HYPOINT

Proposal for implementing a Portable LiDAR-Based Vehicle Detection and Warning System(s) for the City of Joliet, IL

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Introduction

The City of Joliet faces significant challenges due to heavy truck traffic attributed to the rapid growth of the CenterPoint Intermodal Center. To address this issue, HyPoint Solutions proposes the implementation of the Vehicle Identification System, which is designed to identify vehicles that violate restricted routes within the city.

Objective

The primary goal is to initiate a program to discourage heavy truck traffic on designated routes. To effectively implement the citation program, legislation permitting the city to issue citations is necessary. The City Council has expressed readiness to expedite this process upon demonstration of accurate data. Initially, the system will validate the solution's accuracy in detecting vehicles and issuing citations.

HyPoint's Innovative Vehicle Identification System

The proposed Vehicle Identification system utilizes cutting-edge LIDAR and high-resolution camera technology. This system enhances safety by detecting vehicles traveling on restricted routes.

- **Accuracy in Adverse Conditions:** Vehicle Identification uses LiDAR technology, which excels in adverse conditions like fog and rain. It effectively filters out false positives, ensuring reliable performance.
- **Cost Efficiency:** Vehicle Identification requires only a single sensor mounted on one side of the road, significantly reducing installation costs compared to detectors on both sides. This cost-effectiveness aligns with the City's commitment to efficient budget allocation.
- **Traffic Monitoring:** Besides vehicle warnings, Vehicle Identification provides valuable traffic monitoring data. This data is instrumental for the City in traffic planning and management, further enhancing road safety.

Key Features of Vehicle Identification System for Vehicle Detection

High-Resolution Sensor: Vehicle Identification utilizes a single high-resolution sensor that can scan multiple lanes accurately, outperforming traditional single LED sensors.

- **Precise Alerting:** Upon detecting a vehicle type violating restricted routes, the Vehicle Identification System logs essential data such as time, direction, speed and captures images for comprehensive analysis, reporting, and citation issuance.
- **Data Logging:** Comprehensive data collection allows for accurate reporting and analysis of vehicle violations, enabling informed decisions for effective traffic management.

- **Accurate, Real-Time Traffic Count:** Vehicle Identification also provides accurate, real-time traffic counts, a valuable resource for budget forecasting in highway maintenance.
- **Enhanced Safety:** The Vehicle Identification System ensures early detection of over-height vehicles, preventing potential accidents or infrastructure damage.

System Overview

LIDAR Sensor

The Vehicle Identification system comprises a 3D LiDAR sensor and a camera, which measure vehicles accurately as they travel at highway speeds. A web-based dashboard displays real-time transaction data, including vehicle measurements, images, time stamps, axle counts, and vehicle classification.

Sensor Specification	
Max Detection Range	200m at 30% reflectivity
Angular Resolution (H)2	0.35°
Frame Rate	380 Hz; 1140 lines/sec
Range Accuracy	± 3 cm
Laser Wavelength	905 nm
Laser Safety	Class 1 (eye safe)
Operating Temperature	-40°C to +65°C
Environmental Protection	IP67
Points per Second	315K (single return)

Integrated Camera System

The Vehicle Identification system incorporates an integrated camera module designed to provide a comprehensive view of vehicles and capture their license plates for accurate identification. This camera system serves as a crucial component in the process of detecting vehicles and issuing citations for restricted route violations within the City of Joliet.

Key Features:

- **Photograph Capture:** The integrated camera captures high-quality photographs of vehicles passing through the monitored area. These images serve as visual evidence to support the identification and validation of violating vehicles.
- **License Plate Recognition (LPR):** In addition to capturing images, the camera system includes automated license plate recognition (ALPR) capabilities. This feature enables the extraction of license plate information, enhancing the accuracy of vehicle identification.

- **Day and Night Functionality:** The base camera system operates effectively during daylight conditions. For nighttime operations, the camera requires proper illumination in the monitored area. However, with adequate lighting provided by the City, the camera system performs optimally, ensuring consistent surveillance and detection capabilities during nighttime hours.
- **Opportunity for Validation:** The City of Joliet will have the opportunity to evaluate the performance of the base camera system. This evaluation process enables the City to determine the effectiveness of the base camera and assess the need for potential upgrades or higher-end camera models based on specific installation site requirements.

Edge Device with Cellular Connection

The Vehicle Identification system incorporates an advanced edge device strategically mounted in a weatherproof housing to facilitate real-time data processing of both LIDAR and imaging data. This device serves as the technological hub for seamless data analysis, processing, and transmission within the City of Joliet's surveillance and traffic management system.

Key Features:

- **Edge Device Functionality:** Housed in a durable, weatherproof mount, the edge device is designed for on-site installation and real-time processing of data obtained through LIDAR and imaging technologies. It acts as a localized computing center, ensuring rapid analysis and interpretation of incoming data.
- **Real-Time Data Processing:** The edge device performs instantaneous data processing, enabling immediate interpretation of LIDAR and imaging data collected by the Vehicle Identification system. This real-time processing capability ensures swift and accurate identification of vehicles, particularly those violating restricted routes.
- **Wireless Cellular Connectivity:** Equipped with a cellular connection as part of the system, the edge device operates via wireless cellular networks. This connectivity allows seamless transmission of real-time data to the City of Joliet's central data repositories. Moreover, this feature provides the flexibility for HyPoint Solutions to remotely monitor the system's operations in real time.
- **Remote Monitoring Capabilities:** Leveraging the wireless connectivity, HyPoint Solutions can remotely access and monitor the Vehicle Identification system. This remote monitoring feature enables continuous oversight of the system's performance, ensuring its functionality and allowing for immediate troubleshooting or adjustments as needed.

Upgrading Vehicle Detection System to Portable and Dual-Power Mode

The proposal includes enhancing the vehicle detection system to a portable solution. This advancement involves mounting the system on a lightweight trailer to accommodate a LIDAR sensor, camera, edge device, and local cellular Wi-Fi connection. The components, including the LIDAR and camera, will be secured on an adaptable pole that can collapse for easy transportation and, when positioned, can be raised and securely locked into the optimal height for vehicle scanning.

The system will present two primary power options for maximum flexibility and uninterrupted functionality. Firstly, including solar panels will enable the charging of onboard batteries, ensuring complete self-sufficiency during data collection. Secondly, the system will feature an alternate power provision, allowing direct connection to a permanent power source and providing a secondary operational mode for extended or fixed deployments.

This portable system represents a significant leap in enhancing the efficiency, adaptability, and reliability of vehicle detection operations within Port of Seattle. The portable design, coupled with dual-power capabilities and remote operational efficiency, offers a comprehensive and versatile solution for accurate and convenient vehicle monitoring and data collection, ultimately contributing to enhanced traffic management and safety measures.

References

Illinois DOT is among the many transportation agencies that have successfully implemented the HyPoint solution and can provide valuable insights regarding the effectiveness and reliability of the HyPoint Solutions. Geno Koehler, Permit Unit Chief at Illinois DOT, 217.725.4690, Geno.Koehler@illinois.gov

Conclusion

HyPoint Solutions believes that the Vehicle Identification System will significantly contribute to mitigating the challenges of heavy truck traffic in the City of Joliet. It offers an advanced solution for monitoring and addressing restricted route violations, fostering safety and efficient traffic management.

Price

Lease Options

Description	QTY	Downpayment	Monthly Lease Payment
Five Year Lease Option 1: Single Portable System			
Vehicle Identification: Vehicle Detection System and Web based Portal	1	$20,000.00	$3,200.00
Five Year Lease Option 2: Two Portable System			
Vehicle Identification: Vehicle Detection System and Web based Portal	2	$38,000.00	$6,000.00
Three Year Lease Option 1: Single Portable System			
Vehicle Identification: Vehicle Detection System and Web based Portal	1	$30,000.00	$3,500.00
Three Year Lease Option 2: Single Portable System			
Vehicle Identification: Vehicle Detection System and Web based Portal	2	$48,000.00	$6,600.00

One-Time Cost or Down Payment:
• Initial payment covers the new portable design, installation, setup and training.

Inclusions:
• The overall cost includes annual support and maintenance for the systems.
• Ensures continued functionality and efficiency of the upgraded system.

Purchase Options

Description	QTY	Total
Single Portable System		
Vehicle Identification: Vehicle Detection System and Web based Portal	1	$75,000.00
(Optional) Extended Support and Maintenance Per Year after First Year		$18,000.00
Two Portable Systems		

Vehicle Identification: Vehicle Detection System and Web based Portal	2	$150,000.00
(Optional) Extended Support and Maintenance Per Year after First Year		$30,000.00

Payment Terms:
25%: Due upon acceptance of this proposal and project initiation.
75%: Due upon the successful completion of installation, testing, and demonstrations.

Collaboration and Notification Process:

Upon finalizing terms, setting up the system in new locations will involve seamless collaboration between HyPoint and the City of Joliet. HyPoint will remotely conduct a collaboration procedure to ensure system accuracy and functionality. Upon completion, a notification will be sent back to the City to initiate data collection, requiring no additional steps from the City's end.

This framework aims to offer flexibility and convenience in the lease structure, aligning with the requirements for the upgraded portable system. We look forward to discussing and finalizing these terms in greater detail upon acceptance of the proposed cost.

Acceptance:
To indicate your acceptance of this proposal, please sign and date below. Upon acceptance, we will initiate the project in accordance with the agreed-upon timeline.

Authorized Signature: _____

Date: _____