# Development System With The Attendance of Content Based Image Retrieval (CBIR)

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**ABSTRACT**

The application of robot system by using gray scale images and pre - process using the Wavelet Haar method, often applies some error to calculating similarity matrix values in the identification of a face image. The results for 1000 samples image, the processing time required takes 45-60 second. Thus, it requires the calculating similarity with color, texture, prewitt gradient (call these *Gx* and *Gy*). Retrieval (CBIR) is thoughtly more advantage, with its popularity and generating test by using time and accuracy level parameters. Content-Based in Content Based Image Retrieval (CBIR) works by measuring the similarity of the query image with all the images that exist in the data base, so that the query cost is proportional to the number of images in the database. The search for the most similar image has a range search by performing image classification that aims to reduce the query cost in CBIR. Implementation of web-based attendance system is using in calculating the similarity. This study is aimed to enable to extract the color features, texture and the edges of the face image by using prewitt gradient. The results of the feature extraction process are then be used by the software in the learning process and in calculating similarity. The learning image contained in 5 classes of features, images stored in data base query are 1000 bmp and jpg image, and the image of the test sample will be sized of 400 x 400. The results showed that the color feature combination, texture and edge detection with prewitt gradient magnitude, showed a significant effect i.e. higher accuracy level than by using gray scale image with Wavelet Haar Method. The face image Calculating similarity takes longer in processing time, which requires 20-40 seconds in time processing.



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## 1. INTRODUCTION

Robot system by using grayscale images and pre - process using the Wavelet Haar method [10], often applies some error to calculating similarity matrix values in the identification of a face image. The results for 1000 samples image, the processing time required takes 45-60 second. That is used commonly often caused error and the process takes 45-60 minutes for facial image identification. Meta image data consist of 1000 users ID, and common errors mostly happened in identifying user ID. It happened because the face image by ID takes longer time in processing and it still applies Wavelet Haar method. Classification process, identifying and counting the same image similarity take 65 seconds, then the success rate is only 65% of the attendance system. Retrieval (CBIR) is more advantage in application, with its popularity and generating test with time and accuracy level parameters. Content-based in Content Based Image Retrieval (CBIR) works by measuring the similarity of the query image with all the images that exist in the data base so that the query cost is proportional to the number of images in the database. Thus, it requires the calculating

similarity with color feature combination, texture and edge detection with Prewitt Gradient Magnitude and uses larger data storage.

The search for the most similar image has a range search by performing image classification that aims to reduce the query cost in CBIR. Content based image retrieval (CBIR) is a technique in which images are indexed by extracting their low level features, and this image retrieval is only based upon these indexed image features [1], [15]. In an effective image retrieval system, the user poses a query and the system should find some images that are somehow relevant to the query. Thus, the way of representing the query, the way of representing the images, and the way of comparing the query and the images are needed. This kind of approach is known as querying by content.

## 2. RESEARCH METHOD

### 2.1 Image Retrieval

Image search is a specialized data search used to find images. User may give a keyword, sketch or an image to search the engine image for retrieving the relatively similar images from the image databases. The similarity used for searching these criteria could be Meta tags, color distribution in images and region/shape attributes. Most traditional methods of image retrieval utilize some methods for adding metadata such as captioning, keywords, or descriptions to the images so the retrieval can be performed over the annotation words [9]. The limitations of text-based approach are subjected to human perception and the problem of annotation of images. Annotating every image is a cumbersome and also an expensive task.

Content-based image retrieval (CBIR) is the application of computer vision to the image retrieval problem, that is, the problem of searching for digital images in larger databases. The term 'content' in this context might refer to the color, shapes, and textures. The color aspect can be achieved by the techniques of averaging and histograms [2]-[4]. The texture aspect can be achieved by using prewitt [12]. Finally the shape aspect can be achieved by using prewitt gradient operators or morphological operators. Some of the major areas of application are: Art collections, Medical diagnosis, Crime prevention, the military, Intellectual property, Architectural and engineering design and Geographical information as well as remote sensing systems.

### 2.2. Content Based Image Retrieval (CBIR)

The images are very rich in the content such as in color, texture, and shape information which are presented in them. Retrieving images based on color similarity is achieved by computing a color histogram for each image that identifies the proportion of pixels within an image holding specific values (that humans express as colors). Color searches will usually involve in comparing color of histograms, though this is not the only technique in practice. Texture measures look for visual patterns in images and how they are spatially defined. The identification of specific textures in an image is achieved primarily by modeling texture as a two-dimensional gray level variation. The relative brightness of pairs of pixels is computed such in the degree of contrast, regularity, coarseness and directionality that may be estimated. Shape does not refer to the shape of an image but to the shape of the particular region that is being sought out. Shapes will often be determined firstly by applying segmentation or edge detection to an image. Other methods use some shape filters to identify given shapes of an image. In some cases, the accurate shape detection will require human intervention because methods like segmentation are very difficult to automate completely. Here are some discussions about shape extractions using edge detection masks, like in prewitt gradient operators.

#### 2.2.1. Color Feature

The color feature is one of the most widely used visual features in image retrieval, because the human vision system is more sensitive to color information than the grey values of images [11]. Generally, color features are extracted by using the color histogram technique [12]. The main issues regarding to the use of color histograms for indexing involve the choice of color space and the quantization of the color space. When a perceptual uniform color space is chosen, the uniform quantization may be appropriate.

$$h_{A,B,C}(a,b,c) = N.\Pr ob(A = a, B = b, C = c)$$

In this study, the developments of the extraction algorithms follow a similar progression:

a) The Selection of a colour space,
b) The Quantization of the colour space,
c) The Computation of histograms,
d) The Derivation of the histogram distance function,
e) The Identification of indexing shortcuts.

### 2.2.2. Shape Feature

Shape is the most important and most powerful feature used for image classification, indexing and retrievals. Shape information extracted using histogram for edge detection. The edge information in the image is obtained by using the prewitt edge detection [7]. In shaping, the two edge detection techniques are applied in comparing between both of these techniques. Shapes representations can be generally divided into two categories, they are Boundary-based and Region-based, see Figure 1.

Figure 1. Boundary-based and Region-based Images

### 2.3 Prewitt Edge Detection Technique

The Prewitt operator performs a 2-D spatial gradient measurement in an image. The applying convolution K to pixel group p can be represented as:

$$N(x,y) = \sum_{k=-1}^{1} \sum_{j=-1}^{1} K(j,k)p(x-j,y-k)$$

The Prewitt Edge Detector uses two convolution kernels, one is to detect changes in vertical contrast (hx) and the other is to detect horizontal contrast (hy). The Prewitt Edge Detector uses two convolution kernels, one is to detect changes in vertical contrast (hx) and the other is to detect horizontal contrast (hy).

$$h_x = \begin{bmatrix} -1 & 0 & 1 \\ -1 & 0 & 1 \\ -1 & 0 & 1 \end{bmatrix}$$

Figure 2. Detect vertical contrast (hx)

$$h_y = \begin{bmatrix} -1 & -1 & -1 \\ 0 & 0 & 0 \\ 1 & 1 & 1 \end{bmatrix}$$

Figure 3. Detect horizontal contrast (hy).

These kernels are designed to respond maximal to the edges, running vertically and horizontally, relative to the pixel grid, one kernel for each of the two perpendicular orientations. The kernels can be applied separately to the input image, to produce separate measurements of the gradient component in each orientation (call these *Gx* and *Gy*). These can then be combined altogether to find the absolute magnitude of the gradient at each point and the orientation of that gradient [12], [13]. Typically, the steps used to find the approximate absolute gradient magnitude at each point in an input grayscale image can be seen as follow:

a) The Prewitt edge detector uses a pair of 3×3 convolution masks, one is to estimate the gradient in the x- direction (columns) and the other is to estimate the gradient in the y-direction (rows).
b) A convolution mask is usually much smaller than the actual image. As the result, the mask is slid over the image, manipulating a square of pixels at a time.
c) If we define A as the source image, and Gx and Gy are two images which at each point contain the horizontal and vertical derivative approximations, then the masks will be marked as follows:

| | |
|---|---|
| -1 0 1 | -1 -1 -1 |
| -1 0 1 | 0 0 0 |
| -1 0 1 | 1 1 1 |
| Gx | Gy |

The magnitude of the gradient is then calculated using the formula:

$$|G| = \sqrt{G^2x + G^2y}$$

d) Approximate magnitude can be calculated using:

$$|G| = |Gx| + |Gy|$$

e) The angle of the orientation of the edge (relative to the pixel grid) which is giving rise to the spatial gradient is given by: $\theta = \arctan(Gy / Gx)$, when $G_x = \delta f/\delta x$, $G_y = \delta f/\delta y$

Edge detection is very important in the image analysis. As the edges give the idea about the shapes of objects present in the image, they are useful for segmentation, registration, and identification of objects in a scene. An edge is a jump in intensity. The cross section of an edge has the shape of a ramp [5], [6]. An ideal edge is a discontinuity (i.e., a ramp with an infinite slope). The first derivative assumes a local maximum at an edge. The various gradient operators used for edge extraction is Prewitt. Prewitt Operator is a discrete differentiation operator, computing an approximation of the gradient of the image

intensity function. The Prewitt operator is based on convolving the image with a small, separable, and integer valued filter in horizontal and vertical direction and is therefore relatively inexpensive in terms of computations.

## 3. RESULTS AND ANALYSIS

In our system, we propose a multi feature extraction methods e.g. color, texture, prewitt gradient, Gx and Gy edge detection techniques. The Application system is done in two stages, processing of learning and classification. Input learning process is a process by learning the input image stored in the database with a different class and index image data in a database as input data for searching similarity images. The application of the system is web-based. The system will calculate and display the similarity of 5 images at once. Displayed image will be classified by color, texture and prewitt gradient (call these *Gx* and *Gy*). The overall system is shown in Figure 4. The results of te feature extraction in learning process calculate the similarity. 1000 images contained in the 5 classes learning features is stored in query data base image. The size of the image test samples is 400 x 400.

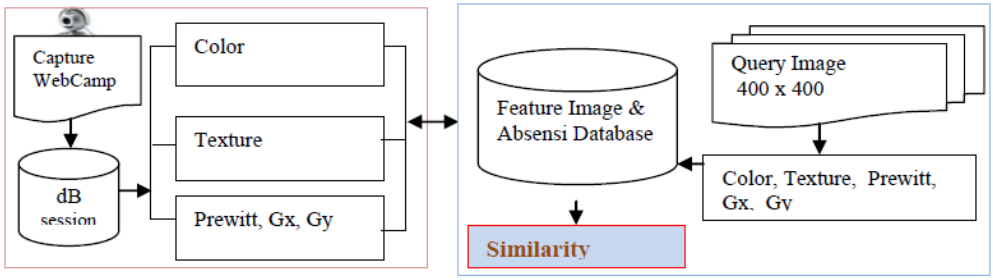


Figure 4. System Overview

### 3.1. User Management and User List

The stages of the user list and Management of users contained in Figure 5. Figure 6 Stages, the attendance systems shows the results as follow:

a. The system can store the entire data member, user include: image, image index, ID and user name.
b. The system provides a facility used to capture the user's face capture, and store the database db Feature. c. Pre-process the image, i.e. the colour, texture, gradient prewitt (call these *Gx* and *Gy*) measuring 400 x 400.

Management of user used input data and image capture to complete users' bio-data and to capture the image that has been entered as a ratio of the input image with a database image of the sample contained in Figure 5 and Figure 6 as a list of uses. Attendance sytem by user could be seen by displaying color imagery, texture, and prewitt gradient (call these *Gx* and *Gy*).

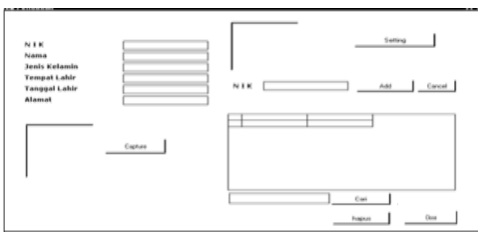

Figure 5. User Management

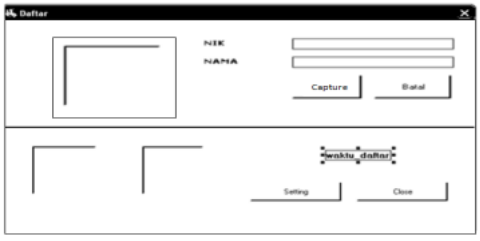


Figure 6. User List

### 3.2. Learning Process

Learning process is the input of a collection of learning software image that has been known as the class label. All learning process will be extracted its image with color, texture, and the gradient prewitt (call these *Gx* and *Gy*). The results of the feature extraction process will be stored in the image database. The following are the steps being taken in the process of learning test:

a. Read the data bitmap and jpeg image learning
b. Feature extraction processes are texture, prewitt gradient (call these *Gx* and *Gy*).
c. Save on ramp session in dB Session

### 3.3. Classification

Classification process is a testing image process which is making the process of feature extraction.
The results of the feature extraction stored in dB Session will be compared with the features stored in a database image classification. The Tests are to determine the class label image and to display the image done in most similar ways. The Steps in classification process can be seen as follow:

a. Read the data bitmap, jpeg and image testing
b. Feature extraction processes are: colour, texture, prewitt gradient, Gx, Gy.
c. The test results that image feature extraction and learning features images stored in the database classification. Image database contains total 1000 images with 5 categories, see Figure 7.
d. Vote to determine the class label image
e. Display the most similar images based on their colour, texture, prewitt gradient Gx, Gy and automatically connect to the data base of the attendance.

Figure 7. Some Images Samples from session Image Database

### 3.4 Implementation And Result

The implementation of the system is using php web, and computer specs ASUS i3 Processor (2.1 GHz) with 2 GB RAM. The corresponding result performs image classification process and displays the 5 most similar images based on the original image, texture, gradient prewitt (call these *Gx* and *Gy*). Picture test results obtained in accordance with the ID test, the name displayed in attendance system based on the appropriate systems, tests are provided in Figure 8. Tests on the same image classification took an average of 20-40 seconds, see Figure 9.


Figure 8. Display the 5 most similarity images

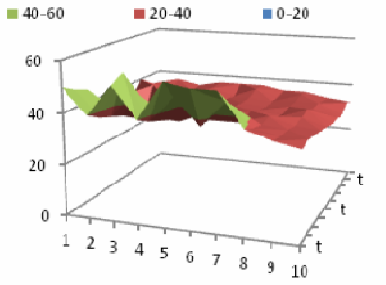


Figure 9. Result Times

## 4. CONCLUSION

The results of the testing system performed image classification and displayed 5 most similar images which are; the original image, texture, gradient prewitt, Gx and Gy. The test resulted for 5 trainings on the image was to obtain the right result, and in accordance with the ID, and the name listed in the attendance system. Results showed that the combination of features of color, texture and edge detection prewitt with gradient magnitude gave a significant effect to a higher level of accuracy than by using grayscale images with Haar wavelet method. The face image in Calculating similarity requires longer processing in time, approximate in 20-40 seconds.

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