Journal of Informatics Education and Research
ISSN: 1526-4726
Vol 4 Issue 1 (2024)

A Study on Content based Image Retrieval Using Knowledge Extraction Technique

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Abstract Among the available digital datasets, multimedia data differs from traditional data repositories. The creation of this data type is easy for the user due to the technological support. Even untrained users can create and store this content in a multimedia data repository. Because of the need for specific data extraction, this field is currently in high demand. Many existing procedures lack support for extracting similar content from these datasets. This serves as the motivation for conducting this study. Immediate attention is necessary for storing and generating key terms for these datasets. The perseverance of this paper is to discover several techniques of information extraction, present their findings, and propose a new approach to multimedia information retrieval.

Keywords: Information Retrieval, Data Mining, Multimedia Data, Image Retrieval.

1. Introduction

Knowledge extraction is performed through information retrieval. This process begins when a user inputs key terms into a search engine, which then retrieves relevant content based on these key terms. The retrieved documents can be matched based on key words, terminologies, or even titles that correspond to the input key terms. This retrieval process can be carried out using either text-to-text or text-to-image retrieval. Nowadays, technology allows users to input images as well, which often results in more relevant outputs compared to text-to-text retrieval. Today, knowledge extraction encompasses various domains such as social science, history, environmental science, artificial intelligence, and more. Each of these domains has its own unique set of information and documents that differ from one another.[1] Knowledge extraction is a broad term that encompasses all of these domains. Among these domains, image extraction is currently a highly researched area. This approach yields more relevant datasets in a shorter period of time. However, users often require specialized training to create content, organize it, and extract information when dealing with image-based retrieval. Before storing files in an image repository, data cleaning, data aggregation, and knowledge extraction are necessary steps.

1.1 Image Retrieval

Image extraction is the process of extracting the image content based on the relevance of the input key terms. This process is done with the help of the following three levels of operations:

(a) Rank 1 First user need to collect the picture elements such as picture element average, picture outline structure, Structure difference, Position o f the structure , Time duration between the structure, Picture value and more.

(b) Rank 2 includes images that are extracted through logical features such as frame features, properties of individual frames, or attributes used in the frames.

(c) Rank 3 includes images that are extracted using the properties of the image or frame sequences.

2. The Practicalities of Knowledge extraction

Data mining techniques are the result of extensive research and product development [2]. Knowledge extraction is accomplished through stored datasets. Initially, data is collected from various sources and stored using data cleaning techniques to remove incomplete or irrelevant data. The remaining data is then stored for further processing. Researchers need to specify their queries in terms of text or images to extract the required information from these extensive data repositories. The preprocessing steps are illustrated in Figure 1, and any data retrieval process must undergo these preprocessing operations. Data collected from different sources must be cleaned; otherwise, users will not obtain accurate result.

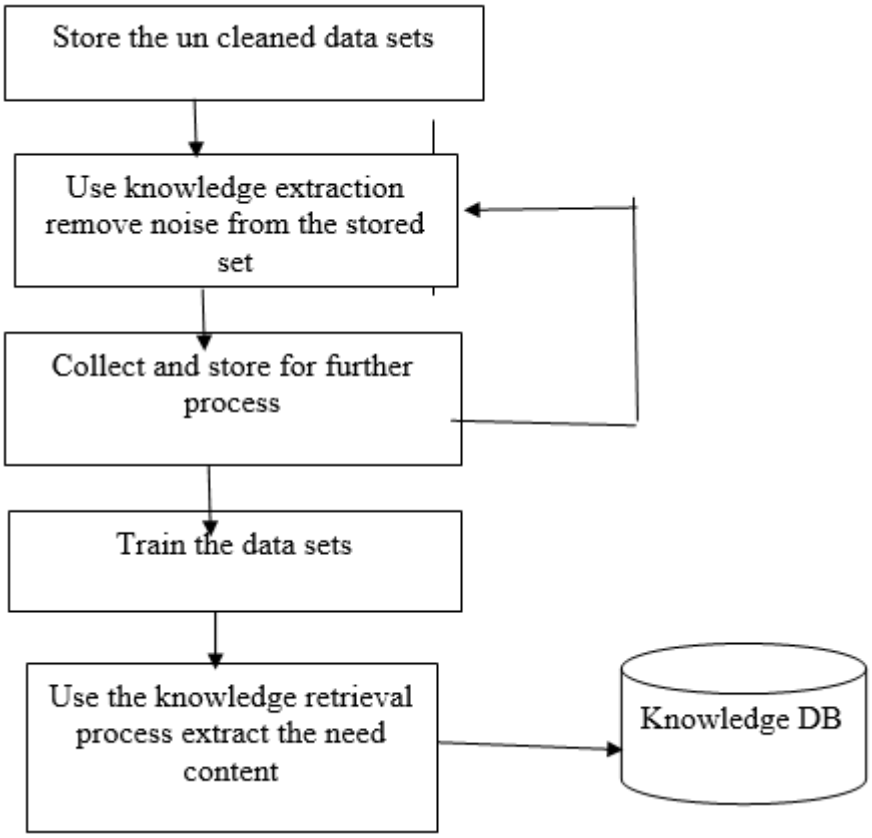

Figure 1. Knowledge extraction Preprocessing Steps

2.1 Examination problems in picture appearance succession

Picture extraction or knowledge taking out contrasts from the actual excavating process due to the complexity of the input sets. An picutre the combination of two or more attributes, and users require specific domain knowledge to extract any particular content from this source. Users need to conduct additional groundwork, which involves training the datasets before storing and extracting them. This procedure is repeated both from the investigator position and the response position, enhancing the competence of the retrieval procedure and reducing retrieval time. It's significant to note that picture extraction is separate from low-rank processer visualization and picture dispensation methods. Image mining focuses on extracting patterns from a large collection of images, whereas computer vision and image processing techniques aim to understand and/or extract specific features from a single image [3]. Image extraction differs from content-based retrieval. Image extraction provides relevant information based on user input. First, image features are extracted from the image attributes, and this information is then sent back to the user. In contrast, object-based extraction requires users to specify input objects in advance, and information is extracted based on the features of those objects. This image extraction approach is entirely different from text-based extraction, where information attributes are extracted based solely on textual content.

2.1.1 Complete as opposed to qualified standards

During the extraction of the data sets, researchers need to clarify the precise meaning of the specified data sets. Each specified data point imparts the actual meaning of the stored data content; data can either be assigned a value or associated with a quantifier. For example, when specifying a range, researchers typically use whole numerical values. In the context of image data, these data sets are employed to specify pixel intensity. Therefore, it is essential to define the data's intended interpretation.

2.1.2 Spatial information

One important distinction between relational databases and image databases is the presence of implicit spatial information, which is crucial for interpreting image content but is not a requirement in relational databases. [4][5]. To address this issue in stored image content, users initially attempt to extract image features. This aids users in retrieving the desired content based on their queries or input. Image extraction differs from standard data extraction as it relies on pre-trained datasets, enabling researchers to extract content more efficiently. This not only accelerates the knowledge extraction process but also enhances the retrieval of necessary content, thus improving the system's time complexity.

2.1.3 Distinctive versus compound clarifications.

The third and most crucial feature of image datasets is that each data point can convey a variety of meanings. This complexity can pose challenges in the information retrieval process. Most stored datasets are extracted and trained based on various image attribute values.[6] Researchers select and train these attributes depending on their specific goals. Unlike text data, which often conveys a consistent or real meaning based on usage and representation, visual data can carry different meanings depending on the context and vary from person to person. In this context, visual content is assessed based on how it is utilized or evaluated.[7] consequently, traditional classification methods are not suitable due to the complexity of the input datasets. Researchers must develop new procedures for image classification.

3 Substance-specified image extraction system

Content-based image retrieval (CBIR), also known as query by image content (QBIC) and content-based visual information retrieval (CBVIR) is the application of computer vision to the image retrieval problem [8] this system is based upon a combination of higher-level and lower-level vision principles. [9]To extract such image data, users require one of the image attributes as input. This attribute could include image pixel values, frame pixel averages, pixel differences, time differences between two frames, frame averages, and more. Users must initially calculate these values and store them separately. These values are then used to extract the required content, as illustrated in Figure 1. This process is repeated on the sender's side of the system, where the same calculations are performed and values are stored separately. Whenever a user submits an image contribution request, these standards are associated with the deposited image data values. Information is then extracted based on these stored values and directed back to the investigator this process is shown in the figure 2-4 and table 1. The table shows the number of input frames and how many milliseconds system takes to transport back the evidence based on the operators input. The goal of category search is to retrieve a given semantic class or genre of images or used to find relevant images that the user might not be aware ahead of time, such as scenery images or skyscrapers [10].

Figure 2. Content based knowledge extraction.

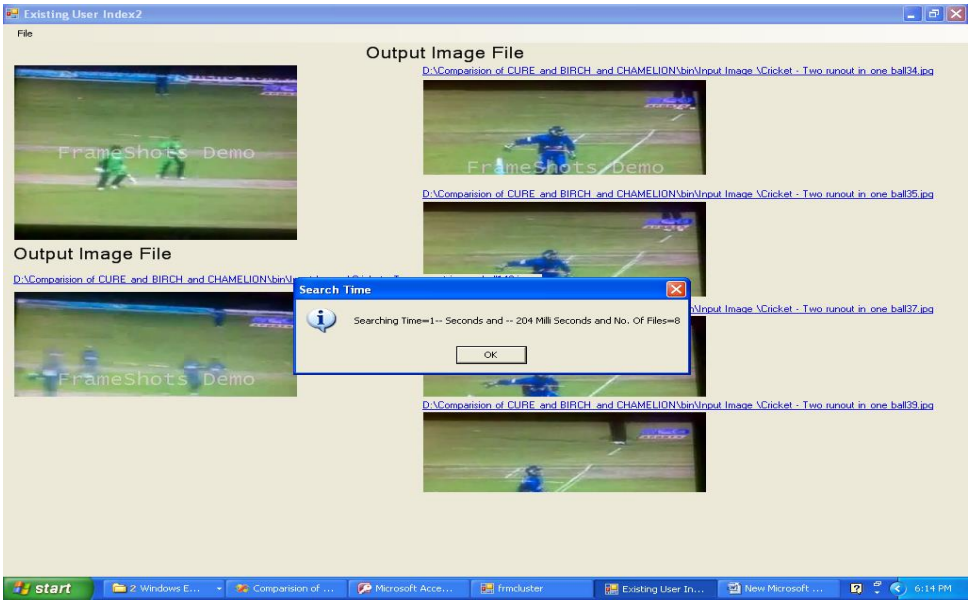

Figure 3. Input image

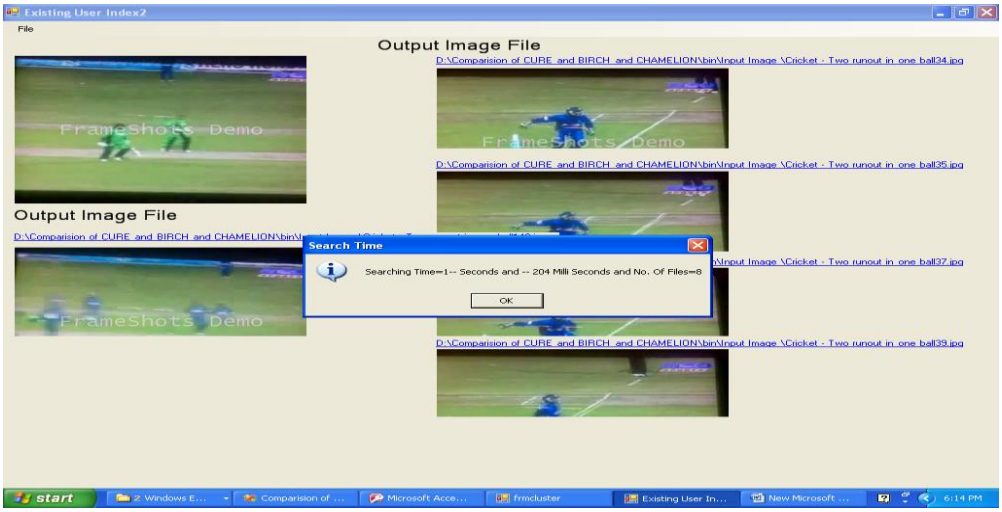

Figure 4. Extracted image

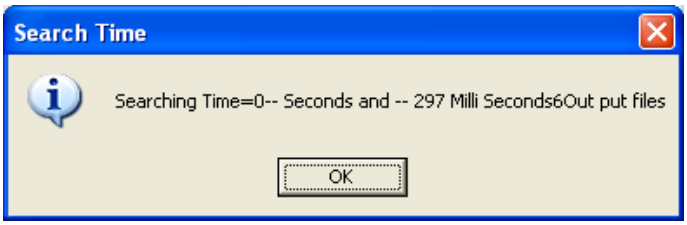

Figure 5. Searching time (Improved time complexity)

Table 1 Object type Vs object formation in milli sec

Structure Count	Time taken in mi second	classification
10	1858	News video
12	1856	News video
15	1877	News video
17	1867	News video
21	1872	News video
22	1845	News video

3.1Image-based applications

Compared to text-based extraction, today's image-based techniques offer several advantages to the user community. Initially, image-based techniques may take a little more time compared to text-based retrieval, but the extractions are remarkably accurate. Today's technology also enables users to create and store image-based input and output systems, which prove to be effective and efficient in various scenarios, as depicted in the figure below. In text-based retrieval, the same query across various search engines often yields different outputs; none of the search engines produce identical results. This disparity exists whether the retrieval is text-to-text or text-to-image-based. However, when users provide input in the form of images for image-based retrieval, information is retrieved more quickly and generates more relevant outputs.

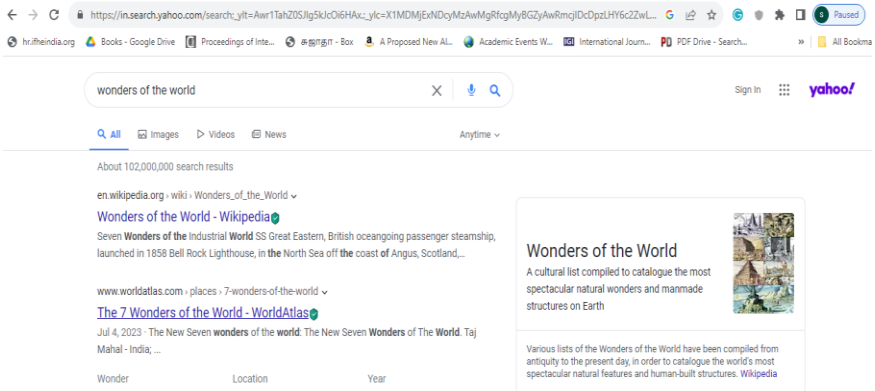

Figure 6. Text –to- text information retrieval in yahoo search

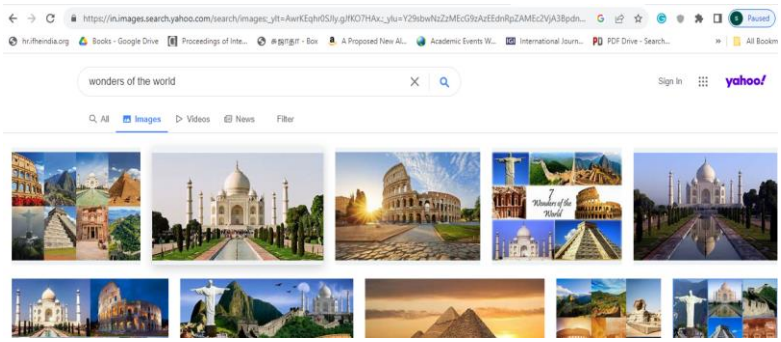

Figure 7 Text-to-image search in yahoo search.

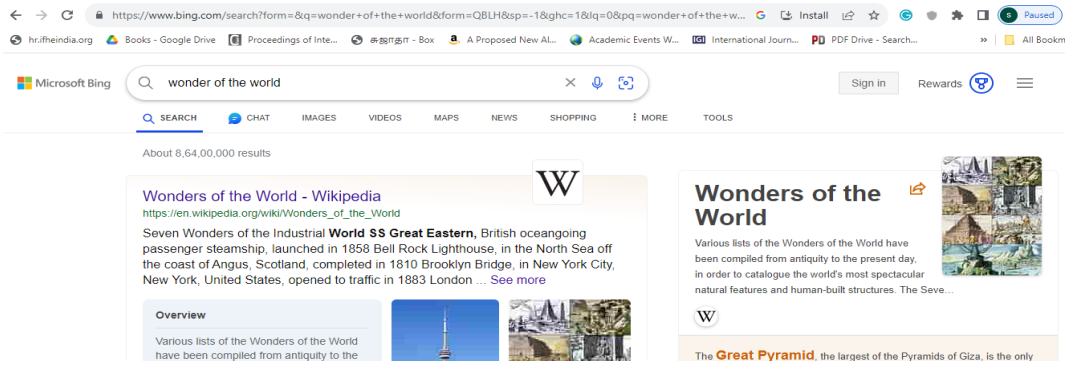

Figure 6. Text –to- text information retrieval in Bingo search

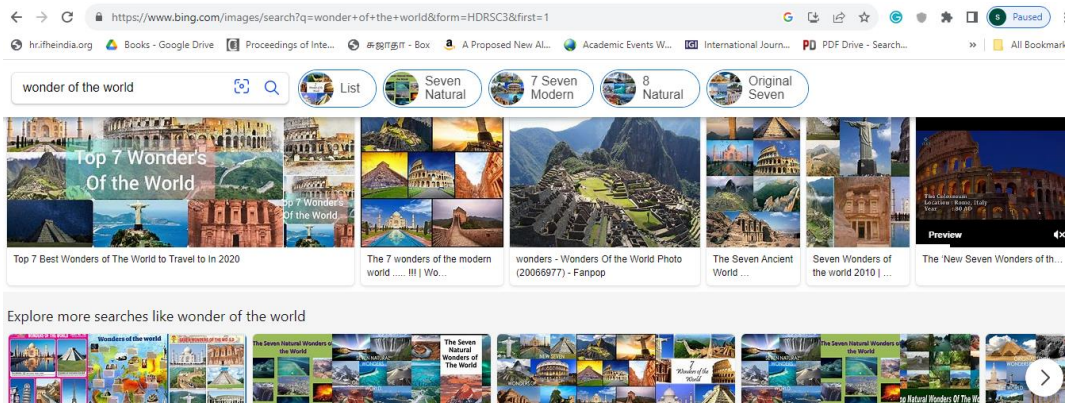

Figure 8 Text-to-image search in Bingo search.

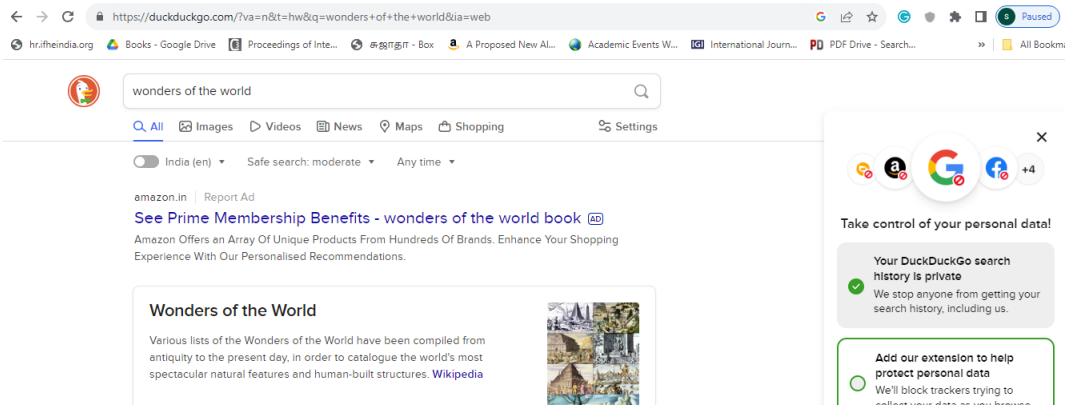

Figure 6. Text –to- text information retrieval in Duckduckgo search

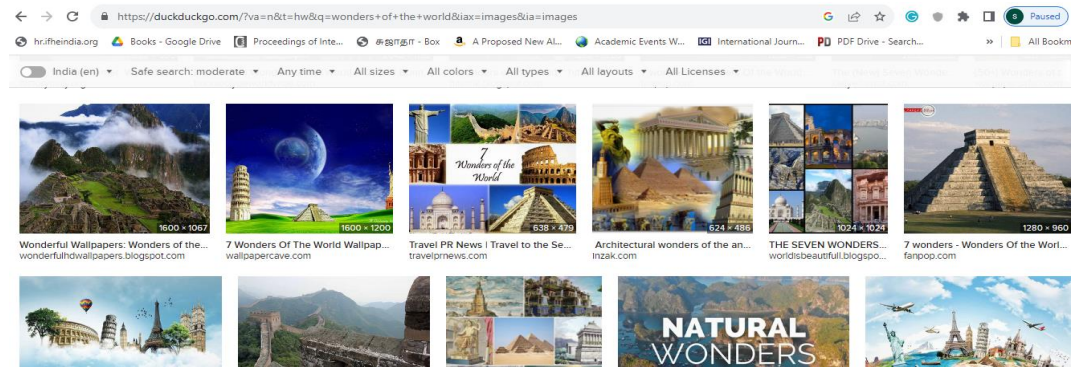

Figure 8 Text-to-image search in Duckduckgo search

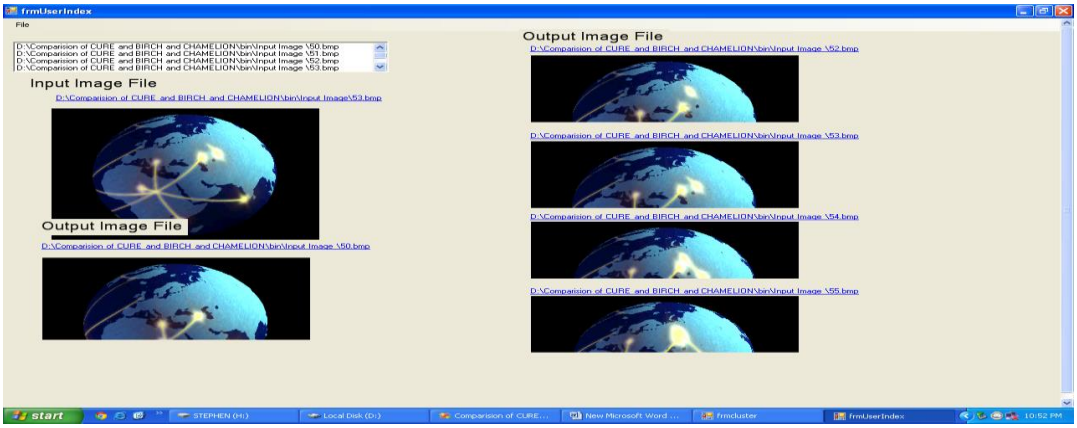

Figure 9 Image –to image searching 1 input 21 outputs

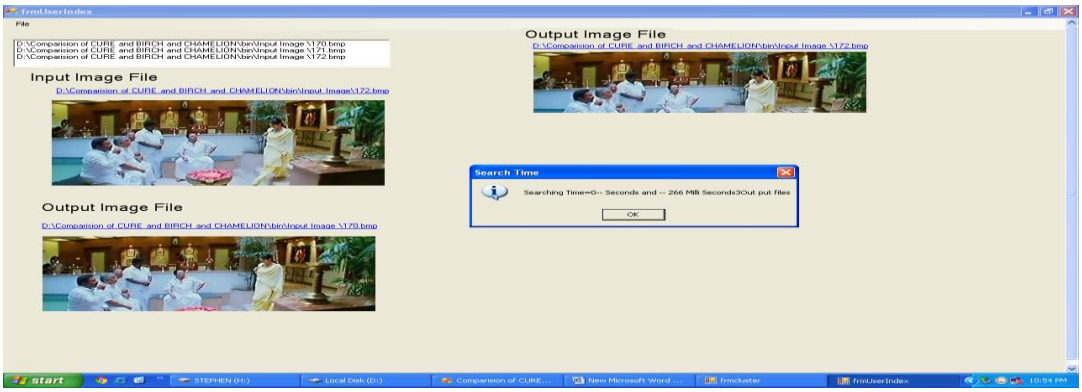

Figure 10 Image –to image searching 1 input 18 outputs.

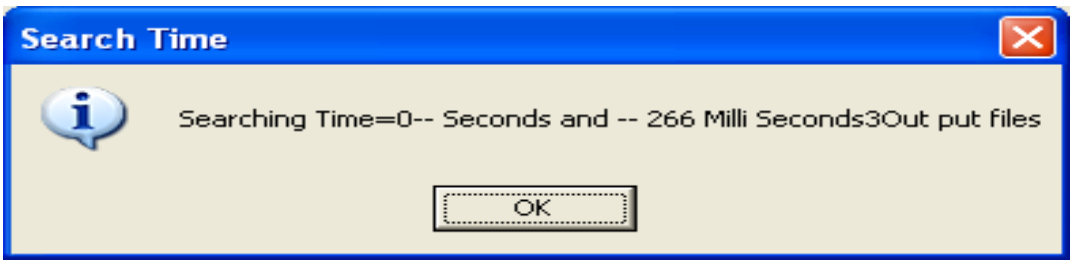

Fig 11. Search time image-to –image retrial in mill secon

3.2 Image Mining Algorithm Steps:

The algorithms needed to perform the mining of associations within the context of image [12] [13]. The major steps involved for this procedure is :

1. **Picture element succession:** After dynamic picture datasets are converted into static image sets, each image frame is treated separately. To distinguish these frames, users need to extract any of the image attributes as key elements. Using these attributes, frames can be identified and separated.
2. **Creation of Attributes for Images:** After calculating the values of each frame, it is necessary to identify and remove unwanted or very similar information from the initial dataset. The remaining images are then identified and numbered for further operations.
3. **Generating Image Clues:** Identifying the similarities or clues within each set and storing them separately
4. **The Facts Abstraction Procedure:** This step involves retrieving the needed content using a knowledge extraction process.

3.3 Creation of object indicators

After creating of separate image database it is necessary to create object indicators for each of this image datasets, it help to search the particular content and bring the results more quickly. For this n number of image indicators are currently existing here some of the indicators are discussed below

1. **Tiny Object Indicators:** These indicators are created based on image attribute sets. Any one of the image attributes, such as image scope or image category, can be used to create these indicators.
2. **Time-Based Indicators:** These indicators are also based on image attributes, such as the time interval between frames. In some cases, the image theme or image description is also taken into consideration.
3. **Operational Piece Indicators:** These indicators utilise low-level image information, including image content, image type, image outline, and others.
4. **Semi logical-Based Indicators:** These indicators can encompass various image contents, such as objects in the images, nature, photos, or any other image content.

4. Video data mining

4.1 Video shot detection. In dynamic image processing, the first step involves converting motion image sets into a static image dataset. In this process, each scene is treated as a frame, and the attributes of these frames are used by researchers to create indices for the frames. This marks the initial and fundamental stage in video data mining. In this study, we have enhanced our previous work by employing a multi-filtering design. This architecture includes attribute-level association, histogram association, and separation map analysis.

4.2 Color histogram

The color histogram for an image is constructed by quantizing the colors within the image and counting the number of pixels of each color[14] More specifically, given a color space (e.g. YUV), an image can be projected onto three color channels (*Y*, *U*, and *V*). In every video frames are converted or extracted this three basic color code of information. The intensity of each color values are identified and extracted using color pixel average techniques. To generate a histogram for a gray-level image, the bin number of the histogram, N, must be given beforehand; each pixel in the image is grouped into the bin whose center is the nearest to the value of the pixel [15].

4.3 Experimental Results:

Figure 12. To view the image

Table 3 Time taken for convert the dynamic image into static scene.

Quantity Of Structure Divided	**Examination Period**
250	3 Mill. Seconds
310	4 Mill. Seconds
550	5 Mill. Seconds

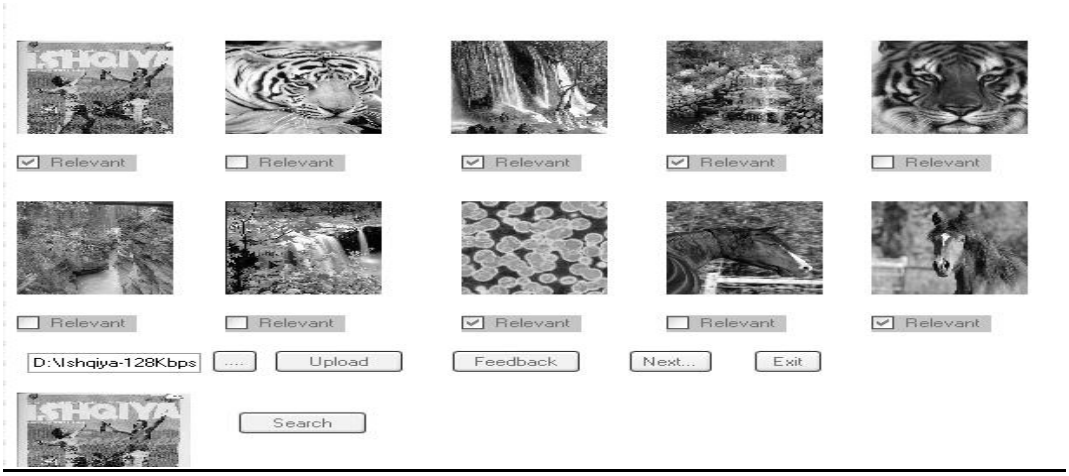

Figure 13. Search the image

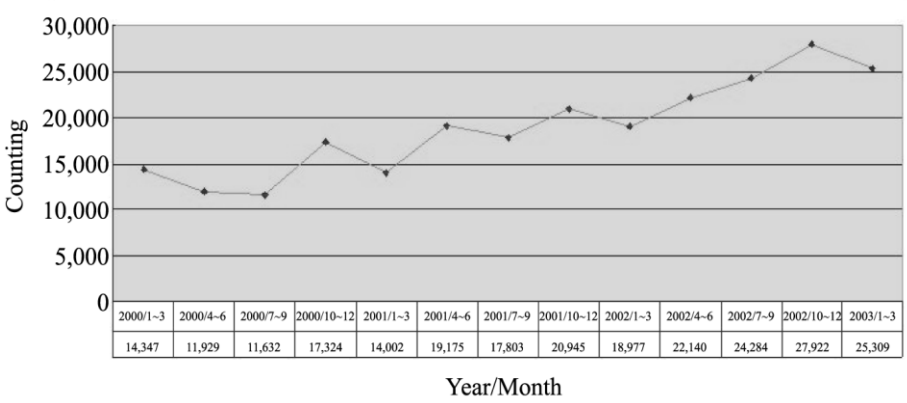

Figure 14. Image Content Comparison

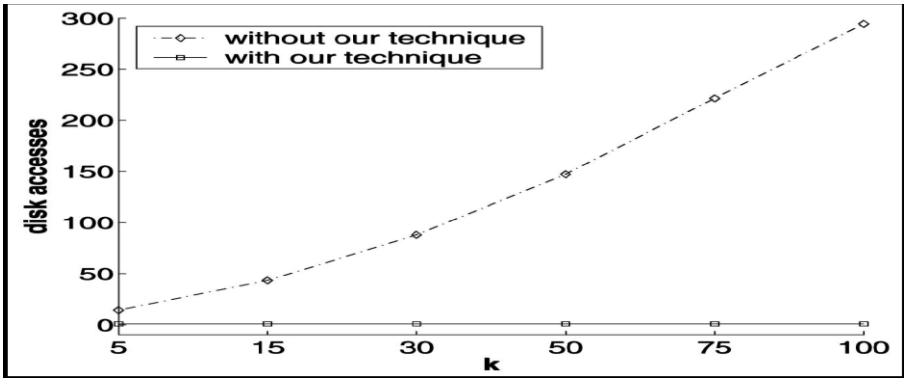

Figure 15. Sampling Query Comparison

5. Conclusion

Knowledge extraction, or knowledge mining, is the process of uncovering unknown information from stored datasets. Every time a user submits a query, they may obtain new insights based on the information retrieved from the stored data. No one has a clue about the type of information that will be retrieved during the retrieval process. While many existing techniques are text-based retrieval methods, when a user submits an image-based input, the information is extracted more rapidly, yielding more relevant outputs. This paper explores the differences between image-based retrieval and traditional text-based extraction. In general, input data can be complex, and among these intricate datasets, this study investigates how information can be effectively extracted compared to existing techniques.

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