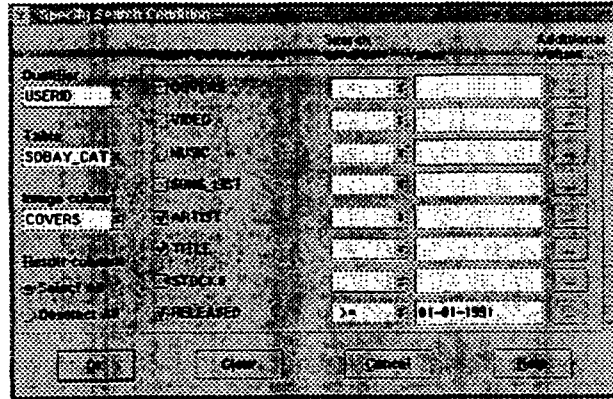
QBIC(Query By Image Content)

- IBM Almaden 연구소에서 개발
- 내용에 기반한 이미지 검색
- 제한된 범위의 비디오 검색(동작 정보 검색)
- Video의 Storyboarding 기능
- Query by picture/Query by sketching, drawing, painting
- 색상, 모양, 질감 등에 기반한 질의 지원
- 제한적인 주석 기반 검색
- 특징 데이터의 추출은 완전 자동, 반자동, 수동의 세가지 방법 제공
- 유사도 기반 검색
- Key Component in IBM products Ultimedia Manager and Ultimedia Visualizer Query

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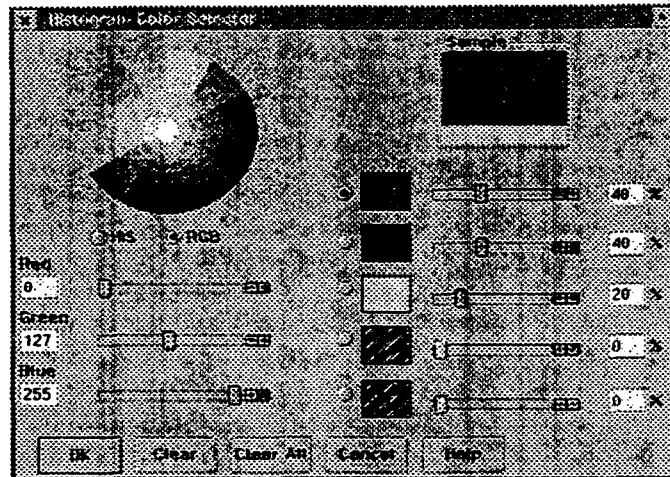
Ultimedia Manager(1)

- Find images by color, shape, texture and related business data



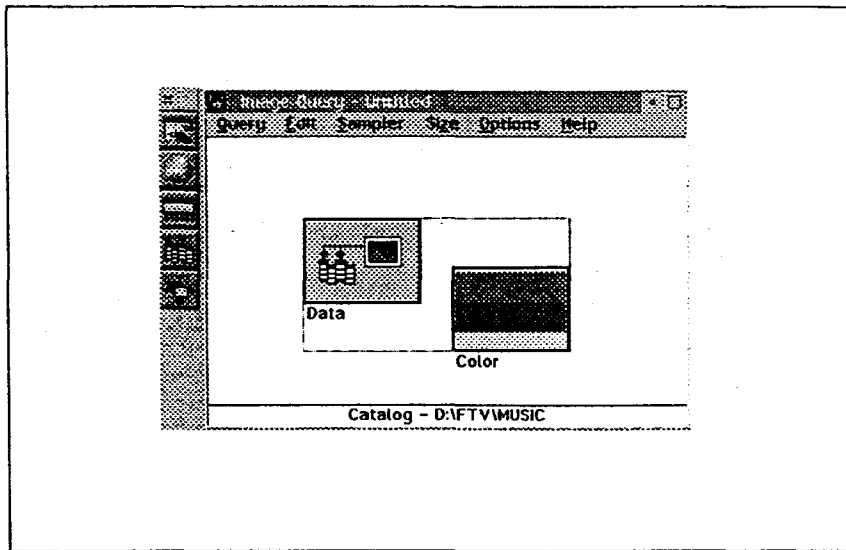
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Ultimedia Manager(2)



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Ultimedia Manager(3)



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Ultimedia Manager(4)

The screenshot shows a window titled 'Query Results' with a menu bar containing 'View', 'New', and 'Help'. The main area displays a table with the following data:

ICON	AREA	ARTIST	TITLE	RELEASED
		J_Fusion	Entroplan	02/27/1994
		Nitecry	Run For Cover	08/15/1992
		Fuzzy Blues	Aurora	04/14/1994

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IBM Digital Library Version 2(1)

- Advanced Search**
 - Search and Retrieve documents in multiple languages
 - Fuzzy and phonetic searches
 - Search with Boolean logic by single word, phrase or multiple terms
 - Use of natural language when specifying a query
 - Clustering of results list
- Rights Management**
- Access Via the Internet**

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IBM Digital Library Version 2(2)

- Scalability**
 - Ability to grow from a single workstation to a networked enterprise-wide solution
 - Collections can be maintained on a single PC hard drive, then grow to being managed by storage servers containing terabytes or even petabytes of data.
 - Use of networked IBM Tape Library and Optical Library units under System Managed Storage control
 - Use of RS/6000 configurations with multiple Object Server nodes, fast switching and high availability
 - Multiple distributed Object Storage Servers, allowing:
 - ↪ the selection of specialized server types that are best suited to the storage and distribution of a particular data type
 - ↪ the location of servers to be placed close to users to reduce network demands and improve user response time
 - ↪ storage of multiple parts of a single digital asset on different Object Servers

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IBM Digital Library Version 2(3)

- Openness**
 - Users can install servers on Windows NT platforms and run clients in the Macintosh environment.
 - They support the use of a variety of APIs, including Java, C++, C and Active X.
- The IBM Digital Library Media Manager works with the IBM VideoCharger Server for AIX product to deliver streaming digital audio and MPEG video objects over the Internet.**
- IBM Digital Library Version 2 contains selected components of IBM DB2 Universal Database Version 5**

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기타 IBM 제품

- IBM Media Management System**
 - an integrated Web-based solution for the automated storage and retrieval of video stock footage, audio, still images and film scripts.
- IBM Digital Library Collection Treasury**
 - enables cultural institutions to provide online access to valuable original holdings while managing appropriate restrictions on audience access and the reuse of images.

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Virage

- Video Cataloger**
- Media Manager & Browser**
- Image Read/Write Toolkit**

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Video Cataloger(1)

- intelligently extracts metadata-keyframes, time codes, textual information and an audio profile-from the video in real-time.**
- Video Sources**
 - Analog--NTSC, PAL
 - Digital--MPEG
- VTR Controls**
 - V-LAN control of compatible video sources
- Keyframing**
 - Intelligent sampling (content-based)
 - Even sampling (time-based)

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Video Cataloger(2)

- Metadata Extraction**
 - Automatic keyframe detection with adjustable threshold
 - Closed caption text
 - Time stamping: SMPTE time code or time of day (plus offset)
- Streaming Video Proxy (optional)**
 - Integrated real-time proxy creation
 - Cross-indexed with metadata
- Annotating**
 - Marking and annotation of logical video clips
 - Point and click to select in and out points
 - User-defined video label and annotation fields
 - Time-based text and document association

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Media Manager & Browser(1)

- Browsing**
 - Low-bandwidth, thumbnail previews of image and video assets
 - Video asset storyboards and summaries
 - List or tile mode viewing options
 - User-configurable search and results screens
 - Cross-enterprise, cross-platform access via a Web server

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Media Manager & Browser(2)

Searching

- Advanced text search
- SMPTE time code mapping
- Media type preference selection
- Virage Visual Information Retrieval
- Visual and audio content queries
- Owner and usage information

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Media Manager & Browser(3)

Automatic Cataloging

- Automatic extraction of media and file attributes for all media types
- Automatic analysis and indexing of visual content (using Virage VIR technology) for still images and video keyframes
- Automatic thumbnail creation
- Virage Video Cataloger integration for intelligent keyframes, closed caption text, audio track and SMPTE time code analysis
- Batch insert capabilities

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Media Manager & Browser(4)

□ Annotating

- User-defined annotation fields
- Story-level annotation for video content
- Dynamic updates of annotation schema

□ Adding Assets

- Multiple image, video, audio and document file format support
- Asset association
- File upload from local Web client browser
- Virage Video Cataloger integration

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Media Manager & Browser(5)

□ Image File Formats

- TIFF, GIF, JPEG, EPS, PICT, BMP, SGI, PSD, Scitex CT, TGA, MAC, RLE, PhotoCD, PNG, PCX

□ Video File Formats

- Analog: NTSC, PAL via Video Cataloger
- MPEG

□ Audio File Formats

- WAV
- AU
- AIFF

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Image Read/Write Toolkit

a component technology that reads, writes and creates thumbnails for image files of various formats.

- JPEG
- CompuServe GIF
- Targa
- Utah Raster Toolkit
- OS/2 BMP
- Silicon Graphics RGB
- Windows BMP
- Scitex Continuous Tone
- Windows RLE
- Portable Network Graphics
- Windows Paintbrush
- Tagged Image File Format
- MacPaint
- Adobe Photoshop
- Macintosh PICT
- Adobe Encapsulated
- PostScript
- Kodak PhotoCD

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활용예

상용 DBMS의 영상 검색 엔진으로 채택 판매되고 있음

- Oracle
- Informix
- Objectivity
- Object Design
- Sybase

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Partnership

- Virage in Cinebase's Digital Media Management System(DMMS) for professional film, video, post-production and cable markets
- RealNetworks
- Silicon Graphics: Virage Media Management System + SGI Studio Central asset Management System
- Sun Microsystems
- Avid for Integrated News Cataloging, Browsing and Production Solution for Broadcasters
- BBC: 미래 방송국 모형 구축 사업
- Microsoft, Kodak, PhotoDisc

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Exculibur

- Video Analysis Engine
- Visual RetrievalWare
- Screening Room

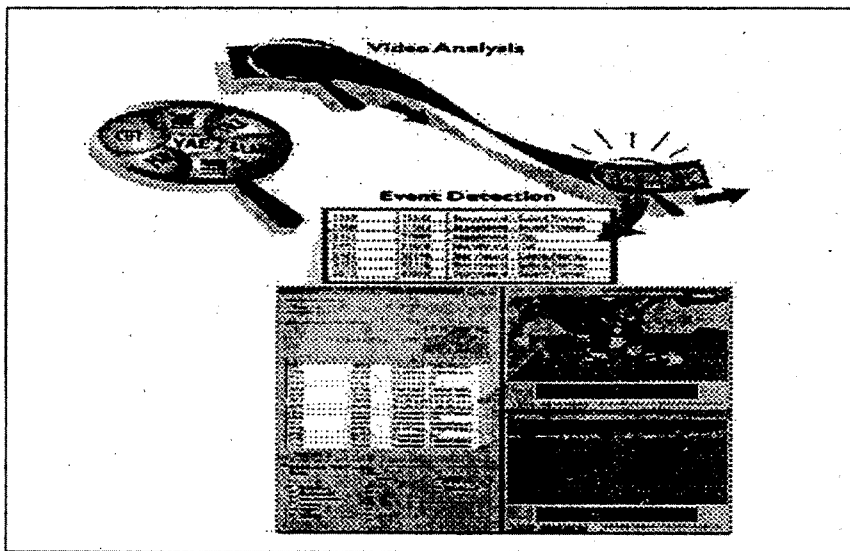
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Video Analysis Engine(1)

- Version 1.0 of VAE incorporates the following video event detectors:
- Cut: detects hard cuts in the video stream
 - Fade in/out: detects a fade in or out effect across multiple frames
 - Shift/Pan/Tilt: detects the visual effect generated by motion with the video stream
 - Blank: detects the presence of no picture
 - Salient: detects frames that stand out from surrounding frames
 - Dissolve: detects a dissolve effect across several frames
 - Aspect: returns the current aspect ratio of the video on request

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Video Analysis Engine(2)



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Visual RetrievalWare

- Content-based retrieval for multiple types of digital visual media**
 - Graphics and illustrations
 - Full animation
 - Full motion video
 - Other specialized media formats
- Visual RetrievalWare SDK로도 판매**
- Web에서의 이용**
 - Yahoo
 - Infoseek
 - image assets

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Internet Spider

- multimedia web crawler. It is a high-performance solution that traverses the Internet or an intranet, seeking knowledge from multimedia and text documents. Businesses and applications developers can access, develop, and leverage knowledge collected from all documents and information published on the Web.**
- How Does it Work?**
 - Navigate the World Wide Web
 - Handle word processing, PDF, HTML, and graphic files
 - Monitor designated sites consistently
 - Automatically add new documents to Excalibur RetrievalWare for indexing and filtering
- Image Surfer라는 이름으로 Yahoo, Infoseek, Image Assets 에서 이미지 검색기는 서비스중**

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Screening Room

- Capture Station:** capture, analyze and storyboard your analog or digital video assets (including live feeds, closed caption text and metadata such as title, producer, date and time codes).
- Video Asset Server:** automatically index and store your saved story-board(s) for instantaneous retrieval from a server.
- Edit Client:** make any necessary revisions, including text annotations, to produce a user-friendly, easily managed and concise storyboard.
- Browser Client:** access the completed storyboard(s) through any web-based browser on your network.

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Magnifi

- Enterprise Server**
 - **Sigma MediaCrawler**
 - The component of SmartPreview(tm) that crawls through URLs (web sites and networked file servers), parses through the media files, and builds the media index file.
 - **Sigma MediaSearch**
 - Server software that serves the media index file to allow users to search for information across media types.
 - **Sigma MediaBlocks**
 - Software components that add support for new media/file types.
- IBM의 QBIC 이용**

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*MediaCrawler*의 Media File 색인 방법

- Name and location of the media file
- text string associated with the media file
- plain ASCII text that surrounds the media file reference
- title of the HTML document that contains the media file reference
- keywords associated with the HTML document
- URL for the HTML document that contains the media reference
- keywords and textual annotations embedded in the media file
- auxiliary data in the media file(copyright, author, producer, etc.)
- auxiliary data located within the media reference in the HTML document

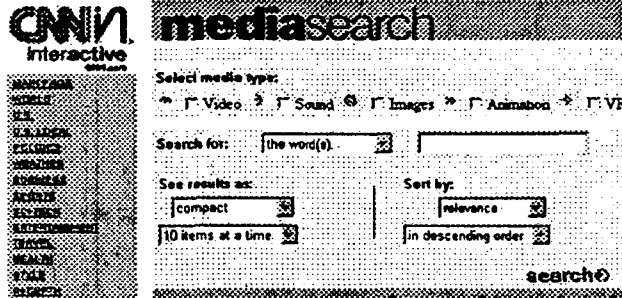
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Magnifi 응용예(1)

- CNN Interactive(cnnplus.cnn.com)
- ABC News
- CBS
- PBS Online(www.pbs.org)
- Hollywood Online(www.hollywood.com)
- an application cartridge for the ORACLE Web Application Server

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Magnifi 응용예(2)



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상용 제품 가격

- The Executive Producer for logging and very simple search: \$1,099
- ImageMine: \$10,000
- ISLIP starts at prices between \$15,000 and \$25,000
- Magnifi at \$20,000
- Virage at \$50,000
- QBIC: 약 3,000만원

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제품의 평가요소

- 입력 및 색인 방법의 용이성 및 효율성
- 대상 미디어 타입
- 웹 데이터의 색인 및 검색 기능
- DBMS와의 결합성
- Total Solution에의 근접성
- 검색 방법의 종류
- 현재 시장 점유율
- 가격

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멀티미디어 정보 검색 시스템의 운용예

- Magnifi 이용예: CNN Interactive, PBS
- Virage 이용 제품
- QBIC의 이용예
- IBM DL 이용예
- Viewpoint, Avalon
- MBC, KBS, SBS
- 이용 분야
 - 전자 상거래
 - 디지털 경제
 - 전자 정부
 - KMS

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멀티미디어 정보 검색 산업의 과제

- 조직이 도입했을 때 생산성이나 수익이 증가함을 증명해야.
 - Any enterprise that handles rich media content consumes an enormous amount of time, money and people finding and accessing the "right" image or video segment. In most cases, the inability to locate the "right" media means wasted content, reacquisition costs and lost opportunity. In some industries, it even dramatically affects ratings and profitability. (Virage)
 - 투자 평가의 예: paper & analog tape vs. digital data
 - 효율 평가의 예: Fedex보다 저렴해야

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멀티미디어 정보 검색 기술의 과제

- Pieces to Complete Solution
- High Speed Network
- 저장 장치 비용
- 멀티미디어 관련 입력 장비 비용
- 데이터의 입력 및 색인 속도와 정확성
- 웹상에 있는 멀티미디어 데이터의 자동 색인
- 비디오 요약 기술
- 그래픽 데이터의 검색 (STEP, VRML, 디자인 데이터, 애니메이션 데이터 등)
- 음향 정보 검색

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