![AgilityVideo logo]

# SmartCatch™ | Track & Tunnel
## Intrusion Detection System
## Technical Specification

## DESCRIPTION

The Track and Tunnel Intrusion Detection System (TTI) is a video analytics solution that has been developed specifically for the needs of subway and rail operators to detect track and tunnel intruders. The system instantly recognizes violators, regardless of the presence of a train, and provides the ability for immediate assessment. As a result it helps prevent accidents, attacks and other malicious events.

What makes TTI truly unique is its ability to recognize the presence of a train and self-adjust so that it ignores the visual affects of the trains' motion and the presence of humans inside the cars. This virtually eliminates false alarms, maintaining the viability of the system in all conditions. Whereas conventional video analytics systems are overwhelmed by false alarms or disabled during periods of train motion, TTI is not. By automatically sensing the presence of a train and tuning out its effects, the system provides full-time protection against track and tunnel intrusions.



TTI provides a complete solution for rail and metro organizations as it provides security protection for both long range intrusion detection and detection of tunnel intrusions when trains are passing. When a train is not blocking the view, the system detects human and vehicle movements at long range. If a train blocks the field of view, as in the example on this page, detection capability is maintained in the visible areas of the scene. With this ability, TTI can be deployed in subways, train stations and along outdoor track areas. Within moments of any violation, a video clip or image is delivered to security personnel, whether they are in the SOC or on patrol. Instantly, an assessment can be made, and an action plan put in place if necessary.

TTI supports the definition of multiple regions of interest (ROI) within a single camera view. Each ROI can be configured to alert for specific types of objects (human, vehicle, other) and different types of motion. Types of motion include entering, leaving, appearing, disappearing, loitering and moving in a specific directional motion. Each type of motion can generate a unique alert type allowing security personnel to recognize the violation.



This behavior utilizes the SmartCatch learning engine, a patent-pending capability, which uses artificial intelligence to automatically filter out unnecessary alarms while maintaining the detection rate. To operate, the self-learning feature only requires that users indicate whether alarms are true or false positive. After a sufficient sample of alerts are classified as true or false, a filter is created that suppresses future false alerts while still detecting violations from

other intrusions. With the learning engine, system accuracy improves over time, providing even greater protection while reducing the distractions caused by false and nuisance alarms. The behavior handles shadows and other environmental conditions too, like poor weather, wind, and other environmental motions not related to object tracking. Additionally, camera vibration is a common problem for surveillance cameras. The perimeter monitoring behavior can adjust for camera vibration using a camera motion estimation and motion compensation technique.

## SUMMARY

- ➢ Filters out train motion to virtually eliminate false alarms from trains
- ➢ Detects human intrusions onto track and into tunnels regardless of the presence of a train.
- ➢ Tracks humans, vehicles and other objects moving through the field of view.
- ➢ Supports resolutions from 1CIF to megapixel. Greater processing capacity is required for higher resolutions.
- ➢ Learning engine for automatic false and nuisance alarm reduction
- ➢ Day and night time operation (with illumination or thermal cameras).
- ➢ Compensation for slowly varying illumination
- ➢ Tracking sustained despite infrequent

occlusions.
- ➢ Detection methods include
  - • Entering
  - • Leaving
  - • Appearing
  - • Disappearing
  - • Directional Motion
  - • Loitering
- ➢ Supports multiple regions of interest, each with different object and motion methods.
- ➢ Operates on industry-standard Windows servers
- ➢ Adapts to minor camera vibration
- ➢ Configured through a wizard-driven easy to use interface

## REQUIREMENTS

The following are requirements for deploying TTI

- ➢ Camera height – Cameras should be placed as high as possible and placed on structural elements to reduce camera shake. The minimum height is 12 feet.
- ➢ Object size for detections – Detecting human tunnel intrusions when trains are present requires 12x20 pixels. With a 30 degree FOV camera, at 1CIF, this results in a 120 feet detection range. For detections in the absence of trains a minimum of 3 x 5 pixels are required for possible classification (5x13 for more reliable classifications), resulting in a range of 500 feet.
- ➢ Tracking time – For reliable tracking, SmartCatch requires 3 seconds of unobstructed viewing time of the object.
- ➢ Frame rate – Minimum of 10 frames per second.
- ➢ Processing requirements – The compute requirements by scene crowdedness and pixel resolution as described above. For a tunnel intrusion by humans, using a server with two Intel Xeon E5-2620 six-core processors can support about 10 TTI behaviors. For long range perimeter detections, the same server can support about 20-30 cameras.