Enhancing Image Retrieval System Using Content Based Search Criteria

[1]Umoh E. E, and [2]Mbam, B. C. E

[1]Department of Computer Science , Cross River University of Technology, Calabar,
Tel: 08037134736, e-mail: enoimah@yahoo.com.
[2] Department of Computer Science, University of Agriculture, Umudike,
Tel: 07036597010, e-mail: quicksuccessng@yahoo.com.

Abstract

The purpose of this work is to design and implement a software that enhances the retrieval of image using the image content base as the criteria. As the size of multimedia databases and other repositories continues to grow, the difficulty of finding multimedia information increases, it becomes practically impossible to depend on the metadata of images for retrieval. Therefore, the development of a content-based image retrieval system becomes necessary to structure the retrieval of an image by its content. This work provides a good alternative to the normal retrieval pattern by making use of a browser that would search and retrieve image based on content. For fast retrieval of images the user must provide the appropriate parameters required for the retrieval, such as image category, extension format, color and dimension (width and height) of an image. The output shows more efficiency in retrieval because instead of performing the search on the entire image database, the image category option directs the retrieval engine to the specified category. Also, there is provision to update or modify the different image categories in the image database as need arise.

Keywords: *Content-based, Multimedia, Search Engine, Image-based, Texture, Query.*

Introduction

The use of images in human communication in our contemporary society is in very high demand. Images now play a crucial role in fields as diverse as medicine, journalism, advertising, education and entertainment. Technology in the form of inventions such as photography and television has played a major role in facilitating the capture and communication of image data [2]. However, the real engine of the image revolution has been the computer. The involvement of computers in imaging can be dated back to 1965, with Ivan Sutherland's sketchpad project, which demonstrated the feasibility of computerized creation, manipulation and storage of images, though the high cost of hardware limited their use until the mid 1980s [1].

Once computerized or digitized images became affordable, largely the development of a mass market for computer games, it soon penetrated into areas traditionally depending heavily on images for communication, such as engineering, architecture and medicine. Photography libraries, art galleries and museums, too began to see the advantages of making their collection available in electronic form [6].

The image is content-based means that the actual content of the image might be referred to colors, textures, shapes and other information that can be derived from the image itself rather than the metadata such as tags, descriptions or keywords associated with the image [4]. Therefore, content-based image retrieval system is

desirable taking into consideration the quantity and quality of the image.

Retrieving images using content-based retrieval system could be problematic because;

1. The retrieval of image and other multimedia data is quite different from the method used for conventional documents.
2. Its key technique is having the ability to automatically derive image features, such as color, texture, shape, width and height.
3. Most of the web search engines rely purely on metadata and this produces a lot of garbage results.

Therefore, an efficient and effective tool that can retrieve images based on its content keeping track of the content and quality of the image is very essential. With the considerable potential that content-based image retrieval holds as a fast growing technology, it is necessary that the way and manner in which images are retrieved does not pose any problem to the user [5]. Also, there is need to automatically regulate the image search engine.

Therefore, there is need to develop a browser or search engine that can effectively and efficiently retrieve image based on its content and metadata by specifying the width, height and color for easy retrieval. User queries must match when retrieving an image.

This has become imperative due to the fast development of digital cameras and computer technology, where large number of images are collected and stored in computers and other digital devices. Systematic management of these image data is therefore very important for future use and applications.

In his work "Development of a perception oriented texture-based image retrieval system for Wallpapers" [8], there are two approaches commonly used, one is text-based image retrieval and the other is content-based image retrieval.

Today, image digitization, compression and archival has become popular and inexpensive, straight forward and there is broad range of available hardware and software to support these tasks [3].

Methodology

The proposed system is a search engine that will search for images using content-based search criteria such as color and dimensions of the image. The search engine will combine similarity measures, semantics and content-based information in the retrieval of relevant search results that satisfy the user's query. It will operate by accepting queries from it users through the search criteria. Now, Depending on the type of image and its features that have been specified, a connection is established to the database and the search commences.

Using similarity measures, the content-based and multidimensional feature vector applied on relevant images are retrieved and the searches which are more similar to the user's query are displayed [7].

Requirements

Input Requirement: The input requirement will consist of a graphic interface that will enable the users to query by providing the search criteria such as dimension and color chosen from a listbox. These also include access to the application and other options to implement the software.

Output Requirement: The output requirement consists of a window to display the collection of image category in thumbnails. Each of the images displayed contains a link that displays a collection of images under it. The first display is known as image category, while the sub-images of the image category are known as the image collection.

Database

The database design is the creation of a conceptual model of a database that is structured for the insertion and retrieval of images. This consists of the image

retrieval table and the image insertion table.

Table 1.1: Photo.

Column Name	Data Type	Allow Null
Photo_Id	Int	No
ImageCategory_Id	Int	Yes
Filepath	Varchar(30)	Yes
Extension	Varchar(50)	Yes
Color	Varchar(50)	Yes
Width	Varchar(50)	Yes
Height	Varchar(50)	Yes
Name	Varchar(50)	Yes

Table 1.2: Photo Collection

Column Name	Data Type	Allow Null
Id	Int	No
Photo_Id	Int	Yes
Photo	Varchar(50)	Yes

System Data Flow Diagram

This shows a breakdown of the program modules and describes in details the information flow of the system.   It considers the required information for the implementation of the modules describe in the high level diagram. For the purpose of this work we shall limit our system function to the data flow diagram only.
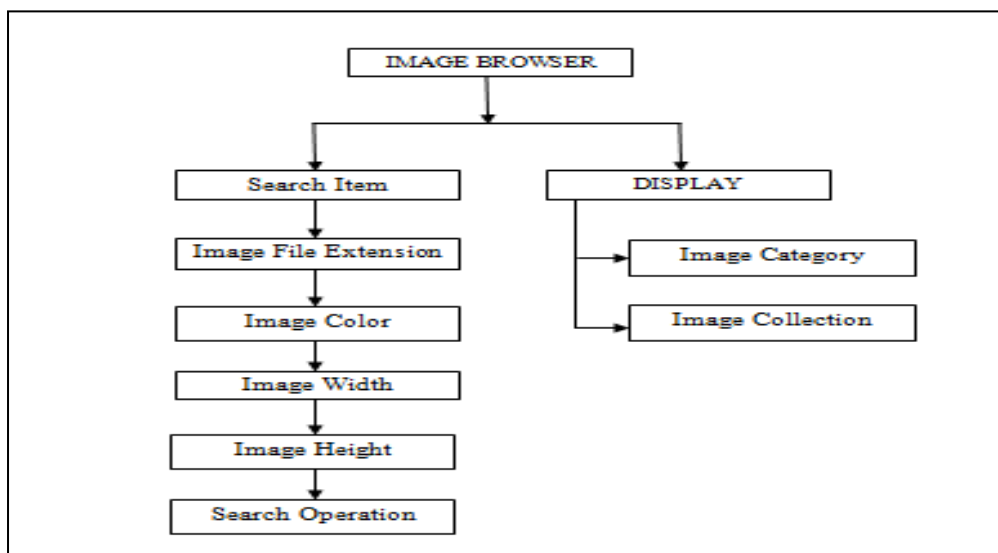

Figure 1.1: Data Flow Diagram

Figure 1.1: Data Flow Diagram

Program Flowchart

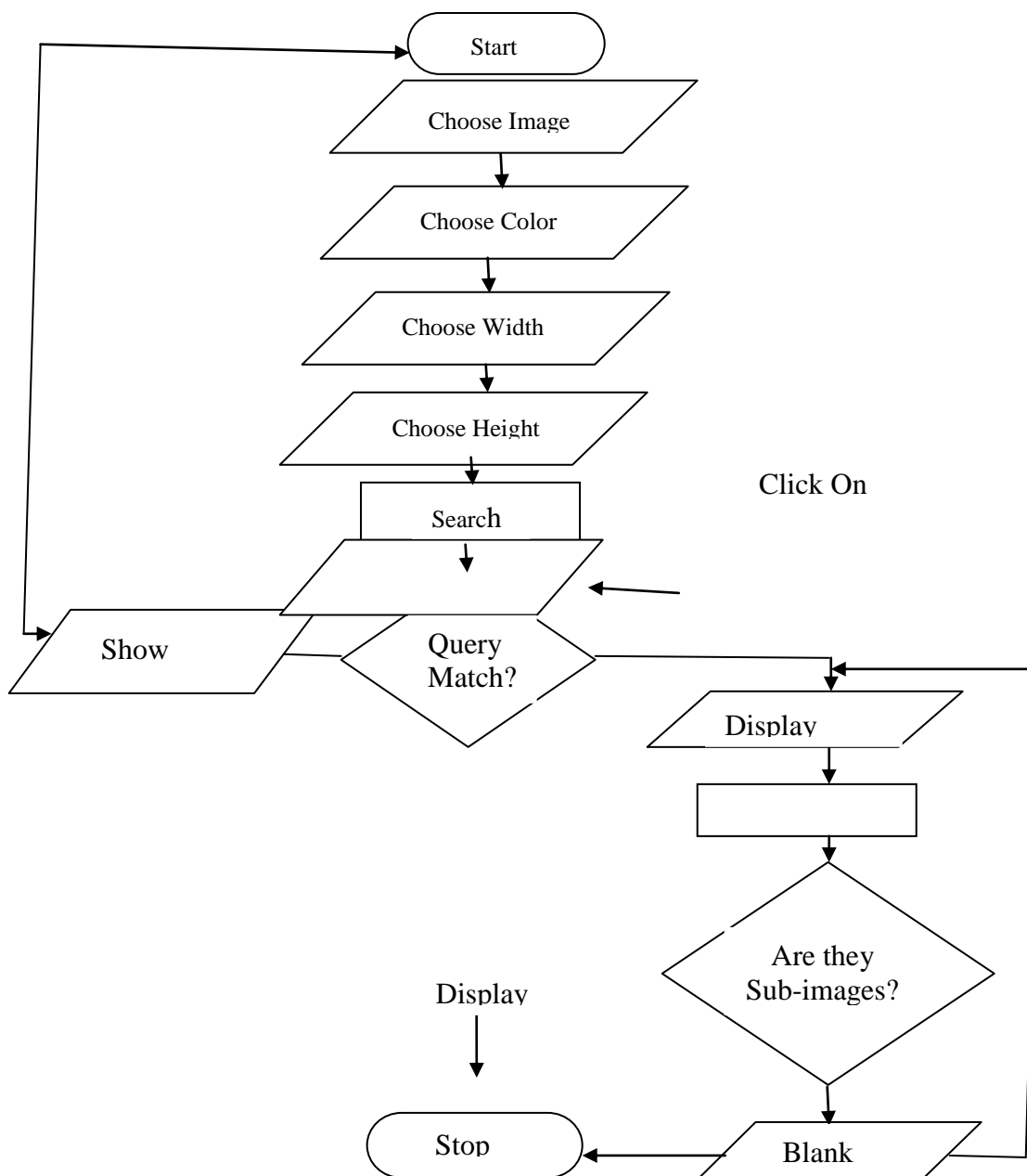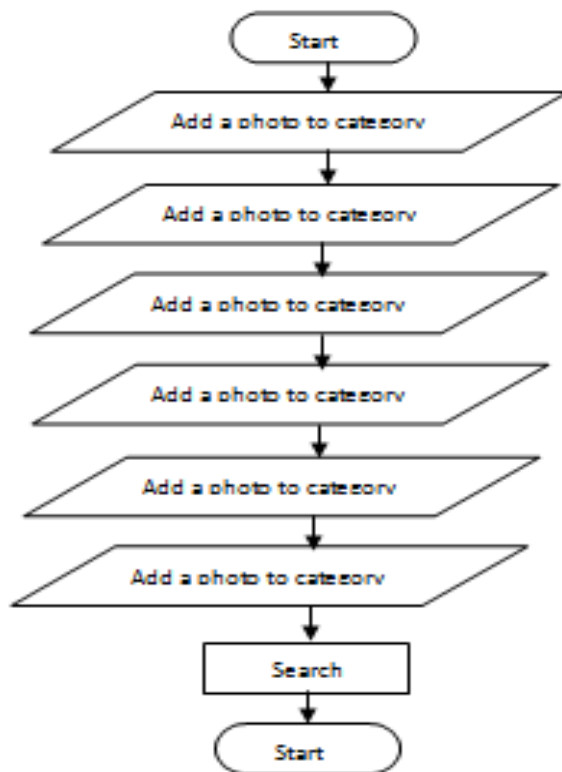There are three basic flow charts: User flowchart, image category flowchart and the image collection flowchart.

```
                    ┌──────────────┐
                    (    Start      )
                    └──────────────┘
                          │
                   ╱──────────────╲
                   ╲ Choose Image  ╱
                          │
                   ╱──────────────╲
                   ╲ Choose Color  ╱
                          │
                   ╱──────────────╲
                   ╲ Choose Width  ╱
                          │
                   ╱──────────────╲
                   ╲ Choose Height ╱
                          │                      Click On
                   ┌──────────────┐
                   │   Search      │
                   └──────────────┘
                          │
         ╱────────╲   ╱───────────╲
         ╲  Show   ╲ ╱   Query      ╲
                     ╲   Match?     ╱        ╱──────────╲
                      ╲────────────╱         ╲  Display  ╱
                                                   │
                                             ┌──────────┐
                                             │          │
                                             └──────────┘
                                                   │
                                             ╱────────────╲
                                             ╲  Are they   ╱
                                             ╱ Sub-images? ╲
                                             ╲────────────╱
                    Display                        │
                       │                    ╱──────────╲
                 ┌──────────┐               ╲  Blank    ╱
                 (   Stop    )◄─────────────
                 └──────────┘
```

Figure 1.2: User Flowchart

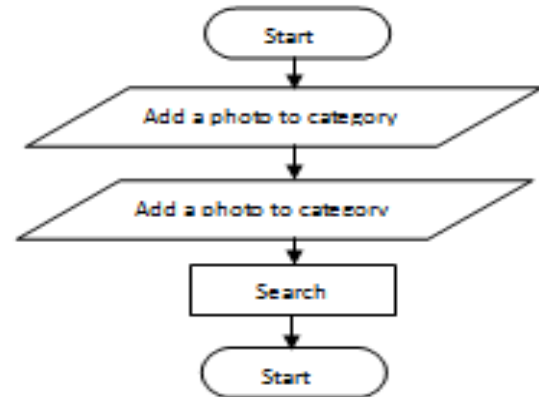7

Figure 1.4: Image Collection Flowchart

Figure 1.3: Image Category Flowchart

System Design and Implementation

The image search engine is a single interface application with other procedures that brings out the complete functionality of the application. The system components of the search engine are as listed below:

   i. arch item combo box
  ii. Extension textbox
 iii. Width textbox
 iv. Height textbox
   v. Color textbox
 vi. Search button
vii. Display area

The input required for the execution of the content-based image retrieval system is a query to the file extension of the image, color of the image, width and height of the image. All these attributes describe the relationship with the image search engine and what the user require.

Discussion of the Result

The main idea has been to structure the retrieval system of an image by it content. The retrieval method uses the criteria that are pertaining to a particular image as it can be identified by professionals in the field. The content is searched and retrieved with improved retrieval

efficiency. What makes it more efficient is that instead of performing the search on the entire image database, the image category option directs the retrieval engine to the specified category, such as sports, automobile, game, and so on. What is important here is the regular update of the image category database. See figures below:
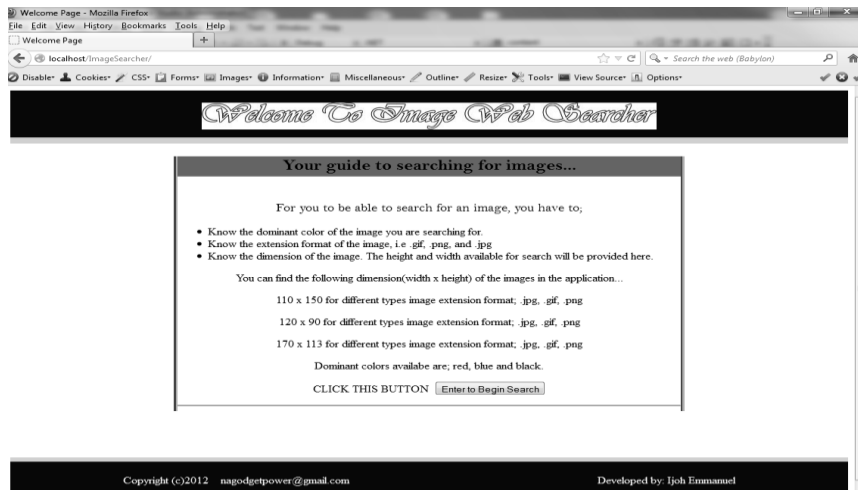

Fig. 2.1: Graphic User Interface showing the options to proceed or exit the program.
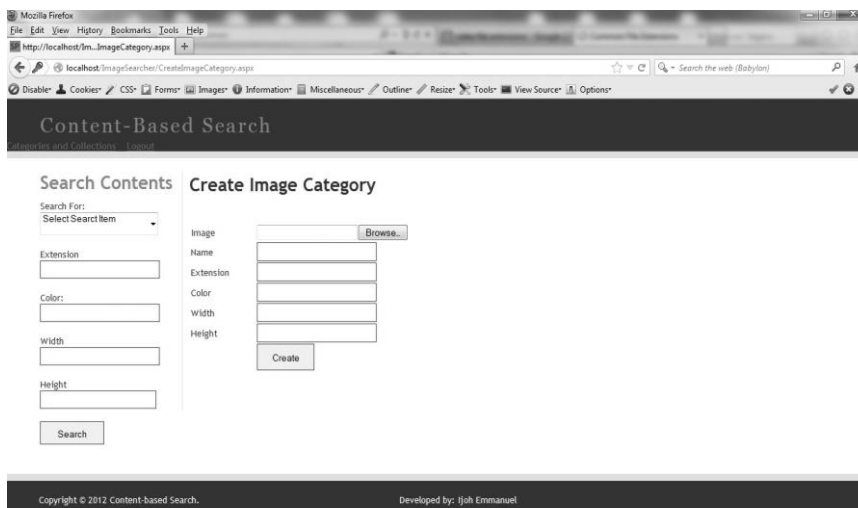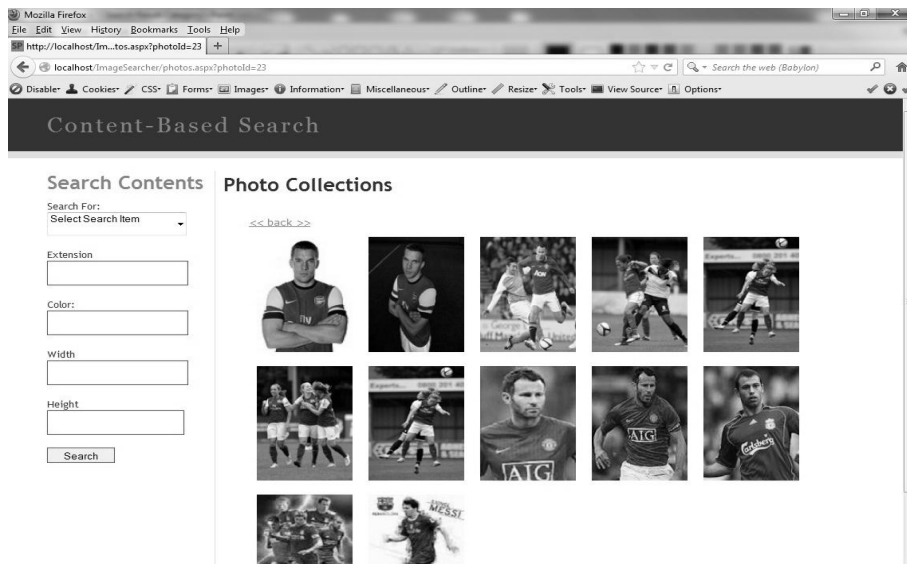

Fig. 2.2: Image Categorization Screen

Fig. 2.3: Image Collection Screen to add photo to the collections
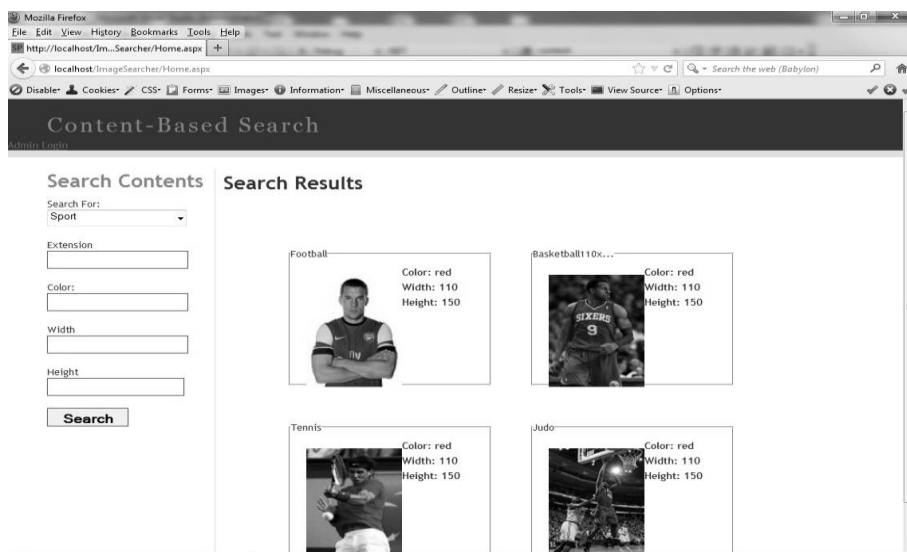

Fig. 2.4: Search result.

Notice that the result displayed indicates the parameters of the image as used in the search criteria, that is, the color, width and height of the image.

Conclusion

The main idea has been to offer a solution that will improve the results of searching for image. It could be from storage media or on the internet. The development of a content-based image retrieval system becomes necessary to structure the retrieval of an image by its content. Using the content criteria therefore provides an improved method that enhances the retrieval efficiency of image retrieval systems. It also provide a good alternative to the conventional retrieval pattern by making use search engine or browser that would search and retrieve images based on it contents.

References

[1]   Datta, R., John, D., and Wang, A. J. (2008). Image Retrieval: Ideas, Influences and Trends of the New Age, Michael West Publishers, USA.

[2] Gaurav, Jaswal, Kaul A. (2000). Content-based Image Retrieval – A Literature Review. National Institute of Technology, Hamirpur, India.

[3] Jerry, Z., Hallquist, A., Liang, E. (2002). Image-based Localization. (http://google.com) 26th May, 2013 at 4.00pm.

[4] John, E., and Graham, M. (2000). Content-based Image Retrieval, University of Northumbria, Newcastle.

[5] Remco, C. V., and Tanase, M. (2000). Content-based Image Retrieval System: A Survey (http://google.com), 13th June 2013 at 2.00pm.

[6] Stan, S., Taycher, L., and Cascia, M. L. (2005). Image Rover: A Content-based Image Browser and Image Digestion for the World Wide Web.

[7]   Van den Broek, F. L., Kister, P. M. F., and Vuupijl, L. G. (2004). The Utilization of Human Color Categorization for Content-based Image Retrieval, San Jose, CA.

[8] Yu Qian (2008). Development of a Perception Oriented Texture-based Image Retrieval System for Wallpapers, USA.