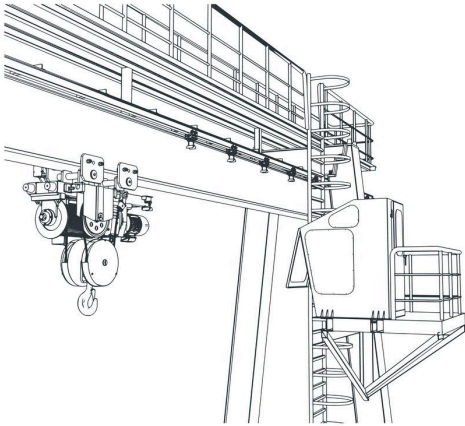


Human Presence Detection System (HPDS)



HPDS is a computer vision-based safety solution designed to detect unsafe or unauthorized human presence during crane operations. By identifying when a driver exits the cabin or reaches outside the vehicle during container handling, HPDS helps prevent dangerous human-machine interactions—supporting safer, more compliant yard operations.

Unlike laser scanners or static zone sensors, HPDS uses deep-learning models to visually detect people from multiple camera angles. It integrates with existing crane-mounted video systems and operates as an always-on, AI-trained observer—bringing greater consistency, speed, and reliability to crane safety monitoring.

HOW IT WORKS

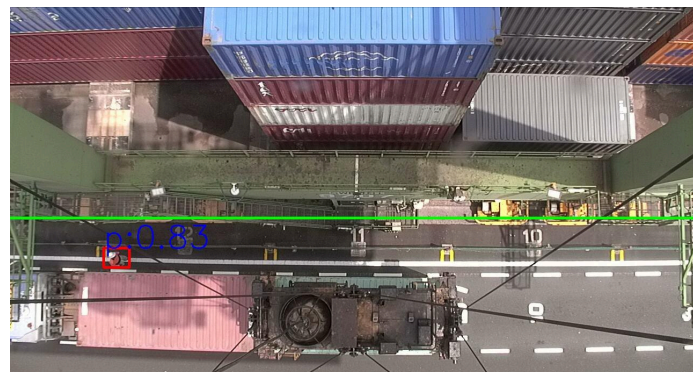
HPDS uses AI-powered image recognition to detect unsafe or unauthorized human presence during crane operations.

- **Job Begins:** crane PLC provides job and position data; HPDS activates zone monitoring for the assigned slot.
- **Camera Views Activated:** top and side cameras monitor the operational area around the prime mover.
- **Neural Network: Human Detection:** deep learning model identifies full-body presence, as well as partial exposure (e.g., head or hand) outside the cabin.
- **If Detected:** a full-body presence triggers a fault; head or hand detection triggers a warning, alerting the operator or system.

CAMERA INTEGRATION

HPDS integrates with existing crane-mounted and yard-level camera systems to provide comprehensive visibility around the prime mover:

- Primary cameras provide top and side views of the driver cabin and immediate surroundings.
- Secondary cameras offer optional coverage for approach, departure, or blind spots..
- Detection is powered by deep neural networks trained to identify human outlines from multiple angles using both side and overhead perspectives.
- Camera selection is automated based on crane trolley's position relative to the job slot.



KEY FEATURES

- **AI-powered human detection:** identifies full-body presence as well as partial exposure (e.g., head or hand) outside the driver cabin during crane operations.
- **Multi-frame validation:** verifies presence across consecutive frames to reduce false positives from brief occlusion, shadows, or movement artifacts.
- **Real-time, adaptive monitoring:** activates when crane trolley aligns with the job slot and deactivates as the trolley exits—adapts to real-time crane positioning.
- **Intelligent camera management:** dynamically selects between top and side cameras based on trolley location and zone visibility.
- **Modular and camera-agnostic design:** works with existing or new crane-mounted cameras; supports diverse terminal layouts and equipment configurations.
- **Confidence scoring & fault output:** provides detection confidence and triggers warnings or faults via PLC or operator interface.

PERFORMANCE CONSIDERATIONS

HPDS is purpose-built for crane operations—focused on detecting unsafe human presence with minimal disruption to normal workflows.

- **Trained for real-world safety risks:** detects both full-body exits and partial exposure, such as reaching outside the cabin, even in visually complex environments.
- **Resilient to visual interference:** handles cluttered scenes, variable lighting, and shadows with multi-angle validation to reduce false positives.
- **Maintains operator clarity:** low-confidence detections are flagged, retried, or suppressed—ensuring only actionable alerts reach the system or operator.

HPDS is designed to match human-level judgment, identifying unsafe presence only when it is clearly visible in real-time video—just as a trained operator would recognize a breach.

DEPLOYMENT & INTEGRATION

- **Retrofit-ready:** installs alongside existing crane or yard camera systems with minimal disruption to infrastructure.
- **Edge compute:** runs on GPU-enabled vision appliances near the crane control network, with on-premise AI inference optimized for real-time video processing.
- **PLC and system integration:** detection outputs integrate with existing alarm logic, operator consoles, or crane automation systems for immediate intervention.
- **Tunable detection logic:** trigger thresholds, activation windows, and fault conditions can be adjusted to match terminal equipment and safety protocols.

mVizn develops AI-powered computer vision systems that enhance safety and automation in industrial environments. Based in Singapore, we specialize in edge-deployed solutions for container terminals, ports, and logistics yards—integrating seamlessly with cranes and control systems to deliver real-time operational intelligence.

Computer vision offers a distinct advantage in dynamic, visually complex environments. By delivering object-level understanding and context-aware detection, mVizn enables operators to respond to real-world situations with greater speed, accuracy, and confidence.

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