An Approach to Develop a Simple Algorithm: Retrieval of Top k Objects from an Unsorted Multimedia Database

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***Abstract:* - During the last decade, multimedia has emerged as a major research and development area. With the advent of the information superhighway, a vast amount of data is currently available on the Internet. Previously Prof. Ronald Fagin developed an algorithm for finding of top k objects [1]. But there were some drawbacks; to improving these drawbacks Threshold Algorithm was introduced. But both of these algorithms required sorted order data. Here we are tried to introduce an algorithm in MDBMS in which the required data are in unsorted order.**

Keywords: - **Multimedia Database, CBIR, Top k objects.**

1. INTRODUCTION

As the use of multimedia data has increased tremendously in various software applications .The applications include digital libraries (text documents, images, sound, video) manufacturing and retailing, art and entertainment, and so on. Normal databases are incapable of handling such wide range and huge amount of data. So we need database to support storage, indexing, retrieval of huge and wide variety of data

Typically image in multimedia database is searched based on keywords, features and/or user given query. But the problem, specifically in feature based retrieval, lies on the vast number of attributes to express the image: size, color, shape, texture, location, position, domain, etc. Given tremendous amount of image data, capabilities to support efficient and effective image retrieval have become increasingly important. There are two general approaches for image retrieval: the text-based approaches apply traditional text retrieval techniques to image annotations or descriptions where as the content based approaches apply image processing techniques to extract image features and retrieve relevant images.

Many of today's image retrieval systems rely on CBIR with varied techniques ranging from single feature vector to combined visual and conceptual image content descriptions and ontology[4] [6].

In CBIR, images are indexed by their visual content, such as color, texture, and shapes. Moreover, the fundamental difference between content-based and text-based retrieval systems is that the human interaction is an indispensable part of the latter system. Humans tend to use high-level features (concepts), such as keywords, text descriptors, to interpret images and measure their similarity [4] [6].

Image content can be described at various levels. It may regard perceptual features (also known as content dependent metadata) like color, texture, shape, structure and spatial relationship, or semantic primitives (also known as content-descriptive metadata) such as the identification of real-world objects and the meaning of the images , and image retrieval using low-level visual features is a challenging and important issue in content-based image retrieval. However, most of the CBIR systems focused on perceptual (low level) features.

Consider a set of objects (e.g., web documents) and a sequence of different rankings of these objects. The rankings are not pre-defined and could be derived from a search operation (a user given query).

Object Code	Object Name	Shape	Size	Color
R11	Ladies finger	Not Round	Normal	Not Red
R10	Carrot	Not round	Normal	Normal Dark
R9	Jack Fruit	Near About Round	Very Large	Not Red
R8	Mango	Roughly round	Large	Light
R7	Plum	Near About Round	Very Small	Normal Dark
R6	Potato	Fairly Round	Large	Not Red
R5	Grapes	Fairly Round	Small	Not Red
R4	Onion	Round	Normal	Normal Dark
R3	Apple	Round	Normal	Very Dark
R2	Orange	Round	Normal	Normal Dark
R1	Tomato	Round	Normal	Very Dark

Figure 1:Fruit Database

2. WORK AREA

2.1. Membership Value

The degree of membership with which color Red belongs to the category (set) 'Very Dark'. Full membership of the class 'Very Dark' is represented by a value of 1, while 'Not Red 'membership is represented by a value of 0. The degree of belonging to the set 'Very Dark' is called the confidence factor or the membership value. The shape of the membership function curve can be non-linear.

2.2. Linguistic Variables and Linguistic Terms

Linguistic variables [7] are used every day to express what is important and its context. 'This room is hot" is specific: it represents an opinion independent of measuring system, and it has information that most listeners will understand.

The members of the decision-making committee use the linguistic terms as proposed to express their ratings criteria.Very low (VL) Low (L) Fairly low (FL) Fair (F) Fairly high (FH) High (H) Very high (VH).

Here we use 3 linguistic variables like color, size and shape. In color Linguistic variable we use 4 linguistic terms with respect to color red with membership value 1 and not red with membership value 0.The 4 linguistic terms are very dark i.e. its range from(1-0.75) ,normal dark(0.75- 0.5) ,light(0.5-0.25) and not red(0.25-0) [7] .
Similarly, in size linguistic variable we use 5 linguistic terms with respect to size large with membership value 1 and small with membership value 0. The 5 linguistic terms for size linguistic variable are very large (1-0.8), large (0.8-0.6), normal (0.6-0.4), small (0.4-0.2) and very small (0.2-0). Same as, in shape linguistic variable we use 5 linguistic terms with respect to shape round with membership value 1 and not round with membership value 0. The 5 linguistic terms for shape linguistic variable are round (1-0.8), fairly round (0.8-0.6), near about round (0.6-0.4), roughly round (0.4-0.2) and not round (0.2-0).

Object Code	Object Name	Shape	Size	Color
R11	Ladies finger	0.07	0.55	0.01
R10	Carrot	0.08	0.52	0.66
R9	Jack Fruit	0.55	0.95	0.02
R8	Mango	0.37	0.76	0.38
R7	Plum	0.58	0.02	0.62
R6	Potato	0.77	0.77	0.02
R5	Grapes	0.75	0.38	0.03
R4	Onion	0.85	0.56	0.68
R3	Apple	0.87	0.55	0.97
R2	Orange	0.88	0.58	0.73
R1	Tomato	0.89	0.53	0.95

Figure 2: Fruit database with membership value

3. IMPLEMENTATION

3.1. *Algorithm*

Proposed Algorithm

Step 1: Parallel take k objects and stored them in a stack and consider them to be maximum.
Step 2: Find the sum of all membership values of the objects.
Step 3: Take the next object from database and compare it with the selected k objects, and discard minimum value and put the objects into the stack.
Step 4: Repeat until all objects are compared.
Step 5: Remaining top k objects are left, these are the resultant objects.
Step 6: End.

3.2. *Discussion*

The Figure 3 shows the object code with membership value of fruit database. First we calculate sum of all object R1(2.37),R2(2.19),R3(2.39),R4(2.09),R5(1.16),R6(2.16), R7(1.22),R8(1.51),R9(1.52),R10(1.26),R11(0.63).

Now take the R1 (2.37), R5 (1.16) and R10 (1.26) and put them in a stack. next object is R6(2.16) which is greater than R5(1.16),so we pop R5 and Push R6.Now stack contain R1(2.37),R6(2.16) and R10(1.26), next coming object is R2(2.19) which is greater than R10(1.26) so we pop R10 and Push R2(2.19). We continue the process until all object are visited, after that we get the final result R1 (2.37), R3 (2.39) and R2 (2.19).

R1(0.89)	R5(0.38)	R10(0.66)
R6(0.77)	R2(0.58)	R11(0.01)
R3(0.87)	R7(0.02)	R5(0.03)
R5(0.75)	R9(0.95)	R1(0.95)
R9(0.55)	R10(0.52)	R6(0.02)
R11(0.07)	R1(0.53)	R7(0.62)
R4(0.85)	R6(0.77)	R4(0.68)
R2(0.88)	R8(0.76)	R3(0.97)
R7(0.58)	R3(0.55)	R2(0.73)
R10(0.08)	R11(0.55)	R8(0.38)
R8(0.37)	R4(0.56)	R9(0.02)

Figure 3: Object code with membership value

3.2. *USER QUERY*

" Select top k objects (here k=3) where color= 'Dark Red', size= 'Normal' and shape ='Round'."
The Answer will be Tomato, Apple and Orange.

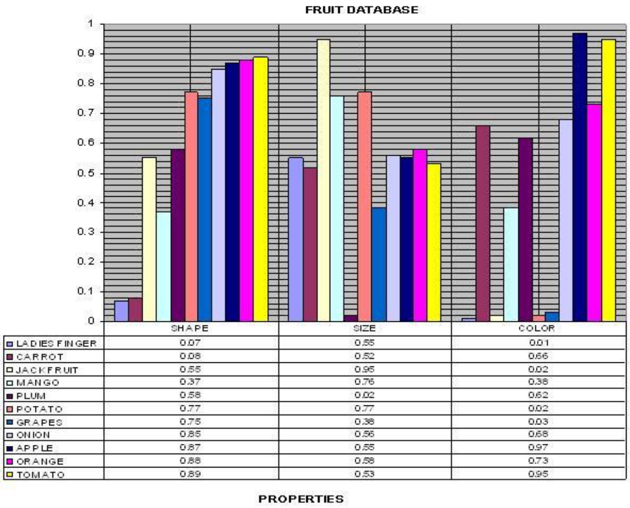

Figure 4: Graphical Representation of Fruit Database

3.3. *ILLUSTRATION OF OUR PROPOSED WORK*

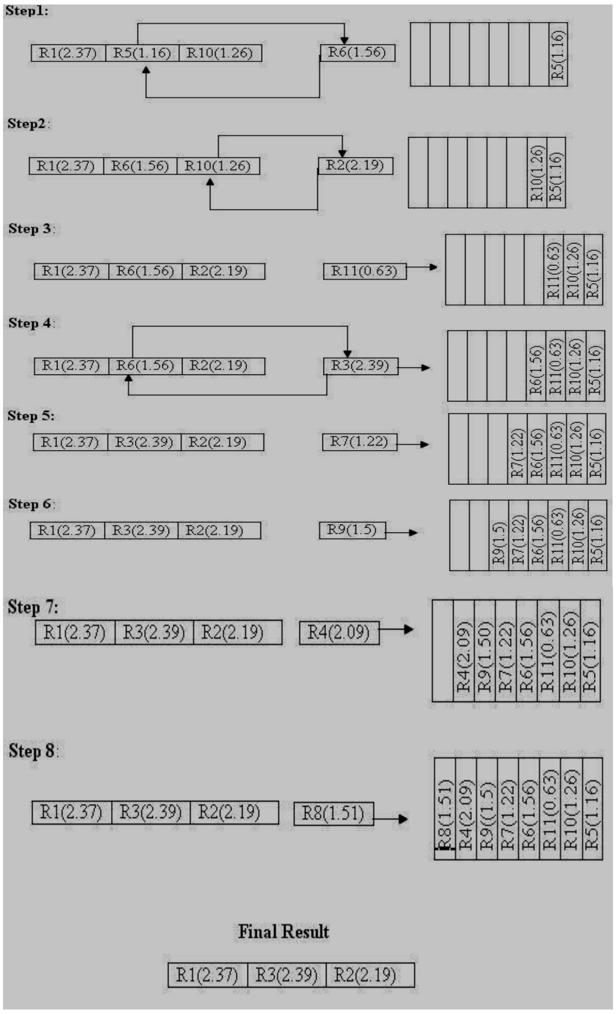

Figure 5: How Our Algorithm Works

3.4. *COMPARISON OF THRESOLD ALGORITHM AND PROPOSED ALGORITHM*

- Threshold Algorithm (TA) uses less buffer space than Fagin Algorithm.
- Our Proposed Algorithm uses less buffer space than Threshold Algorithm.
- In TA the objects value must be in sorted order.
- Our Proposed Algorithm the objects grade value need not to be in sorted order.

3.4.1. *THRESHOLD ALGORITHM:*

Threshold Algorithm

R1(0.89)	R5(0.38)	R10(0.66)	1.93(Threshold value)
R6(0.77)	R2(0.58)	R11(0.01)	
R3(0.87)	R7(0.02)	R5(0.03)	
R5(0.75)	R9(0.95)	R1(0.95)	
R9(0.55)	R10(0.52)	R6(0.02)	
R11(0.07)	R1(0.53)	R7(0.62)	
R4(0.85)	R6(0.77)	R4(0.68)	
R2(0.88)	R8(0.76)	R3(0.97)	
R7(0.58)	R3(0.55)	R2(0.73)	
R10(0.08)	R11(0.55)	R8(0.38)	
R8(0.37)	R4(0.56)	R9(0.02)	

Figure 6: How Threshold Algorithm Works

Threshold Value=R (0.89)+R5 (0.38) +R10 (0.66) =1.93

R1= (0.89+0.53+0.95) =2.37 (Grade Value)

R5= (0.75+0.38+0.03) = 1.16

R10= (0.08+0.52+0.66) = 1.26

Threshold algorithm is not applicable when data are unsorted order because in TA "Halt when at least k objects have grade ≥ Threshold Value."

4. CONCLUSION

This paper has provided an overview of multimedia databases focusing on query issues, content-based querying and multimedia DBMS requirements. Unfortunately, most existing multimedia DBMS are not adequate for managing multimedia data. These products lack support for real-time delivery and content-based querying. Rigorous research is being conducted in the areas of metadata extraction, metadata storage, and indexing, multimedia data delivery over the Internet, and content based querying. This paper explained about Query-by-example as the primary method for specifying queries in multimedia databases.

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