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Computer Vision based Crowd Attention Detection System

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Abstract - *Video surveillance systems for crowd analysis have attracted a great deal of attention in the field of computer vision, due to the rapid increase in population and human activities. The unique number of individuals, extreme clusters and complexity of the sensors make public requirements and/or management in the high density crowds a major challenge. Researchers in the Computer Vision community have made significant advances in the last decade for smart video services. The system proposed uses some applications to analyze the attention of the public on the basis of facial detection technology. The system includes the module of image acquisition, face detection, display module and data analysis. The system uses the camera to capture crowed images on a regular basis while showing a video. The system then detects, marks and counts images of the faces that are concerned with this attractive video. The system also displays the crowds ' data change diagram at different times and calculates the expected value of the mathematical attention of the crowd for further processing such as large data technology.*

***Key Words*: Face Detection, Image Processing, Detection Analysis**

1.INTRODUCTION

Facial detection technology has been applied to various fields with the continuous development of science and technology. For instance, face detection can improve efficiency considerably in security controls. The use of face detection can improve authenticity in the automatic presence instead of the traditional fingerprint attendance. But the application of this technology to get people's attention has been very rare. A few years ago, the algorithm using facial detection technology to analyze the attention paid by the crowd has been improved by domestic university researchers. Furthermore, in the field of training, some researchers use this technology to analyze student concentrations and so on.

In society, the level of attention of the crowd in some areas is an important criterion to predict the behavior of people. For example, the level of concern for the product directly affects the consumption of people and the product's market prospects. In this case, we propose a method for implementing the Intelligent Crowd Attention Detection System, based on face detection technology. System modules are co-ordinated to monitor the crowd status in real time and receive information from the crowd as quickly as possible.

2. METHODOLOGY

A certain place like the classroom is selected. The image capture module regularly captures images of the crowd through a camera during the video. Face detection module analyzes crowd attention data in various times, circles the faces in the pictures and counts the faces. The detection process for faces is based on the algorithm of Adaboost. It's an algorithm for classification. Using a wide range of fundamental classificators with simple abilities and enhance them by a certain method to form a strong classificator with strong classification skills. Some powerful classes are then cascaded into an image search and detection stage classifier. The display module displays the crowd face at different times with dynamic images and dynamic data graph. Data analysis module calculates the expected mathematical value of the crowd attention over this time period to enable further analysis of the data. The expected mathematical value in the data finally determined by the system is based on the expected mathematical value in each picture. This is the specific method of calculation:

$$Exp\_final=\sum_{i=1}^{N} Exp\_per/N \quad (1)$$

In formula (1), Exp_final represents the final mathematical expected value calculated by the system, N represents the total number of pictures involved in the face detection, and Exp_per represents the mathematical expected value of the number of faces detected in each picture. Exp_per is calculated by formula (2) .

$$Exp\_per = face\_num / total\_p \quad (2)$$

In the formula, face_num represents the number of faces detected in a picture, total_p represents the actual number of people in a picture.

3. OBTAINING CROWD ATTENTION DATA USING FACE DETECTION TECHNOLOGY

The open source library called OpenCV is used in this system. It is a cross-platform BSD license-based computer vision library. The processing of images, signal processing and other fields plays an important role. This paper uses open source code for the visual library source that produced the haar-like and adaboost algorithms-based cascade classification. The face of the image can be accurately detected. With the camera, the system regularly captures crowd images while showing a video. The system then

processes images through gamma correction, Gauss filtering, picture sharpening and Histogram Equalization, detects, circles and counts the faces concerned with this attractive video. At the same time, the system still displays the crowd face data change chart at several times, and then calculates the expected mathematical value for multitude attention. Figure 1 illustrates the basic flow chart.

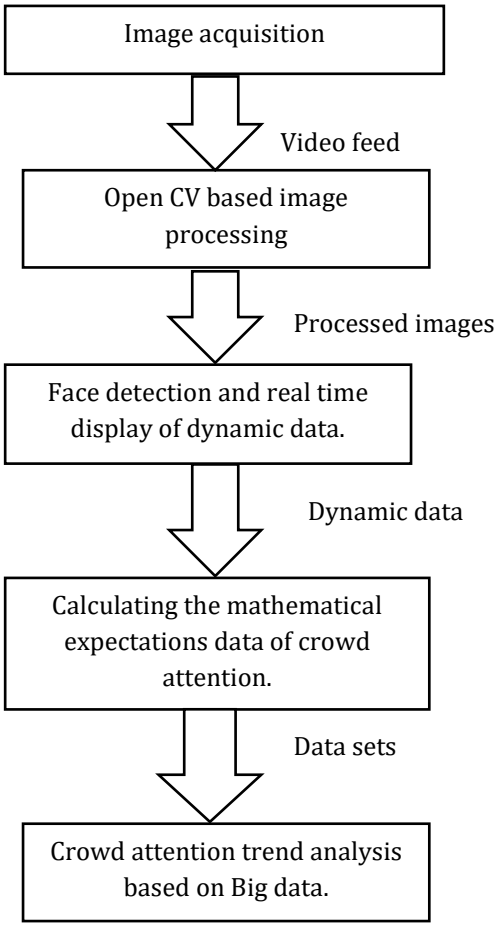

Fig. 1 Basic flow diagram of the system

Step 1: Correction of gamma

Images must be processed first. Gray value of input images is a non-linear operation so that the gray value of the output images and input images is exponential. After gamma correction, dark gray color is improved in comparison with the original image.

Step 2: Gauss transformation filtering

Gauze filtering transform is also required to reduce image noise, in addition to the gamma correction. A linear smoothing filter is the Gauss filter. It can be used to remove Gauss noise and is widely used in the processing of images.

Step 3: Image sharpening compensates for the image contours. It improves the edge and the gray level of the image to clear the picture.

Step 4: Histogram Equalization

The Histogram Equalization is also necessary after the first three items have been processed. Histogram Equalization greatly increases the local image contrast, particularly if the comparison between useful information is rather narrow. This allows for a better distribution of luminosity over the histogram.

Step 5: Load OpenCv

Libraries Use classifiers trained with OpenCv to detect and mark faces in images after four kinds of transformation.

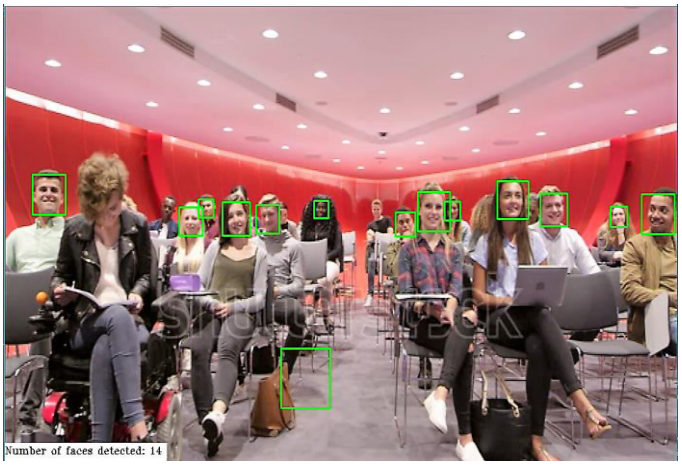

Fig. 2 the results of face detection when the attention is high

Fig. 3 the results of face detection when the attention is low

4. EXPERIMENTAL RESULTS AND ANALYSIS

Figure 2, with more than half of the total number of faces in the picture, ie., 13 and 1 false prediction shows that the video can increase the attention of the crowd. Only four faces were found with a single false prediction in Figure 3 in sharp

contrast. It shows that the video could not at this time attract a large crowd. We can see from both images that certain students still focus on the video from afar.

At the end of the session a dynamic data change chart of the crowd face will be produced at different moments while the video is displayed. The x-axis is the total images that were captured and the y-axis is the number of faces detected. The entire process is intuitive and dynamic. The system also calculates the crowd attention, the mathematical expected value of crowd face (or so-called probe rate). Then we can use big data technology for handling the data and for a long time obtaining the trends in public attention.

The above experiment allows the system to detect crow d attention data easily, accurately and intuitively.

5. CONCLUSION AND FUTURE WORK

Through the use of OpenCV library-based face detection technology, we propose a way to build an intelligent attention detection system for the public. This system is more reliable and flexible compared to the traditional way of attracting attention. By using the system, the corresponding areas can get information from the crowd so they can take what they need as soon as possible.

We can use Big data technology to deal with the expected mathematical value that is multi-aided by the system to get the attention trends over a long time so that we can more precisely predict the crowd's psychological and behavior. It can promote the development of the industries needed, and improve social stability.

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