Chapter 41
Anomalous Event Detection Methodologies for Surveillance Application: An Insight

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ABSTRACT

Automatic visual surveillance systems serve as in-place threat detection devices being able to detect and recognize anomalous activities which otherwise would lead to potentially harmful situations, and alert the concerned authorities to take appropriate counter actions. However, development of an efficient visual surveillance system is quite challenging. Designing an unusual activity detection mechanism which is accurate and real-time is the primary challenge. Review of literature carried out led to the inference that there are some attributes which are essential for a successful unusual event detection mechanism for surveillance application. The desired approach must detect genuine anomalies in real-world scenarios with acceptable accuracy, should adapt to changing environments and, should require less computational time and memory. In this chapter, an attempt has been made to provide an insight into some of the prominent approaches employed by researchers to solve these issues with a hope that it will benefit researchers towards developing a better surveillance system.

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INTRODUCTION

In recent days, due to growing terrorism and hence rising concern about global security, it has become crucial to have in-place efficient threat detection systems. These systems must be able to detect and recognize potentially harmful situations and alert the authorities to take appropriate action(s). This process of active surveillance has been promisingly achieved by means of intelligent video analysis through automatic threat detection systems. Visual Sensor Networks (VSNs) are the most sought-after solution for this purpose. The security personnel can rely on this kind of systems to have better situational awareness, enabling them to respond to critical situations more efficiently.

A VSN consists of a group of nodes called camera nodes (or smart camera devices or sensors) each equipped with a low power embedded processor, energy source and an image sensor. It also consists of a transceiver for communication with other nodes and with the central base station or the sink where the data is collected and further processed for end-user consumption (Marcus & Marques, 2012) as shown in Figure 1. VSNs support a great number of vision-based applications such as in surveillance, environment monitoring, smart meeting rooms, smart homes, tele-presence systems, etc. (Soro & Heinzelman, 2009). In this chapter, the focus revolves around the all-important surveillance application of VSNs.

BACKGROUND

Visual Sensor Networks for Surveillance Application

Of late, VSNs consisting of surveillance cameras are in wide use due to their highly effective monitoring ability which is beyond human capacity. Considerable numbers of surveillance cameras have been deployed in public places with a purpose of crime detection, reduction and crisis management (Gong, Loy, & Xiang, 2011). With conventional visual surveillance systems, human operators were employed

Figure 1. Representative image of a homogeneous Visual Sensor Network