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3-D Face Image Identification from Video Streaming Using Map Reduce (Hadoop)

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Abstract: *This paper focuses on the massive face identification system. I want to recognize a face from a lot of faces at public places. There are two of techniques are used to hit the goal: one is the 3Dface identification technique and the other is the Hadoop detection technique. Face identification technique find a similar face by 3D face features form mass face data. The Hadoop is a parallel processing structure; it can boost the computation ability. From imulation outcome, it is demonstrate that our algorithm is an efficient and accurate method for huge face identification.*

Key Words: *huge, Face identification, Hadoop, Features, Parallel Processing.*

I. Introduction

Face identification is important task for several applications on human being life. There are some examine was published and described it below. I detect faces by using a hierarchical knowledge-based method. I use three level resolutions in their algorithm. The coarse-to-fine strategy reduce the computation is an advantage in this method. I also use local feature detector and random graph matching techniques to create a probabilistic method can locate a face in a scene. By using five features like two eyes, two nostril, and Nose/lip junction to depict a typical face. I am trying to define a facial template and relative distances of any pair official features. This method can detect the testing object is a human face or not.

I will use a general and complete face detection technique. It is a valuable method for face detection and surveying detecting faces in images. For face image comparison, it is a hard work because it needs a lot of working out and it cannot achieve 100% accuracy. If I want to improve the comparison accuracy then the multiple face indifferent angle can be achieve the goal. Furthermore, if I want search a people from public places, it is more difficult because it is related to real time operation problems. It is a massive computation.
However, the parallel processing technique increases computational capacity. For a huge data, it needs massive computation ability. It needs several computer works together to share the data. Therefore, Hadoop structure is a suitable system for solving the huge face identification difficulty.
The Apach Hadoop project develops open-source software for reliable, scalable, and distributed computing.

II. Face Recognition

2.1 Object Extraction from the Video Stream

The first stage of the face recognition is object extraction. Once the individual face is obtained, the face identify can be execute correctly. Figure 1 shows the flow chart of the object extraction from the video stream. Since the video input video is a colour stream, we transfer the colour image into greyscale image for reducing the computer computation. RGB2YIQ stage is used to map the colour image into YIQ component image. Since Y component has 90% energy of the image, it was used for the following task. Next, a background removal stage was used to extract the object from a video.

A media filter was used to filter out the noise. An exclusive bitmapping (EB) technique was used to convert the image from greyscale to binary even on differently exposed environments. Usually, the object image extraction will cause some distortion, so image processing (IP) techniques like the dilation, opening, and closing techniques were used to remedy the drawback. Finally, a small area discard stage was used to delete those objects belonging to noises because their areas are so small.

In addition, by the person structure; we easily extract the human face location by a scale method of object. We compare the face location with the previous frame to make sure the object is brand new or repeated. Once the objects were all examined, we refreshed the previous frame and recorded the new objects. Finally, we normalized the object and run the next frame. The details flowchart is described in Figure 1.

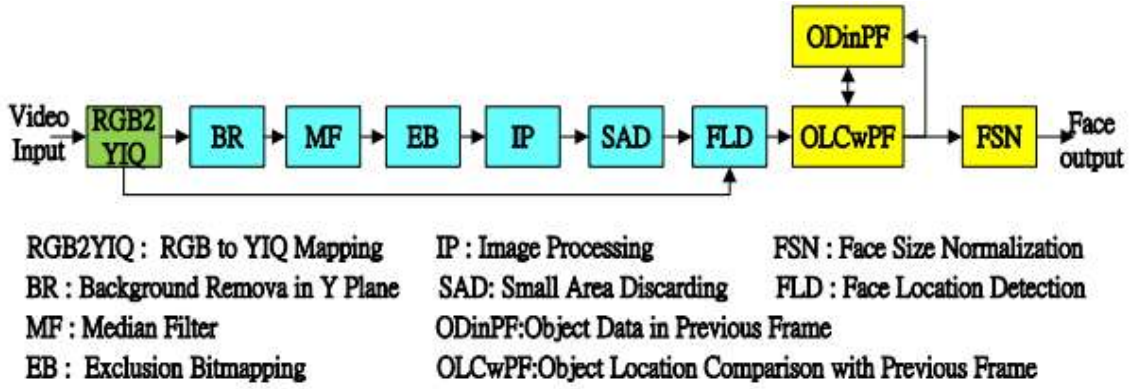

Figure 1: The flow chart of the object extraction from the video stream

4.2 Three-D Face Identification Algorithm

The 3D face identification is better than 2Dbecause 3D method has lots of features. In this paper, I use the skin colour and principle components scrutiny techniques to achieve the face identification. At first, I get the left and right images that include face components. Next, the colour image normalization stage used for further skin colour Detection. In order to obtain the face area, the several stages include Erosion, Dilation, Labelling and Padding is used to achieve the goal. However, the normalization stage is necessary to make the face image standard.

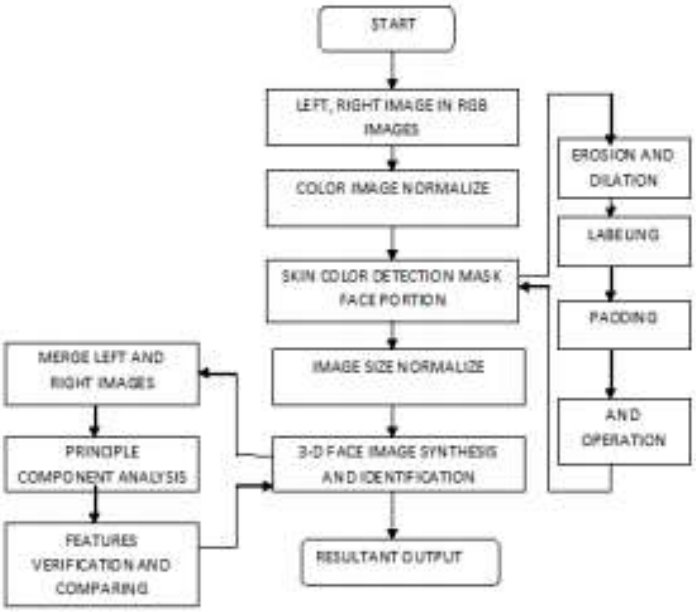

Fig.2 Shows 3D face identification.

Finally, 3D face identification can be completed by using following three steps; I. Merges the left and right image form a 3D image. II. Execute the principle component analysis to get the features. III. Verify the features by comparing the input image and database. Figure 2 shows the details of the system.

2.3 The features and decision function

The face features of this paper totally have 15numbers as figure 3 shown. The important points of the face are denoted in the face image as the listed A to J. The fifteen features are the distance between the each two points shows in figure 3. For example the distance A and B express the feature of the distance between two eyes. The feature IJ denotes the width of the mouth. The feature EK is the distance between the centre of the two eyes and mouth. There are two steps for the decision function; one is the error of the feature that is the difference between the input image and database under the threshold. The first step is check the features if one

of features is over the threshold that it is die out. The second step is calculating the features error that is the error by compare the input image with the database. Once the accumulation error is the minimum then it is the answer.

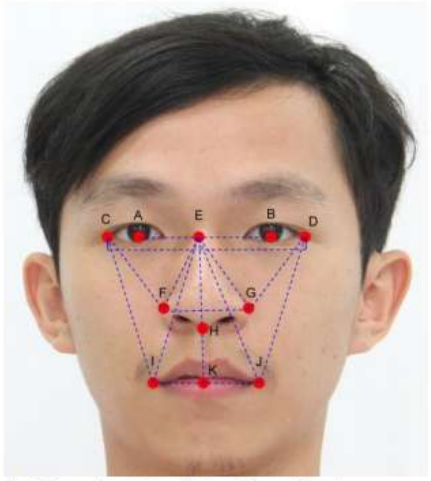

Figure 3: The sketch of the face feature

III. Hadoop System

Since the 3D face recognition from a video stream is computation consumption, a big data processing technique is needed to achieve the goal. For our case, the Hadoop technique is suitable for massive face recognition.

4.2 Brief Introduction of Hadoop

Hadoop has a distributed storage and computing platform suitable for massive data, such as above PB level massive data. In Hadoop, a computing task will be assigned to multiple virtual machines to handle. As the de facto standard of Cloud Computing, Hadoop is a large ecosystem.

There are many technologies and products in this system, such as HDFS, Map reduce, Hbase, Zookeeper, Hive, Floom, Sqoop etc. core module is HDFS, Map reduce, and Hbase. Figure 3 is the Hadoop ecosystem diagram. We only introduce the HDFS, Map Reduce and Hbase briefly, and these three modules will be used in the study

3.2 The implement system

The implement system of the Hadoop structure is shown in Figure 6. It includes two processes; Mapping and reducing. The nodes of the Hadoop structure can be failure. If a node is on failure state then the task need to be reassigned. If the task include some side effect then the share state need to restart. For example, the nodes communicate with the outside node, then the share state must be hold until the system restart.

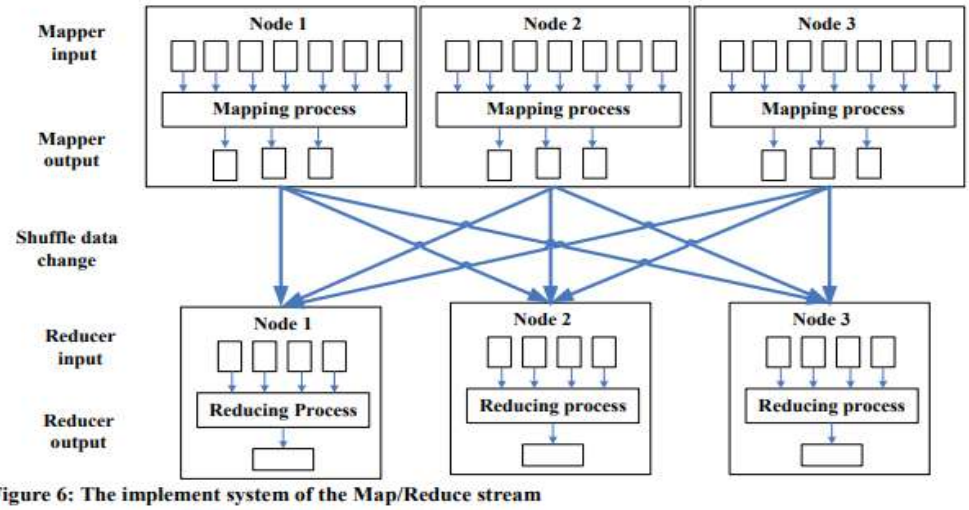

Figure 6: The implement system of the Map/Reduce stream

3.3 Massive face identification structure

Massive face identification system is used to obtain main information from lot of people and public places. For this case, to find a person from massive people, it is a big data problem need a technique to reduce the obscure and finish the job. Hadoop structure is an efficient parallel processing technique can solve big data problem. Figure 5 shows the Hadoop system that was used in the massive face identification. It is clearly, there are two module blocks; one is the subscriber verification and the other is subscriber increase.
The task of the subscriber verification module is search and identifies the input face image with the Map Reduce.

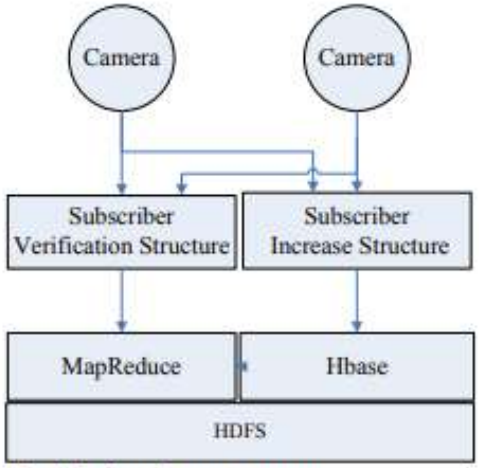

Figure 5: The implement system

It make sure the exactly people by comparing all the image, and pick up the one is the least features error. This action need immense computation, therefore, it is need the Map and reduce techniques under parallel process to accelerate operation speed.

IV. The Problems And Performance

4.2 The problems

There are some problems about this system and list it below:
(a) Due to 3D face recognition have too many features, we hard to decide which is the exactly result.
(b) If the subscribers are too big, the system can't make sure to obtain the accuracy result in real time process. For example, there are 10 billion peoples and have 20 pictures of each people then the system had totally more than 200 billion pictures. It is too big and hard to process in real time.

4.2 The performance

The performance of the big data system is based on the parameters and structures of the process. There are some methods to improve the performance and list it in the following:

a) We can adjust the numbers of the Map and Reduce to improve performance.
b) Set a suitable path of the Name Node and Name Node Federal technique to solve the Name Node breakdown problem.
c) Design a suitable Hbase to raise the performance of the system inquiry by means of the problem analysis.
d) According to the features of the face, Adjust procedure design of the Partitioner, grouping, sort and combiner in the Shuffle of the Map Reduce process to raise the system performance..

V. Advantages

The advantages of Map Reduce programmingare,

- **Scalability**
  Hadoop is a platform that is highly scalable. This is largely because of its ability to store as well as distribute large data sets across plenty of servers. These servers can be inexpensive and can operate in parallel. And with each addition of servers one adds more processing power.
- **Cost-effective solution**
  Hadoop's highly scalable structure also implies that it comes across as a very cost-effective solution for businesses that need to store ever growing data dictated by today's requirements

- **Fast**
  Hadoop uses a storage method known as distributed file system, which basically implements a mapping system to locate data in a cluster. The tools used for data processing, such as Map Reduce programming, are also generally located in the very same servers, which allows for faster processing of data.

VI. Conclusion

In this article, I use the distribution and parallel techniques of the Hadoop to raise the computation speed for the massive 3D face identification. From the simulation results, it is established that the computation speed increases3.5 times under the simulation condition on four computers a cluster and one hundred subscribers. When the subscriber increase, the system only extend the cluster which can achieve the high performance face identification at big subscriber.

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