Video Detection System Design Guidelines

WHAT FACTORS AFFECT THE PERFORMANCE OF A VIDEO DETECTION SYSTEM?
Autoscope® – 20 Years in Traffic
Autoscope Technology: The First

Autoscope wide area detection technology was the first in the industry. Since 1991, Autoscope has been a world leader in Video Detection.
Autoscope Technology: Proven

- Experience of more than 100,000 installations worldwide, including major projects in:
  - Oakland County Michigan (Intersection)
  - Atlanta, GA. DOT (Freeway)
  - Meadowlands, N.J. (Intersection)
  - Jubail, Kingdom of Saudi Arabia (Traffic Data Collection)
Detection Benefits

Easy Installation
- Reduced lane closures … safer for installers
- Typically mounts on existing structures (signal or lighting poles, or sign structures)
- The ability to move, modify, eliminate or create without lane closures at any time
- Use Autoscope before, during and after any road resurfacing or reconstruction project

Procurement cost
- Installed cost often lower than loops
- Multiple detection zones per sensor enables outstanding “cost per detector” economics
Applications

• Intersection actuation and control
• Bicycle Detection
• Ramp metering
• Incident detection/Highway Management
• Traffic data collection and reporting
Intersection Architecture

Traffic Operations Center

Communication Backbone

Local PC

“3-wires-only”

Outputs to Controller

DPM TAP

TS1

TS2
Highway Architecture

Traffic Management Center

Local PC

Communication Backbone

“3-wires-only”
Multi-tasking ITS Solution:
Capable of simultaneously satisfying multiple traffic management objectives: stop line and advanced extension vehicle detection, bicycle detection, advance detection, comprehensive traffic data collection, and MPEG-4 video surveillance.

Minimal Footprint:
Very cabinet friendly!
Two small cabinet components:
Terra Interface Panel (TIP) and the Terra Access Point (TAP).

Easy Integration:
“3-wires-only” makes integration very convenient to new or existing intersections.
No complicated BNC coaxial connections to worry about...no coaxial cable period!
True Ethernet communications make integration to existing Ethernet-based infrastructure as simple as plugging in a CAT 5 cable.
FACTORS AFFECTING DETECTION PERFORMANCE

• FIELD OF VIEW
  – Pole Placement
  – Camera Height

• ARTIFACTS
  – Rain, snow, wind, fog
  – Sun, shadows, day, night

• DETECTION OBJECTIVE
  – Presence, counting, speed, classification …
  – Intersection or freeway
VIDEO DETECTION SYSTEM – PROJECT STAGES

DESIGN STAGE

INSTALLATION

DETECTOR SET-UP
WHAT FACTORS AFFECT DETECTION PERFORMANCE DURING THE DESIGN STAGE?

- POLE PLACEMENT
- CAMERA LOCATION
- CAMERA HEIGHT
- DETECTION OBJECTIVE
- DESIGN EXPERTISE
WHAT FACTORS AFFECT DETECTION PERFORMANCE DURING THE INSTALLATION STAGE?

• Choice of Detection System
• Quality of Materials and Workmanship
• Camera Position
• Camera Tilt
• Camera Zoom
• Camera Aim
• Sunshield
WHAT FACTORS AFFECT DETECTION PERFORMANCE DURING DETECTOR SET-UP?

• WIZARD VS DETECTOR EDITOR
• DETECTOR SIZE
• DETECTOR TYPE
• DET. PLACEMENT
• REGIONAL SETTINGS
• FIELD OF VIEW COMPROMISES
• ENHANCE PERFORMANCE WITH BOOLEAN LOGIC AND CONTROLLER INTERVAL STATUS
FACTORS THAT AFFECT PERFORMANCE - SUMMARY

15-20% DECISIONS MADE DURING DETECTOR LAYOUT

20-35% DECISIONS MADE DURING INSTALLATION STAGE

50-60% DECISIONS MADE DURING DESIGN STAGE
RULES OF THUMB

• PLACE IMAGE SENSOR AS HIGH AS POSSIBLE
• CENTER OVER TRAFFIC AS MUCH AS POSSIBLE
• SELECT IMAGE SENSOR LOCATION TO MINIMIZE OCCLUSION
Downlane Occlusion

Trailing Vehicle Occluded by Leading Vehicle in Same Lane
Cross-lane Occlusion

Vehicle in Far Lane Occluded by Vehicle in Near Lane

Occlusion

- DOWNLANE OCCLUSION
- CROSS LANE OCCLUSION
Cross-Street Occlusion

Oncoming Vehicle Can be Occluded by Cross Street Vehicle
Obstruction Occlusion

Occlusion

- DOWNLANE OCCLUSION
- CROSS LANE OCCLUSION
- CROSS STREET OCCLUSION
- OBSTRUCTION OCCLUSION

Signal heads, signs, overhead cables, etc, block the camera’s view of the primary detection area
Which Type of Occlusion is Typically Most Troublesome?

- **Crosslane Occlusion** – due to camera placement compromises
- What can be done?  You must fully understand the Detection Objectives…
  - Move the camera to another corner?
  - Recommend upgrade to poles/luminaire arms?
  - Pole installation in center islands?
  - Increase Camera height?
RULES OF THUMB

• IMAGE SENSOR SHOULD BE AIMED MORE THAN 5 DEGREES BELOW THE HORIZON
• SELECT IMAGE SENSOR LOCATION TO MINIMIZE VIBRATION OR MOVEMENT
• PLACE IMAGE SENSOR HIGHER TO MINIMIZE VEHICLE HEADLIGHT REFLECTIONS
RULES OF THUMB

TILT IMAGE SENSOR DOWN SO THAT FARthest DETECTOR IS AT TOP OF FIELD OF VIEW
RULES OF THUMB

WHEN PLANNING AN INSTALLATION, EARLY RECOGNITION OF PHYSICAL LIMITATIONS HELPS SET REASONABLE PERFORMANCE EXPECTATIONS
TYPICAL INTERSECTION FOV
WHAT ABOUT THIS FOV?

Camera Objective – Surveillance or Detection?
Video Detection Design

Critical considerations –

• Understand and guide:
  – the Customer’s perceptions, strategies, expectations
  – Detection vs. Surveillance
  – Traffic Control Strategy

• How are their existing loop intersections designed (from the detection perspective)?
• Will their pole placement and pole type support video detection “taking the place” of their loops?
• What type of cabinets and controllers will be used?