Automatic Classification of Digital Archives- A Food and Beverage Restaurant for Example

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Abstract

A digital archive is a digital database, which is built by the internet, websites' culture and information techniques. Modern Restaurant Manager faces numerous digital photos and videos, which are high correlation to cuisine and organizational knowledge improvement. Numerous institutions archives are going digitalized. Except website marketing for a restaurant, education of employee is also a new trend for e-enterprise in a restaurant. This study tried automatic classification of cuisine photos into restaurant's digital database; it would reduce manager working time for selection of cuisine photos, which were applied to employee education. Maybe we can easily classify few archives into database; however, thousand of photos are not economic for human manual classification. This research developed a new algorithm for visual reorganization for cuisine photos, and coded as a software for real world practical application. The experimental results showed that the proposed approach could contribute to e-enterprise knowledge management. It would be easily transferred into others industries.

Keywords: Image Recognition, Employee Education, E-Enterprise, E-Restaurant, and Cuisine Photo Algorithm.

1. Introduction

A digital archive is a digital database, which is built by the internet, websites' culture and information techniques. Modern Restaurant Manager faces numerous digital photos and videos, which are high correlation to cuisine and organizational knowledge improvement. Numerous institutions archives are going digitalized. Except website marketing for a restaurant, education of employee is also a new trend for e-enterprise in a restaurant. Maybe we can easily classify few archives into database; however, thousand of photos are not economic for human manual classification.

Image characteristics recognition is an important issue in modern information technology. Artificial visual technique replaces plant of duplicated work in our environment. Thousands of research applied image characteristics recognition into medical industry, etc.; however, there were few literature applied into food and beverage industry. On the most of them, there were fewer literature applied image characteristics recognition into employee education of an e-enterprise restaurant.
In this study, automatic classification of cuisine photos into restaurant's digital database would be discussed. This research would develop a new algorithm for visual reorganization for cuisine photos. The proposed approach could contribute to e-enterprise knowledge management, to help modern restaurant manager faces numerous digital photos for training their employee through internet photo or others photo database.

2. Literature Review

Image recognition is that of determining whether or not the image data contains some specific object, feature or activity. Cheng *et al.* [2] developed an algorithm to recognize unsound wheat based on image processing and artificial neural network. The sample used for this study involved wheat from major producing areas of China. Images of wheat were acquired with a color machine vision system. Each image was processed to extract shape and color quantitative features. All features were analyzed with principal components analysis method. A two-layer back propagation network was created and trained using gradient descent with momentum and adaptive learning rate. Wu *et al.* [9] presented a blood perfusion model of human faces based on thermodynamics and thermal physiology. Their target was to convert the facial temperature data which are liable to ambient temperature into consistent blood perfusion data in order to improve the performance of infrared (IR) face recognition. Adjouadi *et al.* [1] proposed a new algorithm to optimize the pattern recognition of different white blood cell types in flow cytometry. The behavior of parametric data clusters in a multidimensional space was analyzed using the learning system known as Support Vector Machines (SVM). Beckman-Coulter Corporation supplied flow cytometry data of numerous patients to be used as training and testing sets for the algorithm. Subsequently, the characteristics of the cells provided in these sets were used to train a SVM based classifier. The objective in developing this algorithm was to identify the category of a given blood sample and provide information to medical doctors in the form of diagnostic references for a specific disease state, lymphocytic leukemia.

Kumar *et al.* [4] introduced the use of describable visual attributes for face verification and image search. Xu *et al.* [10] presented that fingerprint recognition,

face recognition, voice recognition and other biometric technology are experiencing rapid development. Osowski *et al.* [5] presented the application of a genetic algorithm (GA) and a support vector machine (SVM) to the recognition of blood cells based on the image of the bone marrow aspirate. The main task of the GA was the selection of the features used by the SVM in the final recognition and classification of cells. Pillai *et al.* [6] stated that non-contact biometrics such as face and iris had additional benefits over contact based biometrics such as fingerprint and hand geometry. Wang *et al.* [8] published that water-soluble CdTe/CdS quantum dots (QDs) were synthesized in aqueous solution with captosuccinic acid as a stabilizer. The absorption and fluorescence spectra showed that the as-prepared QDs had good optical properties. In their research, a cell would be recognized. However, this study focused on red blood cell recognition.

Rezatofighi et al. [7] published that an automatic system which was capable of recognizing white blood cells can assist hematologists in the diagnosis of many diseases. In their paper, they proposed a new system based on image processing techniques in order to recognize five types of white blood cells in the peripheral blood. To segment nucleus and cytoplasm, a Gram-Schmidt orthogonalization method and a snake algorithm were applied, respectively. Moreover, three kinds of features were extracted from the segmented areas and two groups of textural features extracted by Local Binary Pattern (LBP) and co-occurrence matrix were evaluated. Best features were selected using a Sequential Forward Selection (SFS) algorithm and performances of two classifiers, ANN and SVM, were compared. The results demonstrated that the methods were accurate and fast enough to execute in hematological laboratories. In their research, recognition techniques would be applied into recognizing white blood cells.

Although numerous literatures were related to image recognition, there is only a limited amount of literature available on cuisine photos recognition.

3. Research Method

This section contains three segments to discuss, 1.The system development process and structure; 2.The system development concept; 3.The special features of the system:

A. The System Development Process and Structure

The system development process takes the prototyping angle to carry on [3]. The prototyping is the target of the development to adopt the right strategy and correction to fit the system goal. The web site is an adoption of a three-layer structure, using the Linux system environment, the interface language is PHP and the database is MySQL database. When it is finished, the general users can easily query or discuss information from the website.

B. The special features of the system

The special feature of the system is to demonstrate the recognition approach (see figure 1). First, a cuisine photo was digitalized by Matlab 2010 software. The photo would be transformed into RGB (three basic elementary color) array. In order to reducing complexities, the photo would be re- transformed into gray mode following RGB step. After that, the *Cuisine Photo Algorithm* (*CA*) was compiler as executive file and coded by Visual Basic 5. The next section would describe the detail steps of cuisine photo algorithm. Finally, the system will output the classification data of the photo recognition results. The recognition system contributed that it would reduce manager working time for selection of cuisine photos, which were applied to employee education.

C. The *Cuisine Photo Algorithm*

The *Cuisine Photo Algorithm* (*CA*) would determine the object shape and degree of grey. The steps for *CA* were (1) Eliminate the background color (2) Recognize the main shape of object (3) Determine the degree of grey (4) Redraw the photos (5) Classify the photos and save them into a database. The descriptions of steps (see figure 2) were as follows:

Step 1: Eliminate the background color

Unrelated background color would affect identification of main shape of objects. In the beginning, it has to be eliminated form the photos of image array, which come from the grey data array.

Step 2: Recognize the main shape of object

The main shape of object plays a key role on image identification. The searching procedure would compare the main shape with known data, which were already saved in database. If any new shape occurs, the program would ask the user try to name the new main shape of object.

Step 3: Determine the degree of grey

The program will transfer the data array into several levels. The circle main shape maybe represents an apple or an orange. However, the degree of grey (DOG) is one of the important characteristics within an object. If the program classifies certain object into a specific data set, it must have a similar DOG.

Step 4: Redraw the photos

In order to verify classifier, the program will output the redraw pictures, which come from the original photos.

Step 5: Classify the photos and save them into a database

To calculate the similarity scores, classify the photos into different data sets and save them into a database.

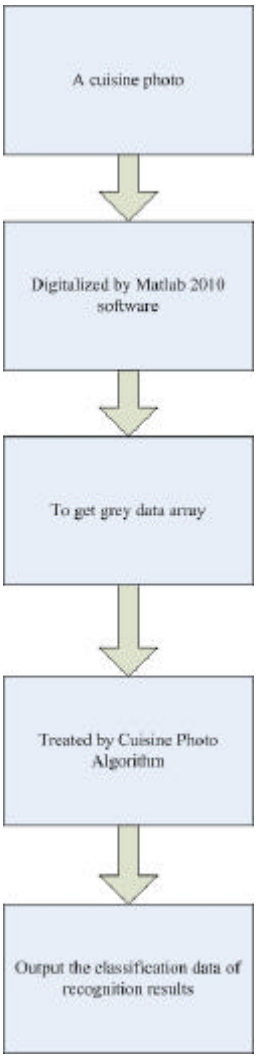

Figure 1. The special features of the system

4. Computation Results and Discussion

The experiments proceeded on the basis of the proposed algorithms. We used a Pentium IV (Celeron CPU 2.40GHz) computer for the computations. In figure 3 and 4, it showed that the original photo and redraw photo. The shape of object was easily been seen. The number of symbols were represented as the degree of grey (DOG). Due to *CA* – Step 3, if the program classifies certain object into a specific data set, it must have a similar DOG; although the Cuisine Photo I and Cuisine Photo II were both near a circle shape, however, the program will put them into different two data set because the DOG in total were entirely different. After that, the software put the original photo and redraw photo into a particular data set in the MySQL database.

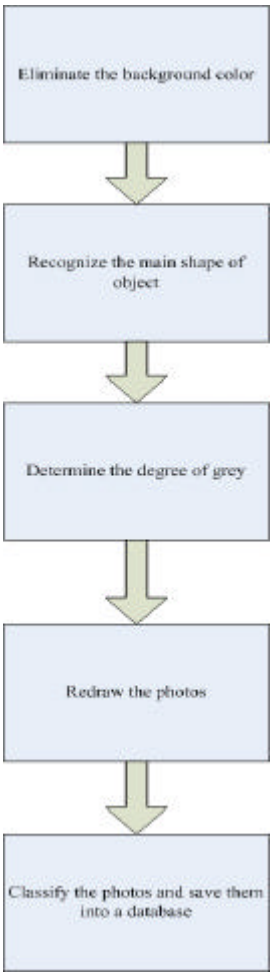

Figure 2. The Cuisine Photo Algorithm

Figure 3. The Cuisine Photo I

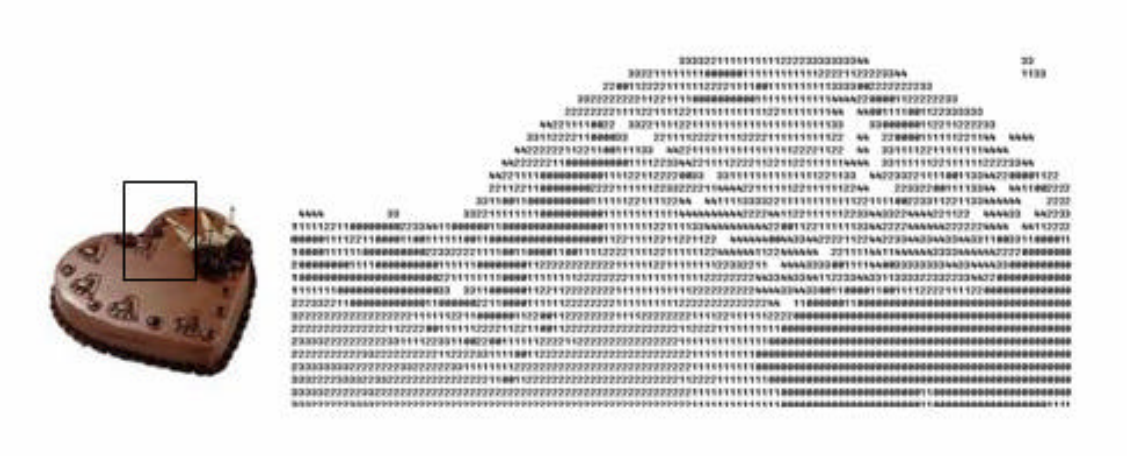

Figure 4. The Cuisine Photo II

5. Concluding Remark

A digital archive is a digital database, which is built by the internet, websites' culture and information techniques. Modern Restaurant Manager faces numerous digital photos and videos, which are high correlation to cuisine and organizational knowledge improvement. Numerous institutions archives are going digitalized. Except website marketing for a restaurant, education of employee is also a new trend for e-enterprise in a restaurant. This study tried automatic classification of cuisine photos into restaurant's digital database; it would reduce manager working time for selection of cuisine photos, which were applied to employee education. Maybe we can easily classify few archives into database; however, thousand of photos are not economic for human manual classification. This research developed a new algorithm for visual reorganization for cuisine photos, and coded as a software for real world practical application. The experimental results showed that cuisine photos were easily to be classified by the proposed Cuisine Photo Algorithm. It could contribute to e-enterprise knowledge management. It would also transfer techniques easily into others industries.

6. References

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