INNOVATION / TECHNOLOGY DEPLOYMENT SUMMARY

Using AI to Detect Blocked Railroad Grade Crossings

CHALLENGE

The city of Nolanville, Texas, a small community west of Belton along Interstate 14, experiences ongoing issues with blocked railroad crossings affecting direct roadway access to I-14. Blockages can significantly impact emergency services response times and public travel. The problem is amplified by the fact that few convenient alternatives are available.

SOLUTION

This innovation utilizes cutting-edge artificial intelligence (AI)/machine learning technologies to monitor two important grade crossings in real time. The AI system inputs live camera video of a grade crossing and outputs live crossing status (e.g., crossing open or crossing blocked; see Figure 1). The information is conveyed via a webpage showing a simple map, crossing blockage status, and a current image of the crossing (Figure 2).

PROACTIVE APPROACH

The AI based innovation delivers economical, real-time grade crossing blockage detection and provides information that can be used by first responders and the public to better plan travel routes. All detection is off railroad right of way, and no Rail coordination is required.

BENEFITS

Although the solution does not remove the trains, the community and the traveling public can use the resource to help plan their travel and find open routes to work, school, and other daily

Figure 1. Live blocked grade crossing detection in Nolanville, Texas.

TxDOT GOALS

- Deliver the right projects
- Focus on the customer
- Foster stewardship
- Optimize system performance
- Preserve our assets
- Promote safety
- Value our employees

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activities. When trains are present, emergency services can use the resource to quickly determine open routes, improving response times.

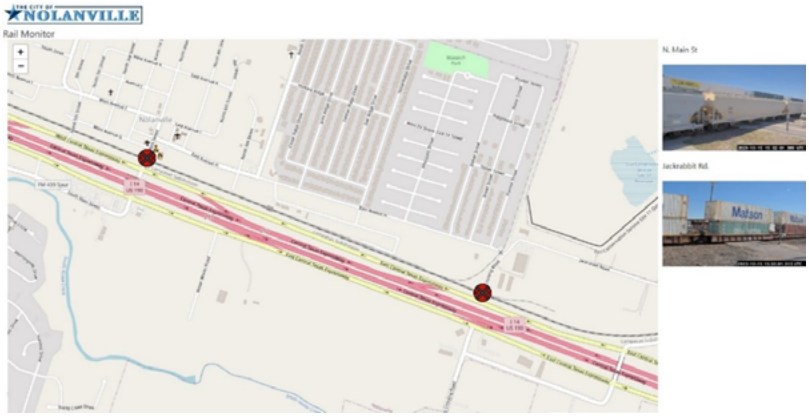

Figure 2. Example crossing monitor webpage.

KEY TASKS

- Identify a partner community with grade crossings where the innovation can be implemented with assistance from TxDOT staff.
- Select a nonproprietary machine vision software model and an appropriate hardware platform that meets specifications for performance, physical size, durability, and power consumption (solar-powered sites are a likelihood).
- Outfit, deploy, and operate a detection trailer to begin gathering important grade crossing data before construction of permanent sites.
- Create a series of improved software models that can be used for training.
- Build awareness by presenting the solution at the 97th Annual Transportation Short Course and create a basic website to demonstrate operation of the innovation at selected grade crossings.
- Design and deploy two permanent detection sites at selected grade crossings for long-term operation.

DATA SOURCES

The camera provides all data for the system.

Resources

Waco District (txdot.gov)

Railroad Trespass Detection Using Deep Learning-based Computer Vision (dot.gov)

Artificial Intelligence-Aided Grade Crossing Safety Violation Detection (trb.og)

Operation Lifesaver: Rail Safety Education - Collisions and Casualties by Year (oli.org)

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