Analysis of Urban Transit Environment for Video Analytics Application and Processing Scenarios

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Abstract

In order to apply the video analytic algorithms in metro railway system, the input images should be classified according to the camera installation environment and its role to handle corresponding events. Before we implement the integrated surveillance system at subway stations, we investigated the required camera's role at each location to employ the video analytics. Resultantly, desirable event processing scenarios are suggested.

Keywords: *Video Analytics, Moving object tracking, Smart camera*

1. Introduction

The security issue in urban transit system has been widely considered as the common matters. The safe urban transit system is highly demanded because of the vast number of daily passengers, and providing safety is one of the most challenging projects. We analyzed various camera inputs acquired at subway systems. Those images range from stations to depots. We classified the images according to situation and location of the installed cameras.

We investigated the required camera's role at each location to employ the video analytics. Resultantly, desirable event processing scenarios are suggested.

This paper is organized as follows. Section 2 explains the image properties acquired at different locations. In Section 3 and 4, we discussed the desirable event processing based on analysis results. The event processing scenarios [1] are also suggested. Finally we concluded in Section 5.

2. Video Properties at Different Places

2.1. Ticket Box and Gate

We analyzed the various scene properties of the input images taken at ticket boxes and ticket gates, and suggested desirable event processing algorithms.

(a) ticket box (b) ticket gate

Figure 1. Ticket Box and Ticket Gate Area

2.2. Platform

We analyzed the various aspects of the images taken at platforms, and suggested desirable event processing algorithms. The video analytic algorithms such as crowdedness, fall down detection onto railway are the essential functionalities at these places.

Figure 2. Various Platform Images

2.3. Corridor and Stair

We analyzed the various aspects of the images taken at corridors and stairs, and suggested desirable event processing algorithms. The video analytic algorithms such as reverse direction stepping and falling over detection are essential technologies at these places.

Figure 3. Corridor and Stair Images

2.4. Railroad

We analyzed the various aspects of the images taken at railroad, and suggested desirable event processing algorithms. The video analytic algorithms such as breaking into forbidden area and abandon object detection are essential factors at these places.

Figure 4. Railroad Image

3. Required Functionality at each Place and Situation

The automatic and intelligent surveillance system integrates various sensor inputs and manipulates events occurring in metro transition systems. Table 1 shows some of possible events in this environment. Considering these events, we established scenarios which handle those in real time.

Table 1. Issues to Solve for Different Environment and Situation

	Issues in environment		Issues in situations
1	Sudden light change	9	Fall down to railway
2	shadow	10	Loitering
3	Reflection on class	11	Abandon
4	Flicker, clutter,	12	Stolen
5	Fall over	13	Break in
6	Fire	14	Garbage disposal
7	Weather	15	Bill board
8	Vibration	16	Crowdedness

4. Event Processing based on Situation and Environment

In case of entering in forbidden area such as depot, the required processing consists of three modules, (1) security region setting, (2) detection time recording, and (3) detection of crossing the designated line. Other event processing modules differ mostly in (3). As an example, a smart camera observes loitering or abandoned objects in a region of interest as shown in Figure 5 [2]. A PTZ camera observing the loitering has automatic tracking, priority tracking or selective tracking capability as the basic functionality.

Referring to the images of subway system, we find that loitering detection is needed at depot, platform, passenger path, entrance gate, stair, or dangerous area. Prior tracking means that camera watches the abnormal walking such as slow or fast person. An automatic tracking means that the camera observes the first person who enters into the scene first. Selective tracking is set by human operator for specific person who is hanging around at designated path or area. The detected event information ranges from camera id, event class and object's information is sent to main surveillance center and recorded automatically.

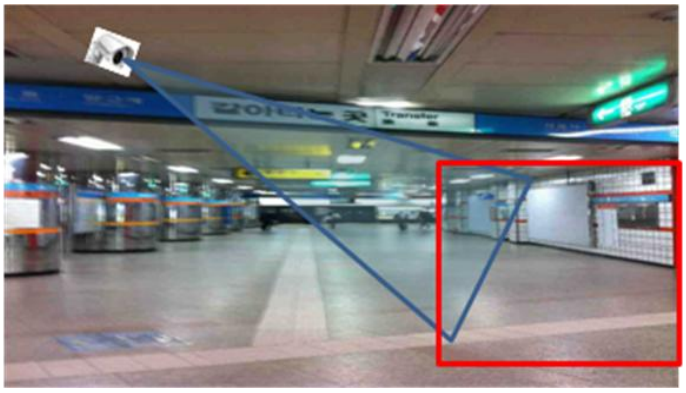

Figure 5. Camera Observes the Designated Area

5. Conclusion

In this paper we analyzed the various input images in metro subway stations and depot in order to apply video analytics algorithms into smart camera which are to be installed at subway environment. Based on the analysis, desirable event processing scenarios are suggested.

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