

Chapter 4

Multimedia Supported Intelligent Video Surveillance System

ABSTRACT

An integrated multimedia supported intelligent video surveillance system is proposed. The system alleviates the disadvantages of the existing video-surveillance kits and provides advanced search, notification, visualization, and alarming functionality through integration of artificial intelligence, motion detection and tracking technology, multimedia databases, and Internet/cell phone connectivity. The effectiveness and feasibility of the proposed concept is proven through experimental results on a real-life video sequence.

1. INTRODUCTION

Nowadays, the expansion of inexpensive video surveillance technology is present on the market, such as wireless digital cameras, motion sensors, etc. Therefore, the equipment, once having dominated corporate security market, becomes available to average homeowners. Typical systems, currently installed at a homeowner's premise, consist of one or several analog or digital cameras, video tape recorder and a monitor (Remagnino, 2002), (Fathy, 1995), (Foresti, 1994). If properly installed, such systems can provide customers with forensic evidence of potential intrusions into property and also may serve as deterrent against potential intruder. However, such systems also have significant drawbacks:

1. The surveillance systems have limited or no interaction with other media, including World-Wide Web and e-mail.
2. The systems do not have any artificial intelligence capable of analyzing the recorded scene.
3. The video storage is bulky and may require an operator to manipulate tapes.
4. Long periods of no activity are unnecessary recorded and stored.
5. Search of sequential storage media is difficult and cannot be automatic.

Recent progress in video and image processing has provided capability of performing intelligent video signal analysis, that includes scene analysis, motion detection, detection of events and tracking. Such systems have wide application and huge spectra of use (e.g., traffic regulation, securing objects in interior or exterior).

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Current developments in object-relational and multimedia database technology can provide efficient linkage between textual and non-textual (image) information. Hence, contextual meaning of recorded visual information could be accomplished by properly coupling an intelligent video-surveillance system with such a database. On the other hand, pattern matching techniques make possible to couple an acquired image with those stored in the database, and thus provide identification of visitors.

Contemporary communication technologies, such as DSL/Cable permanent Internet links, and global mobile and satellite phone networks, make possible instant connectivity and relatively wide bandwidth for transmitting multimedia between homes and remote customers (homeowners). Information can be delivered to the remote user via standardized and universally available interface such as World Wide Web and e-mail.

An integrated multimedia supported intelligent video surveillance system aimed to alleviate the disadvantages of the current video-surveillance devices is described in this chapter. The proposed system encompasses available cutting-edge technologies and is based on recent advances in motion detection and tracking. At the same time, the system consists of inexpensive and easily accessible off-shelf hardware and is easy to implement, produce and maintain. The system configuration emphasizing the motion detection subsystem is discussed and the proof of proposed concept is provided on experimental video.

2. SYSTEM CONFIGURATION

2.1 Video Surveillance System Design Requirements

A video surveillance system design requires making decisions that demand knowledge of basic options and the rationale for selecting from different

ones available on the market. One needs to face making the following key decisions:

1. Camera Types
2. Camera Connection To Video Management System
3. Video Management System Types
4. Storage Type
5. Video Analytics Type
6. Surveillance Video Display

Camera Types

Cameras represent the main input into the video surveillance system and the following is relevant to them:

1. **Physical position of used cameras:** Cameras have to be placed in critical areas in order to record relevant video. The critical places for proper camera placement are entrances, exits, hallway, driveways, etc in surveiled areas where there is a high density of people or vehicles. Also, camera placement can be related to the specific objects or areas that need security such as safes, merchandise areas, cash registers, parking spots, lobbies, banks, etc. Placing cameras at critical and adequate points is a very cost-effective way to document people and vehicles entering and exiting certain facility.
2. **The camera type being used:**
 - a. A camera can be fixed when it is recording only one specific view or it can be PTZ camera that is moving left and right which is called panning, moving up and down which is called tilting and closer and farther away called zooming. PTZ cameras are generally used to cover wider fields of views. Most cameras used in video surveillance are fixed because they cost five to eight times less than PTZ cameras.

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