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Automated Mosaic Web Application Combining Multiple Models Journal of Industrial Information Technology and Application

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Abstract. With the development of the media content market, the damage caused by portrait rights infringement is increasing. Currently, there are no legal regulations that punish portrait rights infringement, so there is a hassle that individuals must file civil lawsuits, and as a countermeasure, specific platforms regulate portrait rights. However, video providers who do not use a specific platform continue to cause problems of portrait rights infringement. To prevent infringement of portrait rights, it is intended to provide a service that automatically processes mosaics using multiple models. In this paper, we propose an automatic mosaic service using face detection, recognition, and tracking. It is intended to solve the problem of portrait rights in the media market in the future by using the services implemented through this methodology.

Keywords. Portrait; Mosaic; Face Detection; Face Recognition; Face Tracking; Web Application;

1. Introduction

This research aims to focus on the problem of portrait rights infringement brought on simultaneously by the expansion of the market of media content. The problem of infringement of portrait rights was brought into focus by the disaster reporting process of public broadcasting. Due to the nature of broadcasting, the scene must be quickly

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delivered, so there have been cases in which the portrait rights of the characters appearing in the video are violated due to mistakes or errors in broadcasting. According to the current “Press Arbitration Act" Article 5, "consent" and "public interest" were defined as the reasons for immunity from portrait rights infringement, but this has a problem that does not apply to media platforms that provide videos because it is limited to media, Internet news services, and Internet multimedia broadcasting. In the event of an infringement of portrait rights on the media platform, a claim for damages due to civil illegal activities can be filed, but the process requires a lot of time and effort for an individual to proceed. In addition, if a person's face is photographed, passed by very quickly, or taken with a distant background, it is not recognized as an infringement of portrait rights, and even if the damage is violated, it is difficult to lead to an actual claim for damages. The current situation without clear legal standards is limited to the platform's own rules. Accordingly, the video provider protects the portrait rights of others by mosaic using a video editing program. This process not only invests labor and time but also limits resources in the editing process. In the case of YouTube, it is possible to mosaic other people's faces through the face blur processing function, but not only does it not properly detect all faces but there is a problem with the mosaic range. Recently, due to this problem, mosaic processing technology through face recognition has been devised in real-time, but due to the problem of FPS(frame-per-second) degradation due to processing speed, there are many difficulties in applying this technology in real life [1]. Therefore, in this paper, we propose a service that prevents the problem of portrait rights infringement that occurs unintentionally through post-processing automatic mosaic service through face recognition, detection, and tracking technology.

2. Related Works

A. Methods of Mosaic Processing

The two methods of the mosaic processing method are region designation and post-processing. Because the region that needs to be designated is constantly changing, the FPS drops when the area designation method applies in real time. By setting a mosaic area in units of stored image frames, the post-processing method, on the other hand, may be capable of maintaining the main image's quality without decreasing the FPS.

B. Recognition Rate

The average face recognition rate in real-time in previous papers is 92% [2]. Portrait rights infringement occurs in a frame when face mosaic processing is carried out previously.

C. *Face-Net*

Face-Net classifies facial images based on the separation of the images in Euclidean space after embedding them in 128 dimensions [3]. Face identification, face verification, and face clustering can be accomplished with the feature value which is extracted from the person's face image and the square 12 distance between the feature values. [Fig. 1] The loss function of the associated model makes use of Triplet Loss to discover that the distance between the embedding vectors of various faces is at least as large as the margin alpha than the distance of the same person.

Figure 1. Face-Net: Methods of learning

D. *Object Tracking*

Recognizing a region of interest is the first process in object detection. The Object Detection Algorithm is commonly used to identify objects, but due to the presence of multiple parameters, the detection process is demanding. To reduce this issue, plan to use object tracking. Most of the tracking involves the processes of object detection, object classification, and object tracking. Object detection is the process of finding objects of interest in video sequences of objects and clusters of pixels [4]. Object classification, then, is the process of categorizing objects found during the detection process. Subsequently, obtaining an approximate path of an object on the image plane in a moving scene is a task in object tracking. In other words, it keeps tracking the object if it is determined that an object of interest is the same object by comparing how similar the object's motion in the current frame is to the motion in the previous frame. [Fig. 2] Object tracking methods include Silhouette, Point Tracking, and Kernel Tracking.

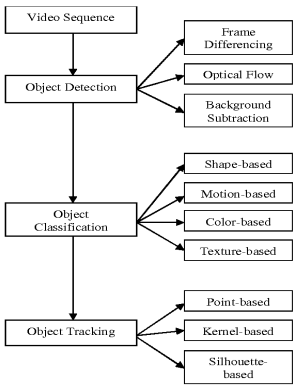

Figure 2. Basic steps for tracking an object

3. Methods

A. Mosaic System

This study's facial recognition consists primarily of two stages. It consists of recognizing the user's face and mosaic the person excluding the user's face from the image to be applied after model generation. Each model is created from the user's face. If the model is assigned to each user, it developed a method of Re-ID (Re-Identification) that has the benefit of being able to grow without having to learn whenever a new user is added [5]. Although the model is an important element used in the process, there is a problem with accuracy and speed. It is intended to improve the problem through model replacement, model lightning, and fine-tuning.

B. System Architecture

In other studies, the Object Detection Algorithm was used to recognize objects, but Object Tracking was used to account for multiple parameters, such as unknown objects and their unknown colors, shapes, and textures. [Fig. 3] Object Tracking can detect a dynamic person and demonstrate a high-accuracy mosaic processing rate by calculating the difference between two consecutive frames using this methodology.

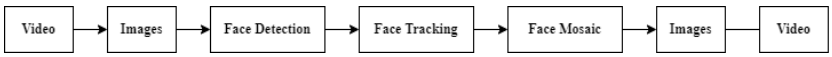

Figure 3. System Architecture

4. Results

The system works in the way described below. [Fig. 4] The user's face is registered to exclude mosaic processing. Upload the video after that. The edited video can be downloaded when the processing is finally finished. [Table. 1] The results of experimenting with this service are demonstrated below. The results demonstrated that outdoor photography had a higher mosaic processing rate than indoor photography. It is also known that the faster mosaic processing rate than in earlier studies will prevent the portrait rights issue.

Figure 4. (A). User's face. (B). Video (C). Edited Video

Table 1. RESULTS OF EXPERIMENTS PROCESSING MOSAICS

Table Head	Results of experiments processing mosaics			
	Number of People	*Location*	*Frames*	*Mosaic Processing Rate*
1	3	Outdoor	10,080	97%
2	3	Outdoor	8,400	96%
3	3	Outdoor	9,240	94%
4	3	Outdoor	12,060	96%
5	3	Outdoor	13,740	98%
6	3	Indoor	7,260	94%
7	3	Indoor	8,160	96%

5. Conclusions

This study made it possible to demonstrate the superiority of offline processing over real-time image processing. The suggested service will allow the media to automate tasks to save time and resources while also saving resources and time for the server. It is anticipated that this will prevent image editors and video editors from violating portrait rights in the future. Additionally, it is suggested that the portrait rights of nearby human rights prevention and disappearance be protected.

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