Realization for Image Searching Engine with Moving Object Identification and Classification

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ABSTRACT

A realization for image searching engine with moving objects identification and classification is presented in this paper. The identification algorithm is applied to extract difference image between input image and the reference image, and the classification is used the region segmentation. That is made the database for the searching engine. The experimental result of the realized system enables to search for human and animal at time intervals to use a surveillant system at inside environment.

KEYWORDS

Moving object, identification, classification, searching engine, time intervals, database, surveillant system

Ⅰ. Introduction

The moving image processing techniques are applied to invader surveillance system, multimedia system, traffic control, entrance and exit preservation, forest fire prevention and so on at many fields based on computer vision technology.[1-3] And also new technique have been studying and implementing in new fields rapidly. Especially a uninhabited automatic invading surveillance system that tracks and distinguishes a moving object is interested in research and required to develop a new advanced system. Besides an automatic object tracking system has been studying for the teleconferencing system and remote video lecturing system.[4-5] A invading objects are mainly adults, children, animals and others. Accordingly a realization for image searching engine with moving objects identification and classification with common CCD camera is required to be proposed for a invading surveillance system. In this paper, the identification algorithm is applied to extract difference image between input image and the reference image with a noise cancellation, and the classification is used the region separation. These result data lead database to construct a searching engine to search for a moving object at sections and intervals to be required quickly.

Ⅱ. Identification and classification algorithm

As shown in Fig. 1 the identification process algorithm on a moving object is divided into the difference image, conversion to binary image, noise cancellation and identification. The difference image D(x,y) is given by subtracting the input original image I(x,y) from the reference image Ref(x,y) with noise image $\eta(x,y)$ by equation 1. That is converted into binary image. The binary difference image is not only included a moving vector of a object and fine moving component occurring by noise. This noise is generated by shaking a camera and changing an illuminant intensity. The removal operation and filling operation on that binary image enables some noises to cancel effectively. And then a moving object is identified by computing the number of transformed pixel.

$$D(x,y) = Ref(x,y) - I(x,y) + \eta(x,y) \quad (1)$$

The region segmentation algorithm is unfolded that the image detected by making AND operation between the edge detected image and the difference image is divided into the region 1 and region 2. The region 1 is segmentalized 4 smaller partitions again, the partition 1 comes up to animal, partition 2 is child 1, partition 3 is child 2 and partition 4 is adult. The region 2 is separated in head and body of object to make the image searching database as shown in Fig. 2

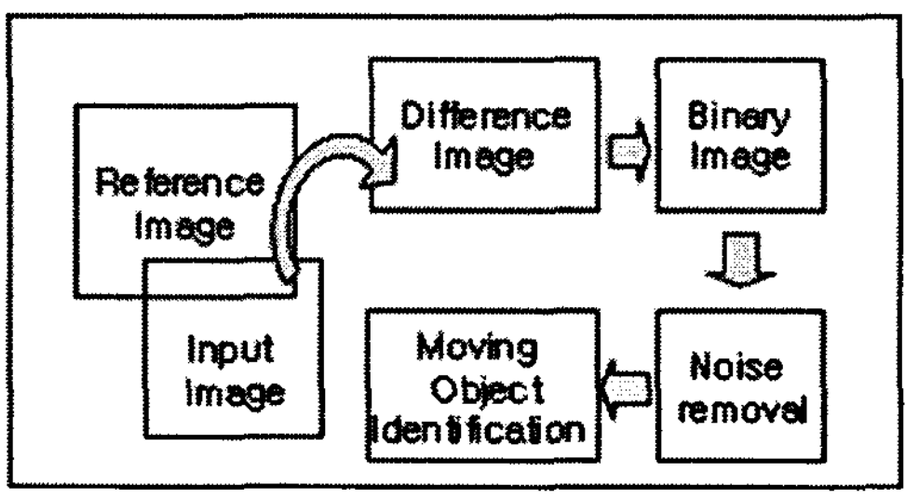


Figure 1. Identification process

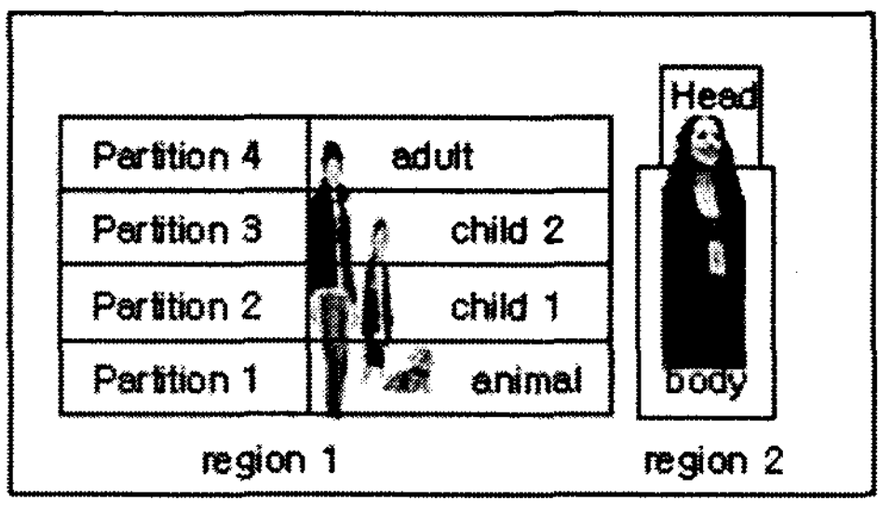


Figure 2. Segmented region

Table 1. Partitioning range pattern

Objects	Ranges
Adult	Men(200~150cm)
	Women(200~150cm)
Child	Child 2(150~100cm)
	Child 1(100~50cm)
Animal	Animal(50~0cm)
Other	Indistinct object

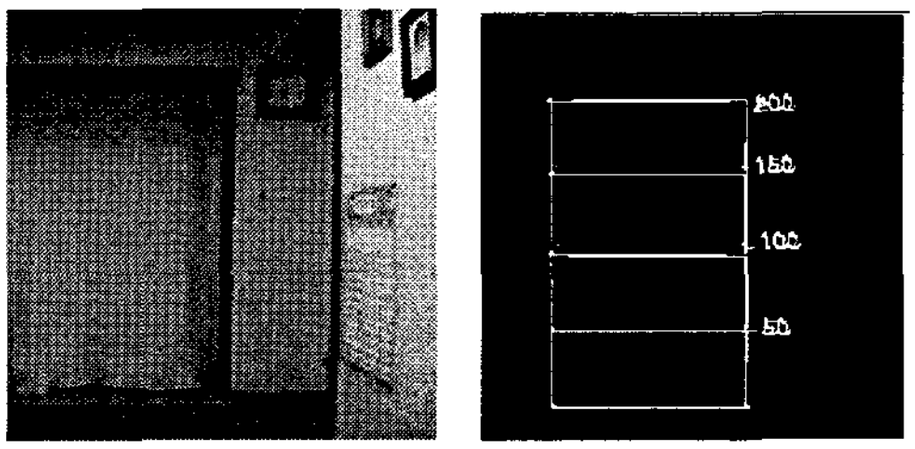
As shown in Table 2 the partitioning range pattern of objects are based on the average height of adult male 173cm and female 162 cm. The partition 1 animal is low 50cm, partition 2 child puts from 100 to 50cm, partition 3 child 2 is from 100 to 150cm and partition 4 has 150cm over for adult. Male and female is segmentalized by separating trunk of body and head in region 2. As shown in Table 2, the database is updated by 4 time intervals a day to be easier to search.

Table 2. Time intervals a day

Intervals	1	2	3	4
Times	5-9	10-15	16-22	23-24

III. Experimentation

A performance of the realized searching engine is examined by experimenting on a entering and exiting adult and child that is taken pictures. The reference image that is used to experiment is as shown Fig. 3(a) and Fig 3 (b) is shown the pattern mask to apply to partition the segmentation region 1.



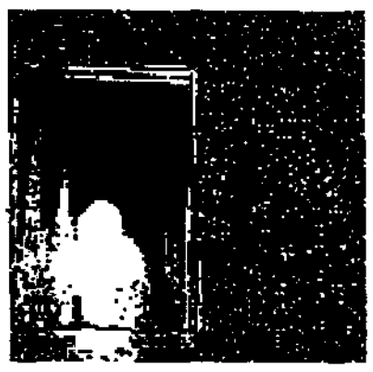
(a)reference image (b)partition pattern mask

Fig. 3 reference image and partition pattern mask

Fig. 4 (a) is the inputted original images, and (b) is the child difference images subtracted the inputted image from the reference image respectively. Fig. 4 (c) is binary images on the differences images with a bubbled impulse noise. That noise is removed by applying removal operation and filling operation as shown in Fig. 4 (d). The partitioned region images are given by compositing the removed image and partitioned pattern mask as shown in Fig. 4 (e). Fig. 4 (f) adult, (h) child 2 and (j) animal are the original images, and (g), (i) (k) are region segmentation and partition images respectively. They are classified with an adult, child and animal, and is stored in database with format as shown in Table 3.

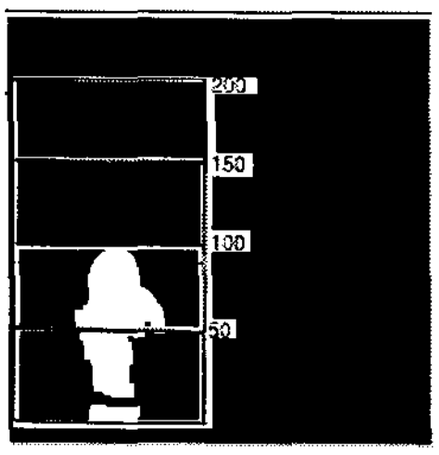
(a)original image

(b)difference image



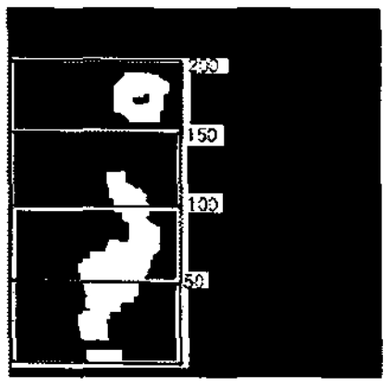
(c)binary difference

(d)noise cancellation



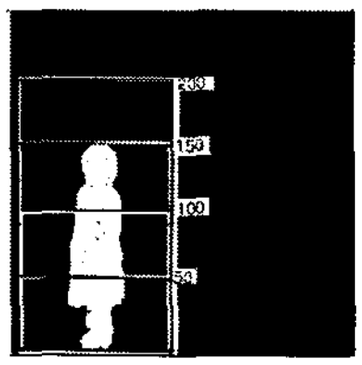
(e)region segmentation and partition

(f)adult

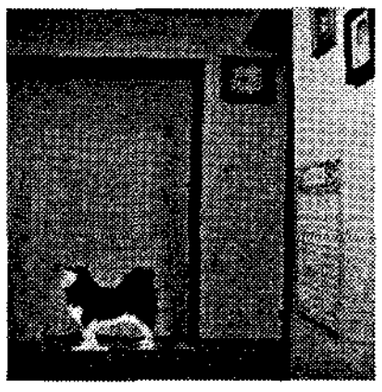


(g)adult partition

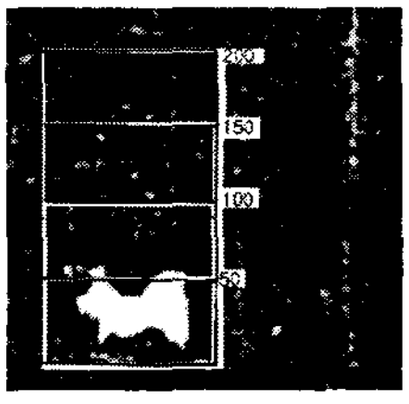
(h)child 2



(i)child 2 partition



(j) animal



(k)animal partition

Fig. 4 images segmentation and partition

The adult is identified as male and female to execute segmentation region 2. Table 4 shows searching engine execution result on a moving images that is taken at time intervals

Table 3. Database format

Images	Partitions	Identification/ Time
Fig. 4 (a)	2	child 1/10:30
Fig. 4 (f)	4	adult/16:00
Fig. 4 (h)	3	child 2/16:15
Fig. 4 (j)	1	animal/16:20

Table 4. Searching engine execution results

Database	Searching Keyword	Searching Result
adult/06:30 adult/08:11 child/09:30 child/10:00 child/03:10 child/16:15 animal/16:20 adult/20:05 adult/22:03	Adult who comes in between 14:00 and 10:00	There is not a data. To confirm other region.
	Children who comes in between 15:00 and 21:00	There is a child 2 data. -partition 2: 1 -partition 3 : 1 To confirm a child 1 partition

There are 20 person adults, 5 person children and 2 animals to show the successful searching resultant rate that is experimented at inside room environment as shown in Table 5. The rates are adult 95%, children 90%, animal 50% and other 10%. A adult person who height is 150cm low is classified with child 2 partition of segmentation region 1, a crawling children out of 10 persons are classified with animals, and animal 50cm over is chosen

child. A phenomena which is reduced a moving component at removing noise makes error for adult sex classification at the region 2. The error show that the diamond trunk shape man is classified with woman, and round head shape is chosen man

Table 5. Searching successful rate

Partition	Adult	Children	Animal	Other
Rate	95%	90%	50%	10%

IV. Conclusion

A realization for image searching engine with a moving objects classification and identification is presented in this paper. The database is updated by experimental results for entrance and exit surveillance at the inside environment with CCD camera. The identification algorithm is applied to extract difference image between input image and the reference image, and the classification is used the region segmentation. That is made the database for the searching engine. The rates for successful searching are adult 95%, children 90%, animal 50% and other 10%. A male and female, and short height for exact identification and classification are required to study more in future.

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