Video based Abnormal Behavior Analysis System
for Surveillance

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Abstract— For people safety and society security, fainting
and abandonment detection are main issues in surveillance
system recently. In this paper, we propose abnormal
behavior analysis system that provide fainting and
abandonment detection for video surveillance. Also we
made used of human detection function for abnormal
behavior analysis system to remove false alarm like fainting
detection of non-human object and abandonment detection
of human object. And we show GUI based human behavior
analysis system that detects fainting and abandonment.

Keywords—Video Surveillance; Abnormal Behavior
Detection, Fainting Detection, abandonment Detection;

I. INTRODUCTION

Intelligent video surveillance system is to monitor the
activity of objects in a video. Visual surveillance has a wide
variety of applications such as homeland security, crime
prevention, and traffic control and so on. Intelligent video
surveillance system should support not only basic object
detection and tracking, but also interpret object abnormal
behavior pattern finally. Fainting detection for safety and
abandonment detection for crime prevention are main issues
in surveillance system in recent years.

So far, many analysis researches are doing for Fainting
and abandonment detection. For fainting detection, [1]
analyze the bounding box coordinates representing the
person in a single image. MHI and ellipse enclosed human
body are used to detect falls [2]. The motion gradient and
human shape features variation using the video are used in
[3]. For abandonment detection, [4] used short-term and
long-term blob split and merges for detect abandoned objects.

In this paper, we propose human behavior analysis
system. It provides fainting and abandonment detection that
reduce false alarm like fainting detection of non-human
object and abandonment detection of human object.
Proposed method has shown good performance in detecting
of abnormal behaviors such as fainting and abandonment.

Section II describes system description, and we show test
results in Section III. Finally, we conclude section IV.

II. SYSTEM DESCRIPTION

Fig.1 shows overall system structure. Abnormal behavior
analysis system consists of foreground extraction, Human
classification, abandonment detection, and fainting detection
parts.

A. Foreground extraction and Tracking Trajectory
In this paper, we use codebook [5] to detect foreground
object. Each foreground object’s information such as
location (x, y), size, and aspect ratio are gathered and
maintained in every frame. Distance information between
foreground objects is used for tracking trajectory of each
object. That is, each object ID and location information is
updated according to the rule of close distance in every
frame.

B. Human detection
Object detection and tracking

For human detection, HOG features and SVM
classification method are used. HOG features have been
successfully used in pedestrian classification by Dalal [6]. It
seems to be one of the best features for capturing edge and
shape information, while being sensitive to noisy
background edges and clutter. Each foreground object is
checked whether human object or not by human
classification step. Fig. 3 shows HOG based SVM learning method for human classification.

C. Fainting Detection
In this paper, we propose a simple fainting detection technology to monitor the human fainting event. Object’s aspect ratio and moving information are used to detect fainting. In human detection function, each object is checked whether or not it is human object. Fig. 4 shows aspect ratio of foreground object. If object’s aspect ratio is above the threshold, then, it checks moving information of object. Finally, if the object is not moving in certain period, then, fainting alert occurs.

$$\alpha_{\text{ratio}} = \frac{H_{\text{width}}}{H_{\text{length}}}$$

(1)

$$\text{Moving dist} = \sqrt{(\text{obj} \_\text{begin}x - \text{obj} \_\text{cur}x)^2 + (\text{obj} \_\text{begin}y - \text{obj} \_\text{cur}y)^2}$$

(2)

$$\text{stop cnt} \_\text{begin} = \text{begin} \_\text{stop cnt}$$

$$\text{stop cnt} \_\text{cur} = \text{cur} \_\text{stop cnt}$$

$$\text{stop cnt} \_\text{cur} = \text{cur} \_\text{stop cnt}$$

D. Abandonment Detection
For abandonment detection, foreground object’s moving information is analyzed. Each foreground object is checked whether or not it is human object using human detection function. Equation 2 shows how object’s moving information is calculated. If object does not move, then stop count is increased. Finally, if object’s stop count is above threshold, then, the object is regarded as abandoned object.

$$\text{stop cnt} \_\text{cur} = \text{cur} \_\text{stop cnt}$$

IV. CONCLUSIONS
In this paper, we presented abnormal behavior analysis system that provide fainting and abandonment detection for video surveillance. Also we made used of human detection function for abnormal behavior analysis system to remove false alarm like fainting detection of non-human object and abandonment detection of human object.

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REFERENCES