Its not the technology that reduces crime
Its knowing how to use the technology that reduces crime!

Closed Circuit Television's (CCTV) Popular Climate

- CCTV is increasingly requested by:
  - law enforcement, security, management, schools, transportation
- Early research shows that CCTV can work if integrated with other systems however research is weak and limited
- Not all view the popularity of CCTV as good as CCTV is the frequent hostile target of inspection by privacy advocates
What is CCTV?

- CCTV was first used in the 1950s and has since become an essential element in any professional security system.
- Closed Circuit Television (CCTV) is a television system which operates on a 'closed loop' basis. Unlike broadcast television, which is available to anyone with a suitable receiver, CCTV pictures are only available to those directly connected to the loop.
- With today's network security, 'Network Video' is an expansion of CCTV beyond analog circuitry to data networks using a common interface such as TCP/IP.
Technical note — In most installations, the loop is a physical link — a cable which carries the picture from the camera to the viewer. With very few exceptions, the pictures are transmitted as a composite video signal at 75 ohms. 1 volt peak-to-peak, generally RG59 or RG6.

Where high resolution (>400 TV lines) is required, some camera equipment offers a Y/C facility where the luminance signal (Y) and the chrominance (C) is divided.

Over long distances, for example in Town Center systems or transportation systems, fiber optic transmission is popular. Where this option is too expensive, ISDN and DSL offers a cost-effective alternative for events.
Example of CCTV Systems Integration

Connect 1 to 4,000+ cameras, alarms, dry-contacts, and other devices from any source.

Digital Video Recorder (DVR) with Triplex to record, view, and manage events for up to 30 days.

High speed, multi-platform video, audio, and data transmission device.

Pre-to-Post alarm/event monitoring (e.g., -15 seconds to +30 seconds after event) call outs and alarm management.

Internet and LAN based Remote Monitoring of Cameras.

Event driven notifications, alerts, pages, emails, and phone calls.

3rd Party Central Station Monitoring, with Proactive Guard Tours, Reactive Event Monitoring, and Intensive Monitoring.

Biometric systems integration: facial recognition, iris scan, hand geometry, fingerprint, etc.

CCTV System Components

Camera selection – how do you decide?

Sample cut sheet of available cameras on the web.

Camera

- The camera is the 'eye' of a CCTV system and at its core lies CCD (charge coupled device) technology.
- The CCD is comprised of about 500,000 light sensitive cells called picture elements (pixels) which convert the light falling onto its surface into an electrical signal. The performance of the camera, and ultimately the surveillance system, is more dependent upon the quality of the CCD than any of the other camera components. Currently, the popular formats are:

<table>
<thead>
<tr>
<th>Format</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Half-inch</td>
<td>High-performance for high sensitivity and low noise</td>
</tr>
<tr>
<td>Third-inch</td>
<td>Most popular and ideal for a wide range of applications</td>
</tr>
<tr>
<td>Quarter-inch</td>
<td>A more recent development</td>
</tr>
</tbody>
</table>

Camera Resolution

- The higher the resolution the sharper the picture. The best resolution available at present for CCD cameras is approaching 750 horizontal lines (TV lines) (3-CCD) and 500 vertical lines.
- Resolution is not necessarily the key design point. Low resolution CCTV, which is usually lower cost, is often perfectly adequate and the final choice depends on the required features and build quality together with site conditions and available funds.
- As a general rule, a high resolution is preferable in low light levels and when identification of points of fine detail are required.
Camera Quality

Lenses

- Demonstration of a Manual and Electronic Lens Calculator

- Lenses – Focal Range (F)
  - The lower the “F” number of the lens used the better the result. For example:
    - Camera one quotes 0.8 lux full video with an F1.0 lens
    - Camera two quotes 0.8 lux full video with an F1.2 lens
    - Camera two is the more sensitive camera as it quotes 1 lux with a slower F1.2 lens.
    - With the faster F1.0 lens, it would probably give a full video signal at only 0.6lux.
Lenses - Aperture Range / Iris

- The aperture is the clear opening in the centre of the lens that allows light to pass to the pick-up device.
- The aperture size is described in relation to the focal length (F). Thus the aperture is specified by an F number.
- If the lens has a focal length of 50mm and if the diameter of the clear opening of the lens is 25mm, then the lens is said to have an aperture of F:2 (50mm divided by 25mm = 2). A 50mm lens with a focusing ability as a 150mm F:2 lens but the glass components will be more complex in order to achieve the telephoto effect.
- Most CCTV lenses have a built-in mechanism called an iris. This allows the aperture to be changed to accommodate varying light levels. The largest aperture setting is often used to define the maximum light gathering ability of the lens, the lens speed. A lens with a maximum aperture of F:1.6 is referred to as an F:1.6 lens and is said to be 'faster' than, say, an F:4.2 or F:8 lens.
- The iris setting of the lens is numbered from the largest F stop down to the smallest F stop. CCTV systems are rarely installed in situations where light levels are constant, so lenses with automatic iris adjustment are important components of most systems.

Light

- The human eye and the camera lens operate on completely different lines. Although the human eye adjusts automatically to various light conditions, the camera is inherently less flexible. CCTV is more receptive to certain color combinations than others. The best results are usually obtained by matching the spectral response of the camera to the light sources in the scene.
- Changes of foreground light and background lighting levels can significantly impact video capture quality.
- The amount of light reflected from an object determines how ‘bright’ it appears. Here are some examples:

<table>
<thead>
<tr>
<th>Light Source</th>
<th>Reflectance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sunlight</td>
<td>High</td>
</tr>
<tr>
<td>Clouds</td>
<td>Moderate</td>
</tr>
<tr>
<td>Shade</td>
<td>Low</td>
</tr>
<tr>
<td>Shadow</td>
<td>Very Low</td>
</tr>
</tbody>
</table>

- When lighting is insufficient there are several options:
  - Improve lighting with traditional security lighting
  - Improve lighting with Infra-Red Illumination
  - Use low-light camera, or auto changing day-night camera
  - Improve lighting through camera wide-dynamic range
  - Improve lighting through camera back-light compensation
**Housings**

- Housings come in many styles and types:
  - Fixed
  - PTZ
  - Unitized
  - Pressurized
  - Vandal resistant
  - Bullet resistant
  - Concealed

**Recorders (analog and digital)**

- Analog video is to Digital Video what the horse and buggy is to the modern automobile. Both will get you to your destination. But the time taken to get there often determines whether you will take the trip at all. Here are some key differences between the recording technologies:
  - Multi-tasking
  - Speed of Information Retrieval
  - User Interaction
  - Signal Degradation
  - Smart Monitoring
- The greater challenge is deciding which of the 450+ Digital Video Recorders (DVRs) to standardize on.

There are over 450 DVR manufacturers and nearly as many transmission device providers ...

There is no “one-size-fits-all” solution.
Peripherals (multiplexers, matrix switchers, etc.)

Switching systems
- Principle and features of different types of switchers
- Multiplexers, quads, & matrix switchers
- Monitors
- Different types and important features of monitors
- Adjustments, precautions and trouble shooting

Transmission Systems
- Video transmission including coaxial cable, Fiber Optics.
- Telephone networks
- Different methods for transmission of control signal
- Power transmission systems
- Adjustments, precautions and trouble shooting
What is the value of remote monitoring?

- Cost of security guard uniform: $48
- Cost of a security console: $20,000
- Cost of CCTV Surveillance System: $150,000
- Cost of 24-7 Manned On-Site Monitoring: $600,000
- Cost of the Newspaper defeating monitoring system: $.50
- Value of Watching the Watchers — Priceless

Remote Monitoring Reporting

Video Monitoring Types

1. Scheduled / Proactive patrols and hotspot monitoring
   - Scheduled tours
   - Maintenance checks
   - Opening and Closings
   - Investigations
2. Event oriented / “Dark Screen” monitoring
   - Alarm (emergency) response
   - Event (non-emergency)
   - Maintenance and system condition monitoring
3. Intelligent surveillance and automated monitoring
   - Automated activity, behavior, and object tracking by computer
   - Recognized events, trouble, malfunctions, are redirected to “manned” monitoring center
   - Automated web based reports
CCTV applications (browsers and remote surveillance trends)

VPON

- VP 300: Camera Server with 2-way audio over LAN (10fps)
- VP 500: Camera Server with built-in video storage (30fps)
- Supports H.263

TeleSite QuickSilver

- Manufacturer Reported Transmission Rate:
  - PSTN line: up to 20 fps
  - On ISDN line: up to 25 fps
Traditional central station monitoring services have been added to several systems (e.g., cVideo)

Integral Technologies RemoteView

Integral Technologies OASIS

Oasis is a software package which integrates numerous security systems, including CCTV, access control, alarms, intercoms, pagers and others into a common graphical user interface. No other software package supports the variety of products – more than 75 systems from 30 manufacturers.
Boeing Autometric VSOC / NICE


Central Station Monitoring

Sample of Central Monitoring Station, Farsight, LTD.

The collar

CCTV Application Technical Approach Pointers

- Examine use of CCTV within your industry
- Examine your need to identify activity, behavior, individuals, etc.
- Examine your BUDGET – often the starting point
- Examine your situational and requirements
- Examine barriers, obstacles, and environmental constraints to implementation
Define CCTV System Requirements

Obtaining more detail in an image is achieved at the cost of each camera covering a smaller area. As higher performance is therefore more expensive and difficult to achieve it should be specified only when necessary.

Conduct a CCTV Site Survey and Don’t Forget the Basics

- Do you really need CCTV?
- Set out your problem
- Set out possible solutions
- List pros and cons for each possible solution
- So, OK, you have decided you need a CCTV system
- Set down a list of objectives for the system
- Who will design the basic system layout?
- The types of specification
- Operational and equipment specifications

Consider seven identified key aspects of successful CCTV implementation

1. Specification and the pre-bidding process
2. Project management
3. Building a project team
4. Engagement of stakeholders
5. Third parties
6. Identification of costs and resources
7. Design and technology
Reasonable CCTV strategies needs to be . . .

- Appropriate
- Sustainable
- Cost effective
- Adaptable
- Compensate for vulnerability to defeat
- Simple interactivity
- Evaluate and improve methods and technologies
- Always On (24x7)
- Redundant backup systems
- Secure
- Reliable
- Efficient
- Robust tools with open data accessibility,
- Scalable system architecture
- State-of-the-art security technologies

CCTV futures – what’s next?

- Fusion Cameras (high-resolution and thermal)
- Intelligent Cameras with embedded software
- Enhanced CMOS cameras with higher color rendition and low-light capacity
- 360 mirror cameras with intelligent software
- Smaller, lighter, wireless cameras
Iris-based biometric devices analyze the features found in the colored ring of tissue that surrounds the pupil. Iris scanning, is less intrusive than retinal eye-related biometrics and uses a fairly conventional camera element and requires no close contact between the user and the reader. In addition, Iris scanning has the potential for higher than average template-matching performance. Iris biometrics work with glasses in place and is one of the few devices that can work well in identification mode.

Popular face recognition solutions (e.g., Visionics and Viisage) analyze facial characteristics with geometric point algorithms. It requires a digital camera to develop a facial image of the user for authentication and compares the image to a database. Real-time reliability of systems not much beyond 70% accuracy in real-world settings during last US gov. tests.

Futures – Biometric - Thermal
Video cameras may be used in public spaces, and proprietary places by the owner. Using audio with video is growing in popularity and can be performed by monitoring companies, however check local laws for notice requirements and other regulations. Privacy law will continue to play an important part of security. Privacy advocates are expected to become more aggressive in their methods and tactics. Within the alarm industry, video verification will increase in importance. Industry driven, or government mandated certification and/or standardization of video monitoring is likely to occur.
More information on CCTV

- CCTV Labs http://focus.cctvlabs.com/
- Security http://www.securitymag.com
- Security Management http://www.securitymanagement.com
- Security Distributing & Marketing (SD&M) http://www.sdmmag.com
- Access Control http://www.securitysolutions.com
- Security Sales & Integration Magazine http://www.securitysales.com
- Security Technology & Design (ST&D) http://www.st-and-d.com
- Security Dealer http://www.secdistributor.com
- Security Products http://www.securitysolutions.com
- Loss Prevention http://www.securitysalesmagazine.com

Where to find more information on CCTV specification, integration, and monitoring

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