



VIDEO RETRIEVAL USING CONTENT BASED
APPROACH

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VIDEO RETRIEVAL USING CONTENT BASED APPROACH

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By

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Abstract

Information retrieval systems are living a significant position in our daily life for getting the necessary information. Many text retrieval systems are accessible and are functioning effectively. Even though internet is complete with media like images, audio and video, retrieval systems for these media are unusual and have not achieved sensation as that of text retrieval systems. Video retrieval systems are helpful in many applications. There is a high request for useful and capable tool for video association and retrieval based on each user's requirement. Videos are divided into set of frames (images) then they are classified into content based image retrieval. We are developing a content based video retrieval system, which makes use of ontology to make the retrieval process intelligent.

Dedication

I humbly thank Allah Almighty, the Merciful and the Beneficent, who gave me health, thoughts and co-operative people to enable me achieve this goal,,,

I wish to dedicate this work to Holy Prophet Muhammad (Peace be upon him) and his companions who laid the foundations of Modern civilization and paved the way for social, moral, political, economical, cultural and physical revolution,,,

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2010

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CHAPTER 1

INTRODUCTION

1.0 INTRODUCTION

Internet makes it achievable for people to access huge total of information. The great impossibility of the World Wide Web (web) is that the more information accessible about a specified topic, the more tricky it is to put the correct and relevant information. Most of the users know what information they need, without knowing where to get it from. Some of the users know what the information they are looking for and where to get it from; and they get it by subsequent suitable links. But these users frequently fail to notice the relevant information accessible on the web which is distant from their known links. Search engines can help all users to find such relevant information(Ding, Chowdhury, Foo, & Qian, 2000).

Videos have been used in human infrastructure for a long time. Computers supply the ability of digital Video capturing, processing and transmission, which makes the usage of digital Video simple and common. This helps us improve better in some areas which are deeply dependent on Video for communication, such as architecture. Since Videos are more significant than words in some cases, most of web sites use videos to communicate their contents(Barbieri, Lambruschini, Raggio, & Stagnaro, 2007).

The contents of
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REFERENCES

- Al-Tayeche, R., & Khalil, A. (2003). CBIR: Content Based Image Retrieval. *Project Report, Department of systems and computer Engineering, Faculty of Engineering, Carleton University.*
- Ali, N., Shukur, Z., & Idris, S. (2007). Assessment system for UML class diagram using notations extraction. *IJCSNS*, 7(8), 181.
- Anda, B., & Sjøberg, D. (2005). Investigating the role of use cases in the construction of class diagrams. *Empirical Software Engineering*, 10(3), 285-309.
- Barbieri, I., Lambruschini, P., Raggio, M., & Stagnaro, R. (2007). Real-time transmission and storage of video, audio, and health data in emergency and home care situations. *EURASIP Journal on Applied Signal Processing*, 2007(1), 110.
- Bhattarai, B., Wong, M., & Singh, R. (2007). Discovering User Information Goals with Semantic Website Media Modeling. *LECTURE NOTES IN COMPUTER SCIENCE*, 4351, 364.
- Brahmi, D., & Ziou, D. (2004). Improving CBIR systems by integrating semantic features.
- Cai, D., He, X., Ma, W., Wen, J., & Zhang, H. (2004). Organizing www images based on the analysis of page layout and web link structure.
- Chua, T., Lim, S., & Pung, H. (1994). Content-based retrieval of segmented images.
- Dennis, A., Wixom, B., & Roth, R. (2000). *Systems analysis and design*: Wiley.
- Ding, Y., Chowdhury, G., Foo, S., & Qian, W. (2000). Bibliometric Information Retrieval System (BIRS): A Web search interface utilizing bibliometric

- research results. *Journal of the American Society for Information Science*, 51(13), 1190-1204.
- Dumais, S. (2004). Latent semantic analysis. *Annual Review of Information Science and Technology (ARIST)*, 38, 189-230.
- Flickner, M., Sawhney, H., Niblack, W., Ashley, J., Huang, Q., Dom, B., et al. (2001). *Query by image and video content: The QBIC system*.
- Gagaudakis, G., & Rosin, P. (2002). Incorporating shape into histograms for CBIR. *Pattern Recognition*, 35(1), 81-91.
- Gudivada, V., Raghavan, V., Grosky, W., & Kasanagottu, R. (1997). Information retrieval on the World Wide Web: Feature. *IEEE Internet Computer*, 1(5).
- Gupta, A., & Jain, R. (1997). Visual information retrieval. *Communications of the ACM*, 40(5), 79.
- Hafner, J., Sawhney, H., Equitz, W., Flickner, M., & Niblack, W. (1995). Efficient color histogram indexing for quadratic form distance functions. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 729-736.
- Huang, J., Kumar, S., & Mitra, M. (1997). Combining supervised learning with color correlograms for content-based image retrieval.
- IBM. (2003). IBM's Query By Image Content. from <http://wwwqbic.almaden.ibm.com/>
- Kalipsiz, O. (2000). Multimedia Databases. Paper presented at the International Conference on Information Visualization. Retrieved from <http://ieeexplore.ieee.org/servlet/opac?punumber=6925>

- Kherfi, M., Ziou, D., & Bernardi, A. (2004). Image retrieval from the world wide web: Issues, techniques, and systems. *ACM Computing Surveys (CSUR)*, 36(1), 35-67.
- Kim, S., & Carrington, D. (1999). Formalizing the UML class diagram using Object-Z. *Lecture Notes in Computer Science*, 83-98.
- Konak, E. (2002). A content-based image retrieval system for texture and color queries. Citeseer.
- Kotoulas, L., & Andreadis, I. (2003). Colour histogram content-based image retrieval and hardware implementation. *Circuits, Devices and Systems, IEE Proceedings -*, 150(5), 387-393.
- Larman, C., & Kruchten, P. (2002). *Applying UML and patterns*: Prentice Hall PTR.
- Lempel, R., & Soffer, A. (2001). *PicASHOW: Pictorial authority search by hyperlinks on the web*.
- Li, Z., Za ane, O., & Tauber, Z. (1999). Illumination invariance and object model in content-based image and video retrieval. *Journal of Visual Communication and Image Representation*, 10(3), 219-244.
- Liu, Y., Zhang, D., Lu, G., & Ma, W. (2007). A survey of content-based image retrieval with high-level semantics. *Pattern Recognition*, 40(1), 262-282.
- Lu, H., Ooi, B., Shen, H., & Xue, X. (2006). Hierarchical indexing structure for efficient similarity search in video retrieval. *IEEE Transactions on Knowledge and Data Engineering*, 18(11), 1544.
- Ma, W., Deng, Y., & Manjunath, B. (1997). Tools for texture/color based search of images. *Human Vision and Electronic Imaging II*, 496–507.

- Ma, W., & Manjunath, B. (1999). Netra: A toolbox for navigating large image databases. *Multimedia Systems*, 7(3), 184-198.
- Mezaris, V., Kompatsiaris, I., & Strintzis, M. (2005). An ontology approach to object-based image retrieval.
- Nagasaka, A., & Tanaka, Y. (1991). Automatic video indexing and full-video search for object appearances.
- Odell, J., Van Dyke Parunak, H., & Bauer, B. (2001). Representing agent interaction protocols in UML. *Lecture Notes in Computer Science*, 121-140.
- Otsu, N. (1975). A threshold selection method from gray-level histograms. *Automatica*, 11, 285-296.
- Papadimitriou, C., Raghavan, P., Tamaki, H., & Vempala, S. (2000). Latent semantic indexing: A probabilistic analysis. *Journal of Computer and System Sciences*, 61(2), 217-235.
- Pass, G., Zabih, R., & Miller, J. (1997). Comparing images using color coherence vectors.
- Pass, G., Zabih, R., & Miller, J. (1997). Comparing images using color coherence vectors.
- Petkovi, M., & Jonker, W. (2004). *Content-based video retrieval: a database perspective*: Kluwer Academic Publishers.
- Shim, S., & Choi, T. (2003). Image indexing by modified color co-occurrence matrix.
- Smith, J., & Chang, S. (1997). VisualSEEK: a fully automated content-based image query system.
- Swain, M., & Ballard, D. (1991). Color indexing. *International journal of computer vision*, 7(1), 11-32.
- Tollari, S., Glotin, H., & Maitre, J. (2005). Enhancement of textual images

- classification using segmented visual contents for image search engine. *Multimedia Tools and Applications*, 25(3), 405-417.
- Uchold, M., & King, M. (1995). Towards a methodology for building ontologies: Citeseer.
- Vaishnavi, V., & Kuechler, W. (2004). Design research in information systems. *January, 20, 2004*.
- Wactlar, H., Kanade, T., Smith, M., & Stevens, S. (1996). Intelligent access to digital video: Informedia project. *IEEE computer*, 29(5), 46-52.
- Wang, J. (2001). *Integrated region-based image retrieval*: Kluwer Academic Pub.
- Yasuda, P., Kuo, T., & Aoki, H. (2004). Personal Photograph Database Retrieval with Spatial and Temporal Based Ontology.
- Zeng, W., Gao, W., & Zhao, D. (2002). *Video indexing by motion activity maps*.
- Zhao, R., & Grosky, W. (2002). Narrowing the semantic gap-improved text-based web document retrieval using visual features. *IEEE Transactions on Multimedia*, 4(2), 189-200.