Research on Metro Anti-Terror Intelligent Real-Time Warning and Response Upgrade

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Abstract. Metro is a high-risk area of terrorist attacks. Although the method of manual security check is generally adopted in domestic subway, the traditional security check method has big loopholes due to the large number of passengers and long lines. This paper argues that, on the basis of the traditional metro security mode, the front end of video should be mainly reconstructed and the video monitoring system should be upgraded, so that it can have the functions of intelligent monitoring, intelligent command, intelligent research and judgment, and intelligent disposal, so that the subway anti-terrorism and effective platform can exert its maximum effectiveness.

Introduction

At present, international terrorism is rampant. Shopping malls, railway stations, bus stations, pedestrian streets, urban rail transit hubs and other public places with dense crowds have become the focus of terrorist attacks. In particular, the metro system has tunnel-like running lines, viaduct type closed track, closed narrow underground space, open platform and loose safety management. When earthquakes, collapses, floods, fires and other disasters come, or be subjected to such terrorist attacks as explosions, poison gas, arson, shooting, or slashing, Or in case of power failure, collision, failure, outage or other accidents, Or in case of power failure, collision, failure, outage or other accidents, or fighting, arguing, seat grabbing, stopping cars, jumping off rails and other emergencies. It is very easy to cause serious danger and emergency of group death and group injury.

Although there has been no terrorist attack on metro in China, many terrorist attacks on subway in foreign countries have long sounded the alarm. For example, on 11March 2004, a bomb attack on a commuter train in Madrid killed 191 people and injured 1800 others. On 7 July 2005, 4Britons directed by al-Qaeda blew themselves up on three London subways stations during the morning rush hour, killing 52 passengers. On the morning of 29 March 2010, two “black widows” blew themselves up in a Moscow subway station, killing 38 people, and so on. The following table 1 lists the basic information of some metro terrorist attacks, showing the harm of terrorist attacks on the Metro.

Table 1. Basic Information of Some Terrorist Attacks in Metro.

<table>
<thead>
<tr>
<th>Time</th>
<th>Location</th>
<th>Style</th>
<th>consequences</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995-03-20</td>
<td>Tokyo Metro</td>
<td>Sarin</td>
<td>13 people died and 5500 were poisoned.</td>
</tr>
<tr>
<td>1996-06-11</td>
<td>Moscow Metro</td>
<td>Explosion</td>
<td>4 people were killed and 15 injured.</td>
</tr>
<tr>
<td>2000-08-08</td>
<td>Moscow Metro</td>
<td>Explosion</td>
<td>13 people were killed and 90 injured.</td>
</tr>
<tr>
<td>2004-02-06</td>
<td>Moscow Metro</td>
<td>Explosion</td>
<td>41 people were killed and 100 injured.</td>
</tr>
<tr>
<td>2004-08-31</td>
<td>Moscow Metro</td>
<td>Explosion</td>
<td>10 people were killed and 50 injured.</td>
</tr>
<tr>
<td>2005-02-18</td>
<td>Daegu Metro</td>
<td>Arson</td>
<td>198 people were killed and 146 injured.</td>
</tr>
<tr>
<td>2005-07-07</td>
<td>London Metro</td>
<td>Explosion</td>
<td>52 people were killed and 700 injured.</td>
</tr>
<tr>
<td>2010-03-29</td>
<td>Moscow Metro</td>
<td>Explosion</td>
<td>39 people were killed and 83 injured.</td>
</tr>
<tr>
<td>2017-04-03</td>
<td>St. Petersburg Metro</td>
<td>Explosion</td>
<td>10 people were killed and 37 injured.</td>
</tr>
</tbody>
</table>

(Source: wikipedia)
Demand Analysis
Despite the grim anti-terror situation on the subway, there is something unexpected: overseas urban rail transit systems, especially subways, are not subject to security checks, perhaps because of cost and utility. However, strict security checks are common in the country's subway system, which is usually equipped with security inspectors, X-ray machines, security gates and hand-held metal detectors. However, this simple approach to security is perfunctory due to heavy traffic and passenger anxiety, and security personnel are too focused on screening passengers to give other functions such as discovery, recording, identification, disposal and command. In practice, simple camera recording equipment has the following problems.

Image Quality Problems
The Metro is a public space, and the dense cameras help to observe the situation in real time. However, the image monitoring effect is not good in the light and dark transition parts of metro stations, as well as in the dark parts, the running areas of vehicles, and the interior of crowded carriages. For now, most of the surveillance cameras in the area of strong contrast, or other light low places, in the monitor screen, not only “fuzzy”, or “invisible”, even spend a lot of financial and material resources, manpower constructed monitoring system, but in need it to exert its function of the co-action area and time.

Video Alarm Problem
In a crowded subway, video monitoring system accounts for 28%. A large amount of cost and manpower are invested to build video system, but the development of the most simple and effective multi-functional intelligent alarm product is completely ignored. Face recognition technology and smoke sniffing are not fully used. Moreover, video collected is only used for post-verification, and there is no independent police to manage video, so real-time or pre-warning cannot be realized.

Monitor Bottle-Necks
At present, the general monitoring center is equipped with a monitoring screen of 10-100 blocks, while the front end video collection point reaches 1-100,000 channels. The ratio between the screen displaying images and the number of real-time monitoring video channels is about 1:1000. It can be seen that a large amount of video information has not been effectively presented, and the display may not be the area with high security risks, which greatly limits the effectiveness of information. In addition, the existing alarm reception and handling system has been operating in an extremely traditional form of telephone alarm for a long time. However, there are many signal blind areas in the subway operation space, resulting in low communication efficiency of alarm reception and handling. In addition, the video monitoring center of subway and the 110 command center of public security organs are usually independent of each other, and cannot be connected, interconnected and linked with each other.

Upgrade Plan
Subway systems in the traditional security and security strategy based on core architecture, the development of the whole security prevention and control system of intelligent, three-dimensional upgrade plan, realize the intelligence information from the front of the monitor alarm trigger, a police scheduling one pace reaches the designated position, the principle, at the same time as much as possible to reduce the intermediate links, to realize the vertical short cross wide flat management model.

Intelligent Monitoring
The front camera adopts bulletproof technology, and USES special ultra-micro optical sensing technology. It integrates the highly available video monitoring system, high-fidelity voice system, multi-function gas detection module, and one-button alarm button.
From the perspective of bionic vision, hearing and smell, multi-dimensional and three-dimensional detection is carried out on the site environment, and the potential information such as abnormal behavior, abnormal sound and abnormal smell can be triggered automatically and intelligently, and the alarm information and video can be pushed to the remote command center through the Internet of things. Among them, the whole intelligent alarm and video application aggregation platform adopt new video of the engine, the video efficiency has improved dramatically, video retrieval and video playback fast, accurate positioning, functional diversity, simple operation, convenient fast and exact positioning, the user of events support instant run backward, based on the analysis of the event, the time slice, with electronic amplifier, image enhancement and other advanced features. Face recognition can transmit face information to the back end for analysis and recognition in real time. If matching with the information of face database is completed, alarm information can be sent to the joint efficiency platform, and information and face pictures can also be pushed to the security end to facilitate security personnel or police to conduct face control and inspection. Of course, according to the user's own needs, different alarm plans can be made for different cameras. When different cameras alarm, linkage of different regional cameras video can lock the target. Button alarm, auditory alarm, smell alarm, video alarm, motion detection alarm, etc. And for different alarm can be customized linkage video plan, alarm video plan, alarm SMS notification plan and alarm email notification plan.

**Intelligent Command**

In terms of receiving and handling police, the Internet of things center of the subway system provides comprehensive dispatching information in the form of voice, image, video, data and other forms, and can send dispatching information directly to the traditional three-in-one system to realize the centralized receiving and handling police of 110, 119 and 122, so as to form an intelligent multimedia command and dispatching platform. Moreover, several platforms can be connected, interconnected and integrated to form an intelligent command center with unified command and rapid response. At the same time, it supports the management and scheduling of human resources and property involved in emergencies on GIS maps, and can be combined with the monitoring video image. Video image of monitoring points can be seen on the map, which is helpful for the command and dispatcher to adjust the strategy immediately according to the situation development and make quick and effective command. In the event of an abnormal emergency, the multimedia police reception and handling command and dispatch platform can call in video of the incident site in the first time, locate the incident site, fault site, attack source and other information, and mobilize police force of nearby police stations and roads according to the plan. Combined with the GIS system, it carries out joint handling and alarm, collects and shares emergency information in real time, understands the overall handling situation of the incident and grasps relevant details thoroughly. And through the existing communication methods such as network, wireless intercom, fixed phone, mobile phone, 4G network, soldier and other notices to warn key departments and units to implement response measures in accordance with the emergency procedures.

**Intelligent Research and Judgment**

After the occurrence of alarm, the relevant video materials on and near the scene can be collected and extracted through the jue platform, and video concentration, variable speed playback, video optimization and other technologies can be used to record clues for anomalies. The system has a variety of video analysis means to help staff confirm the situation, can carry out rapid video analysis and mining, standardized data information management and feature data labeling, can provide fast data search and retrieval and case string analysis; Real-time synchronization of data update to facilitate rapid information sharing; A variety of process task management methods, effective collaborative command, from the massive video monitoring information search valuable clues.
**Intelligent Disposal**

Current end anti-terrorism robot by intelligent vision, intelligent hearing, smell, take the initiative to trigger the alarm, or passive trigger the alarm by pressing the button, the whole intelligent alarm and video application effect in platform can be automatic popup alarm video immediately, at the same time timely warning alarm by sound and light multimedia way, and can through the GIS/beidou positioning smart camera near real-time monitoring video to be obtained and automatically, to quickly locked the suspect and understand the situation. Meanwhile, the intelligent robot can activate the sound prompt, light illumination, refuge guidance and fire sprinkler system to minimize the evacuation risk of the collective escape.

**Conclusion**

To upgrade the traditional subway safety scheme to a fully intelligent real-time warning and response system, the core method is to transform the common functions of the front end of video. Relying on electronic police, bayonet system, police integrated system and other related systems, video equipment on the basic layer has certain intelligent analysis ability; At the standard processing level, the acquisition equipment is transformed into an intelligent front end with primary response, which can complete part of the anti-terrorism disposal procedures; In the application layer of video, image retrieval, trajectory analysis, behavior analysis and video research and judgment are comprehensively integrated, so that it has the functions of prediction, alarm, command and disposal of terrorist activities in the subway system.

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**References**


