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Social network design with facial recognition

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Abstract

This paper presents the idea of an online social network that uses facial recognition technology. By using this technology, it is possible to establish a friendship relationship without the need to have the textual information of the user, and the friend recommendation algorithm can be made more accurate and the face tag can be done automatically. The purpose of this article is to familiarize users with face recognition system technology in online social networks. that users can use this system instead of text information to communicate. The current research method is statistical community research, sampling and virtual space tools, validation and final review, and diagnostic analysis that examines the design of social networks with face recognition, so it is one of the practical methods. The findings include system architecture, user database, face recognition web service, friendship algorithm and experiment implementation, the results show that online social network face recognition technology provides features that improve user experience and user-friendliness compared to existing networks.

Keywords: Face tag, Social networks, Face recognition, User's face

Introduction

A social network is a set of people (or organizations or other social entities) that are connected by a set of meaningful social relationships Online social networking has become very popular in recent years. Some popular social networking websites have hundreds of millions of registered users. On these types of sites, users can update their personal profiles, notify their friends, play games, and share photos with their friends internationally. To find a friend, websites usually rely on textual information such as email addresses, friends' names, school friends' names, etc., and the approach in this paper is that, we argue that face recognition can be used to improve friend search and Use other services in the online social network [1].

problem statement

This paper explains that facial recognition can be used to improve friend search and other online social networking services [1].

The importance of the subject

To communicate on social networks and websites, and find friends, we must use text information such as email, friends' names, school names, etc. The social network uses facial recognition to make friends or other services in the social network [1].

Research objectives and hypotheses

The purpose of this article is to justify users, who can use face recognition option for faster and easier communication instead of using text information for dating or other services in social networks [1].

Literature and history

Research on automatic face recognition can be traced back at least to the 1960s [2]. However, most facial recognition algorithms were developed in the 1980s and 1990s. Two of the most common are principal component analysis (PCA) and independent component analysis (ICA). Kirby and Sirovich were among the first to apply PCA to face images and showed that PCA is an optimal compression scheme that minimizes the mean, squared error between the original images and their reconstruction for any given level of compression [3][4], Turk and Pentland popularized the use of PCA for face recognition [5]. PCA matched the images in the database by mapping them onto basis vectors and finding the closest compressed image in the subspace (called eigenspace). ICA can also be used to create feature vectors that uniformly distribute data samples in their subspace [6][7]. This uses a very different concept than ICA to produce feature vectors that are not spatially localized. Instead, it produces feature vectors that make accurate distinctions between similar images in order to spread the samples in the subspace [8].

research method

The current method of statistical community research is sampling and virtual space tools, validation and final review, and diagnostic analysis that examines the design of social networks with face recognition, which is considered one of the practical methods. And also, the basic method is considered. Research tools include Windows Linux, Word 2021, Photo shop 2023, Adobe PDF 2021, Internet search engines, scientific sites in the media space.

findings

Although facial recognition technology is well established, no online social network uses it. This

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technology can provide a number of benefits of online social networking, including:

1. Friends can search their friends even without text-based information from photos. This is especially useful when we have just taken a photo with a new friend but forgot to exchange contacts

2. Friend recommendation algorithm can be more accurate because it can use information based on text and face.

3. Face tagging can be done automatically using face recognition technology.

In the rest of this article, we will show the design and architecture of our proposed online social network with facial recognition functions. After that, we will show how to use facial recognition technology to design a new friendship search algorithm, create friend recommendation lists, and design photo-based search and matching functions. Finally, we will discuss the system implementation and show our social network prototype [9].

Table number 1

Comparison of online social networks with and without facial recognition technology

	Existing social networks	Social networks using face recognition technology
Forming a relationship	The personal information of a friend is needed	Any face of a friend appearing in any pictures of the user is sufficient
Searching and recommending a friend	Using text-based search algorithm	Using face-recognition algorithm
Tagging a person	Manually	Automatically

System architecture

As shown in Figure 1, the system consists of three components:
✓ User database
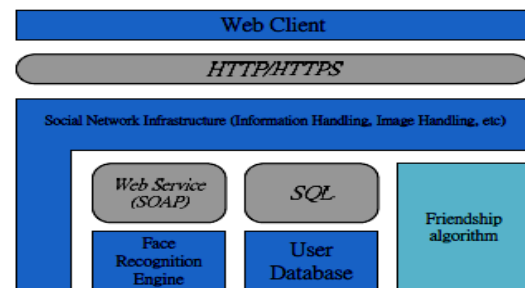✓ Face recognition web service
✓ Friendship algorithm

A. User Database
a. User database
In addition to basic user information, facial recognition information is also required. Options include:
✓ Face - the identity of the user's face, type and subject.
✓ Photo - photo information, ID and subject.
✓ Photo Comment - Comment on any photo on any user's profile
✓ Friendship - communication information between each user
✓ Identification - connection information between photo faces and each friend

Invitation - Information about inviting people between user and friendship tables, invitation message and invita tion status [9].


Figure 1. System architecture

Face Recognition Web Service

Face recognition web services perform face recognition tasks. And using face recognition engine, it implements localization, registration and face matching using digital image processing algorithm. The face recognition process consists of a number of steps as shown in Figure 2 [9].
The normal procedure consists of two parts:
 Reference sectionIdentification section In the reference process, the face detection engine first detects
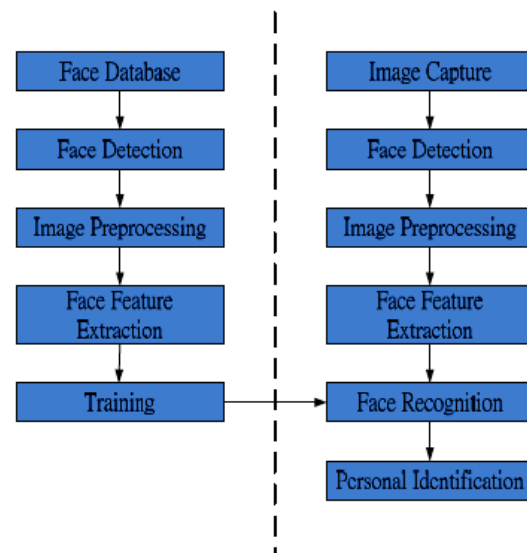
Figure 2. Common face recognition process
faces for the raw image from the photo. It then converts the photo to grayscale to remove the lighting effect and performs some image processing (PCA or ICA) to get a lower resolution of the face. After that, it extracts the feature of the face and stores the face in the training database. In the face recognition process, the engine moves, through these procedures it extracts the face feature and compares it with the training database. But in our implementation, we will perform normalization before storing in the training database. We normalize every face to the same resolution and size it can scale [9].

Table No. 2
Cases Considered In The Friendship Algorithm

Case	Description	Unit	Weighting
My album	People appeared in my albums	No. of appearance	10
Indirect friend	Friend of my friend	No. of common friend	8
Friend's album	People appeared in my friend's albums	No. of appearance	6
Photo with me	Someone has photo that includes myself	No. of appearance	4
Co-photo	Someone and me in the same photo	No. of appearance	2

the speed of the identification face. After the face recognition step, it will provide a score for the face id entity. The face recognition service is provided by the way of Web services, which can make the system more scalability. When the system becomes larger, the face recognition process could become the per form ance bottleneck. Because the face recognition service is provided by web services, more face recognition engine scan be added easily [9].

Friendship Algorithm

The friendship algorithm is used to provide there commendation list for the users. The algorithm make suse the faces recognized in different cases to generate recommendation list. The cases used and the corresponding weighting for each case are shown in

Table 2. Note that the exact values the weighting can be revised if necessary. The friendship algorithm considers different case, and in each case there is a weighting associated. From the values of the weighting, it can be seen that priority has been considered in the friendship algorithm. That is, higher priority is given to the owner's direct relationship and lower priority to the indirect relationship. As a result, a final score for each face can be generated by using the following formula:

The final score equals = No Appearance (my album) x 10 + mutual friend number (indirect friend) x 8 + no. ofappearance (album friend) x 6 + no. Appearance (photo with me) x 4 + no. Appearance (joint photo) x 2   :(1)

The highest score of the face will appear the topof the recommend list, and the lower score faces will appear below the highest recommend friend according to thes core Based on these final scores, the friendship algorithm will recommend the face to the user when the scor higher than a threshold [9].

Implementation

A. Information Handling

The information handling process is the core development of the social network service, as shown in Figure 1. We used the PHP script language to develop this part. The functions are handling the user accounts, photo albums, searching and messaging. We use MySQL to implement our user database [9].

Face recognition process

During the face detection process, we make some optimizations:
- ✓ Convert image to grayscale.
- ✓ Extract the image with face detection.
- ✓ Resize the face to a suitable size.
- ✓ Store the face with base64-encoded string to face
- ✓ database.

of each face and improve the performance of face matching. It can also reduce the process of storing the raw faces as the faces have been downsized. The based64-encoded string will be used in the implementation of the face reorganization web service.

Each user can store multiple face identities -- one main identity and other supplementary identities. So the user can store the current face as the main identity and some old faces as supplementary identities. These faces will store in the trained database for face matching uses. After the comparison, the engine will give the face identity a score. We choose the score 50 as the basic recognition standard. Score 50 means nearly 0.01% off alse acceptance rate (FAR). It is a very acceptable figure for the face recognition. Once the score of matching faceis larger than 50, we would expect the matching face is the same as the reference face[9].

Face Recognition Engine

To implement the face recognition engine in our online social network, we use Veri ook SDK [8] Ver loo k SDK is a software development kit for face detection and face recognition. It supports multiplatform, Windows Linux and MacOS. It also can support C/C++, C#, VB, Java and Delphi as development language. It contains two major components -- extractor and matcher. It also provides a camera manager library to support simultaneous capture from multiple cameras. The matching speed of the engine is 100,000 faces per second in 1:N identification. It supports live face detection, multiple face processing. Our effort in this section is to use Veri Look SDK and create a web service for face recognition. We design this engine using a web service that can provide backend service with one or more servers. The advantage of turning it into a backup service is that if facial recognition technology changes in the future, the backup service can be replaced without having to change it. other components. In fact, this prototype only uses a few simple methods to identify and recognize faces. So from a distance As shown in Figure 3, the service is limited to five methods, Detect Faces, Compare Face, Compare Multipl e Faces, Compar e Multiple Score and Compare Mulitple To Multiple Faces. They performed all necessary facial recognition and authentication functions for our web service [9].
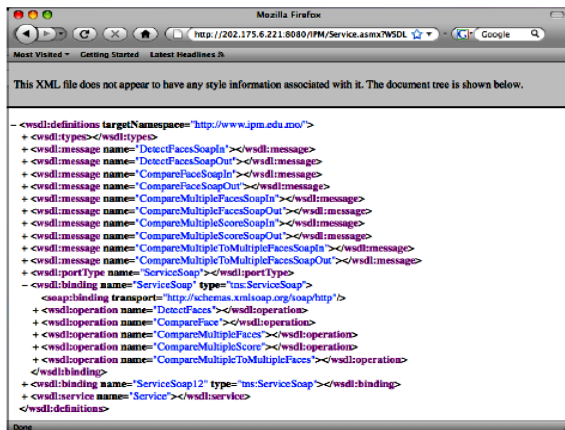
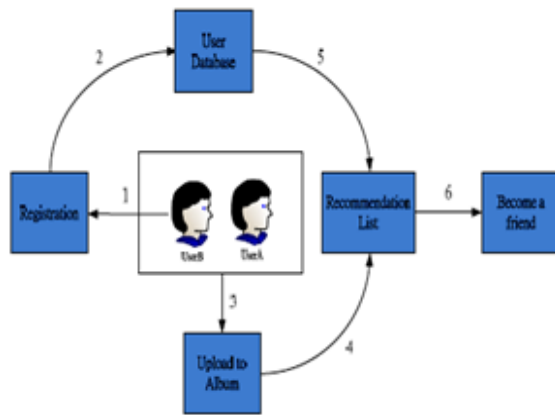**Figure 3. Web service definition**

Figure 4. Establishing a friendship with the face recognition process.

D. System Operation

Figure 4 illustrate the system operation of how a user (User B) meets another (User A) using the face recognition technology

✓ Firstly, when User B registers to the system, besides his basic personal information, he needs to submit a photo containing his face clearly.
✓ When the system receives his face, it will look up the face in the database about User B. If the face does not exist, it will add the face to the database.
✓ Suppose User A has taken a photo with User B in asocial event, and after the event, User A uploaded the photo to his album in the system.
✓ The system will try to detect the faces on the photos User A just uploaded.
✓ Since the system has the faces of User A and User B, it will put their relationship to the friendship algorithm to rank and make the recommendation lists for both User A and User B.
✓ As a result, User A can find User B in his recommendation list, and vice versa. After the friend in vitation by either User A or User B, they can become friend.

Testing

In the final stage of the development, a set of sample data was used for testing the functionality, acceptance

and accuracy of the system. The sample data will in clude some text input, photo upload and comparison test. Some sample accounts and qualified photos are required for this test. We have collected the sample data of 30 users from existing social network application. The size of photo willbe adjusted to around 30k for faster web page response and lower network latency. But the quality of the photos and faces must be maintained to an acceptable ratio [9].

The following testing procedures were run to ensure

✓ the correctness of the system:
✓ Create multiple user accounts.
Upload the user photo that the face will be used as a face identity.
✓ Create albums with multiple accounts.
✓ Upload photos to multiple albums.
✓ Run the friendship algorithm scripts to create[9].

recommend lists.

✓ Make friends with or without the recommend lists.
✓ Click in the photo to examine the face tagging in album.

After testing the correct operations of the system, we have invited about 70 new users to use the system for testing user interface and performance. In the a bove testing stage, we have set up one machine for handling social network infrastructure and user database to serve web client, and set up another machine for handling face recognition engine to provide Web service. The configurations of the machines are:

✓ Core 2 Duo 3.0 GHz
✓ 1GB DDR2 Memory
✓ 250GB SATA II Hard Drive [9].

Demonstrations

In this section, we will demonstrate how our online social network provides the features of recommendation list from photos, face identity database and face tagging

Testing

Figure 5 shows the first page after the user logged in the system. The recommend list is shown on the lower left hand side. By clicking on the "Recognize my faces, the user can upload photo to the face identity data base. User may upload photo with the user face only or with other friends. The system will detect the faces and let the user choose the right face for the database. After this

process, the user will have the face identity for the system. The user may have more than one face identity in the system. When the user clicks the "edit" link beside the "Recognize my faces", the corresponding face data base will appear, as shown in Figure 6, so that the user can delete or choose the right head for the profile. This face database is actually a trained database of face recognition process. It stores all the

possible face identities for face matching process in the friendship algorithm processing.

Face Tagging Face tagging is a very useful feature in the system. The existing social network web sites commonly require a user to manually select and type name in the appropriate area of a picture. As our system employs the face recognition technology, it can recognize face automatically without user interaction. If the user forgot the name of his friend, he can use the feature to list the name of his friend from the name tagging [9].

Figure 5. Web interface – my desktop
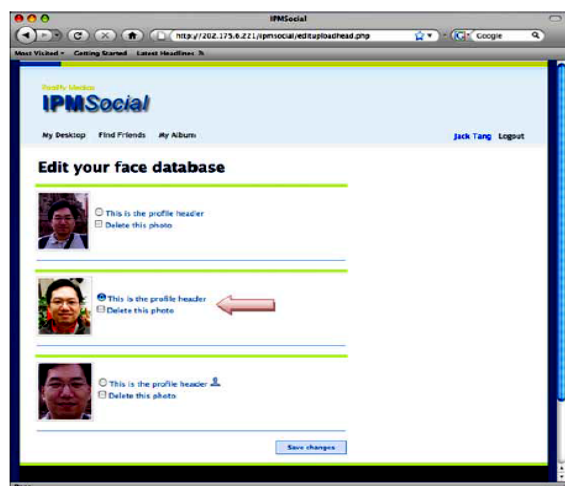
Figure 6. Web interface – face database

The results

Conclusion and discussion

The conclusion is that the design of this social network implements the prototype to show the basic functionality of user registration, creating and editing albums, uploading and deleting photos, editing some text fields and finding friends in the suggested list. Therefore, this online social network facial recognition technology offers features that improve user experience and user-friendliness compared to existing networks. Social Networks. These features include suggested list of side photos, face recognition database and face tagging. In the end, I declare that my findings are consistent with the findings of the researchers of this article and there are no contradictions.

Proposals

Improvement and development of social network design technology with facial recognition by researchers as well as educational and research centers by respected professors and students of related universities, using artificial intelligence in the combination of this design.

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