Proceedings of International Conference on Technology and Social Science 2020 (ICTSS 2020)

Efficiency of image confirmation by e-JIKEI network camera Creating a database to evaluate the detection performance

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Keywords: security camera, motion detection

Abstract. Currently, the e-JIKEI network cameras are installed in the shopping districts and parking lots of Kiryu City, and demonstration experiments and social experiments are being conducted. In the event of an accident, camera images are downloaded to police and government computers. via the Internet. And they check them. At that time, there is a problem that the communication time becomes long when trying to download a large number of camera images. We need a mechanism to improve the efficiency of image reception. By performing difference processing on the image in the camera and evaluating and recording the change (movement) of the image, it is possible to preferentially download the image with the largest amount of change at the time of image confirmation and streamline the confirmation work. In addition, in order to evaluate the results of this analysis, we create a database that predetermines and records the "type", "position", and "direction" of the evaluation image and the objects in the image.

1. Introduction

In recent years, security cameras with communication functions have developed. In order to protect the privacy of the citizens who live there, it is necessary to prevent unauthorized use of the captured images [1-2]. To solve this problem, Fujii Laboratory develop e-JIKEI network camera that can be operated with consideration for privacy [3-5]. This camera features "double encryption of captured images" and "complete recording of browsing activity". All images taken by e-JIKEI network camera are doubly encrypted, limit who can view them [6]. Two PINs are required to display a clear image. It is owned by police and other governments. If you have only one PIN, you can view the blurred image that has been mosaicked. Only one PIN is given to the maintenance company. The maintenance company browses the unclear image and performs maintenance. All of this browsing history is published online. All of this browsing history is available online. Unauthorized browsing is thus immediately apparent. This prevented unauthorized viewing of the images.

Currently, when an incident occurs, there is a time-consuming problem due to the need to download a large number of images from e-JIKEI network camera. We propose a prioritization system for downloading images. This system mainly consists of the following features

- Motion detection in images. Measurement of pixels detected by moving objects.
- Creation of a log with a set of image names and the number of pixels in motion.

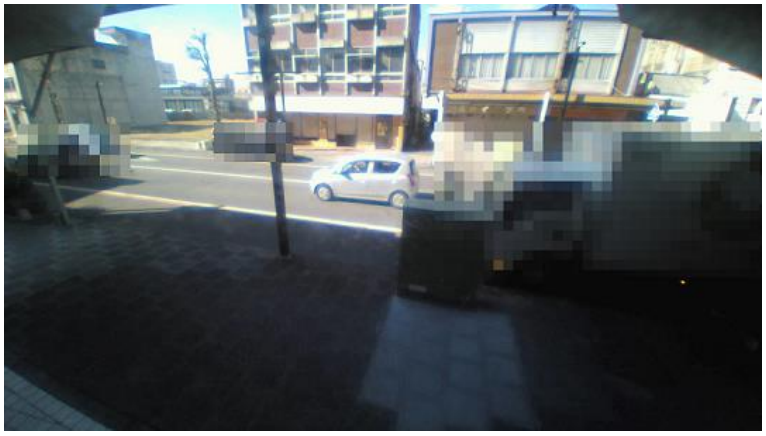
This feature allows us to prioritize the images to be downloaded, which solves the problem of long download times due to a large number of images and reduces the time for image verification. In this paper, we present details of motion detection and recording methods and databases for evaluating detection performance.

2. Motion Detection

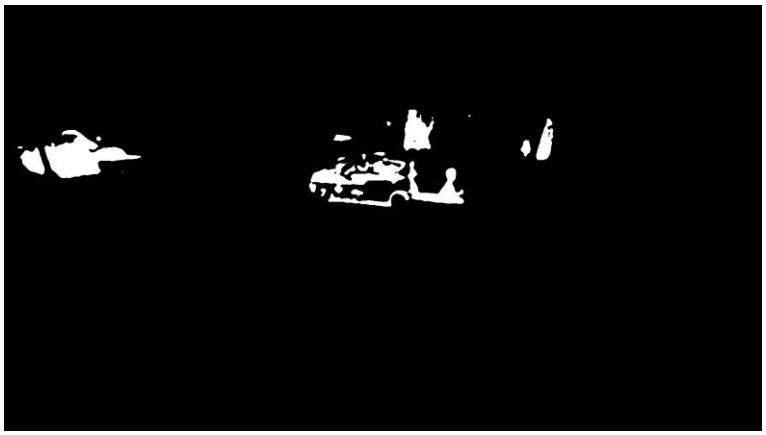
We use "differences from the previous image of 1 second" for motion detection. This method has the advantage that it is less susceptible to sunlight and lighting changes. On the other hand, it is difficult to detect slow moving objects and stationary objects.

In this study, we use "Difference from the mean image" as a method for detecting motion from a camera. This method is considered to be easy to detect slow-moving objects. And it is thought that it is difficult to detect changes in sunlight and lighting. Using this method, we can create an average image of the images taken during the last 60 seconds of the images we want to detect. And then took the difference between that average image and the image we want to detect a motion. For this difference image, white pixels that indicate motion are shown as white pixels, and the total number of pixels is measured. We evaluate the amount of motion by the total number of these white pixels.

Figure 1 shows images of taken with an e-JIKEI Network Camera and a result of difference method. The detection of the silver vehicle in the center of Fig.1(a) is appeared as white area in Fig.1(b). The number of white pixels in Figure2(b) is 43919.



(a) Image taken with e-JIKEI network camera
(The general vehicle was hidden by a mosaic.)



(b) Image of motion detected by the difference method

Fig1 Image taken by e-JIKEI network camera and image processed by difference

3. Recording to the log

The results of the above process are recorded in the log along with the titles of the image files. By checking this log when downloading images, the images with a large number of white pixels (images with large motion) are downloaded with priority to improve the efficiency of image recognition.

4. Database Creation

In order to evaluate the performance of the motion detection program, we create a database of sample camera images.

The images taken during each 24-hour period on weekdays and holidays are visually confirmed, and the "type," "location," and "direction" of the objects in the images are recorded in a CSV file format with the image titles. There are four types of "types" such as cars and pedestrians. "Position" divides the roadway and sidewalk into front and back respectively. "Direction" is divided into left and right and stop. The classification method is shown in Table 1 and for "position" in Figure2(a)~(d).

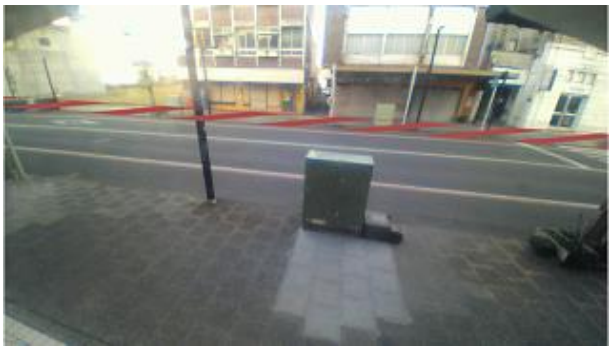
Table 1.Classification method

Type	**Position**	**Direction**
Car	Sidewalk（front）	Left
Bike	Roadway（front）	Right
Bicycle	Roadway（away）	Stop
Walker	Sidewalk（away）	

(a) Sidewalk (front)

(b) Roadway(front)

(c)Roadway(away）



(d) Sidewalk(away）

Fig2 Each range of "position"

We compare this database with the measured logs to evaluate the detection performance of the motion.

5. Conclusion

We introduced the evaluation of the amount of motion by motion detection, the recording of the amount of motion, and the evaluation of detection performance using a database. We plan to actually evaluate the detection performance using a detection program and database in the future.

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