Video Surveillance System-Basics

presented by
Dr.B.Yogameena

Acknowledgment:
Books:
Digital Video Surveillance and security by Anthony C Caputo, Elsevier Inc, 2010
Intelligent Surveillance Systems by Huihuan Qian, Xinyu Wu, Yangsheng Xu, Springer, 2011 and
Web sources
Surveillance: Everywhere!
Motivation

Security

• Huge threat on Human life pay attention

• Proliferation of camera sensors for security purposes.
  – just as a forensic tool which lost its primary benefit.
  – Requirement is not only 24 hours monitoring.
  – Time is important.
  – Consistency in performance.

• Need - smart surveillance
Computer Vision for Video Analytics

People Counting

Panorama View

Defog

Stabilization
Missing object detection  Scene change detection

Unattended object detection
Crowd detection

Face counting

Intrusion Alarm

Traffic Monitoring
Assisted driving

Pedestrian and car detection

Lane detection

- Collision warning systems with adaptive cruise control,
- Lane departure warning systems,
- Rear object detection systems,
Intelligent Video Surveillance 3/3

Typical problems

Metro station surveillance

Surveillance inside trains

Building access control

Airport monitoring

INRIA
Typical CCTV Topology
What is to be known before to design a architecture for a surveillance application

✓ Site Survey (Includes how cameras can be protected from weather)
✓ Topolgy
✓ Analog vs Digital
✓ Number of Cameras
✓ Type of Cameras
✓ CCD vs CMOS Sensors
✓ Lens Specification
✓ Surge Protector
✓ Co-axial cable
✓ Media Converter
✓ Digital Video Encoders
✓ Switch
✓ Storage (DVR vs NVR)
✓ Server
✓ Networking (Wired/Wireless)
✓ VMS
✓ Cost

❖ Make sure that whatever hardware you choose is fully compatible with the software.
Analog Camera

IP Camera

Video Formats: CIF, QCIF
Resolution: MP:HD
Interlaced Vs. Progressive

IP Camera Cabling:

Analog Camera Cabling:

Twisted Pair Network Cable

Coaxial Cable

RJ45 terminated cables

BNC terminated cables
Indoor/Dome Camera (Retail Surveillance)

Outdoor Camera (Parking Lot) (PETS)

Bullet Camera

Box Camera
Day/Night Camera

- Cable out
- Light Sensor
- Camera Lens
- IR LEDs

Infrared

Thermal

Image Intensified [P]
Analog vs Digital Video

F-Stop: The *f-stop* is the method of measurement for the iris opening of the lens aperture. Lenses are labeled with their widest f-stop, which is the largest iris aperture of which the lens is capable.

Shutter speed: Shutter speed also controls how well the camera captures movement. Faster shutter speeds are able to capture movement clearly, whereas slower shutter speeds allow for more light but sacrifice clarity of moving objects.

Focus: Manual vs Auto

Lens: Zoom vs Fixed
Lens: Plastic Vs Glass

Plastic

Glass

Vandal Resistant
# CMOS vs CCD Sensors

<table>
<thead>
<tr>
<th>CMOS Security Camera</th>
<th>CCD Security Camera</th>
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<tbody>
<tr>
<td><strong>Strengths</strong></td>
<td><strong>Strengths:</strong></td>
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<tr>
<td>• High resolution</td>
<td>• Good performance in low-light conditions</td>
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<tr>
<td>• Excellent color</td>
<td>• Good WDR</td>
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<tr>
<td>• Fast frame rate</td>
<td>• Less susceptible to vibration effect</td>
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<tr>
<td>• Low power consumption</td>
<td>• Low noise</td>
</tr>
<tr>
<td>• Cost-effective</td>
<td>• High sensitivity</td>
</tr>
<tr>
<td></td>
<td>• High definition</td>
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<tr>
<td><strong>Weaknesses:</strong></td>
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<tr>
<td>• High noise</td>
<td>• High power consumption</td>
</tr>
<tr>
<td>• Moderate sensitivity</td>
<td>• Slow frame rate</td>
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<tr>
<td></td>
<td>• Expensive</td>
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Use CMOS security cameras in covert environments. Compact size.

CMOS and CCD sensors are typically measured in either millimeters or inches. The majority of security cameras use anywhere from a ¼- to a 2/3-inch sensor.

You can opt to security cameras with CCD image sensors when you want to install your security cameras in dark environments.
Power Over Ethernet

• NVR systems utilizing power-over-ethernet (POE) technology. Only require Ethernet cable to connect camera and recorder.
• The Ethernet cable clicks into the back of the NVR and IP camera. This cable provides both power and video transmission.

Networking: Wired vs Wireless
Bandwidth and hard drive space are crucial components in determining the level of digital video quality required.

Megapixel cameras provide more detail in the archived footage to provide added value at the cost of more bandwidth and storage requirements.
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<th><strong>NVR</strong></th>
<th><strong>DVR</strong></th>
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<td>A network video recorder is considered a complete Internet Protocol camera recording system and is mostly used in Internet Protocol video surveillance systems</td>
<td>A digital video recorder (DVR) is a consumer electronics device designed for recording video in a digital format within a mass storage device such as USB flash drive, hard disk drive or any other storage device.</td>
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<tr>
<td>A network video recorder does not use any dedicated hardware for video capture but makes use of special software on a dedicated device.</td>
<td>It is mostly used in analog surveillance/security systems.</td>
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<tr>
<td>It can record as well as access recorded images and live views.</td>
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