DRISI

Caltrans Division of Research, Innovation and System Information

Research Results

Testing Vehicle Assist and Automation Technology in Transit Buses

VAA applications can help expand the use of bus rapid transit systems

Modal

JANUARY 2014

Project Title:
Pilot Program to Demonstrate the Benefits of Vehicle Assist and Automation (VAA) Applications for Full-Size Public Transit Buses

Task Number: 1733

Start Date: March 5, 2009

Completion Date: September 30, 2012

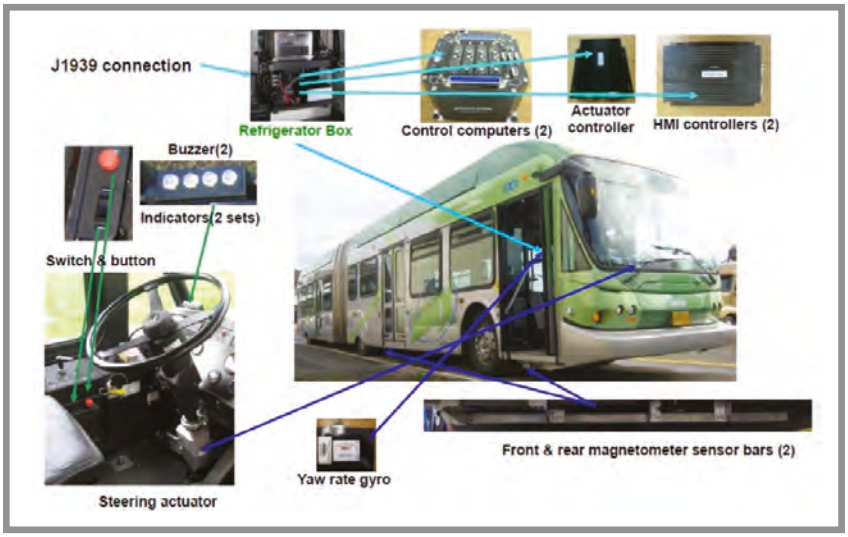
Product Category: New equipment

Task Manager:
Sonja Sun
Transportation Engineer
z.sonja.sun

WHAT WAS THE NEED?

Bus rapid transit (BRT) offers a cost-effective alternative to fixed-rail systems, which are expensive to construct and operate. BRT relies on dedicated bus lanes to run at a high level of reliability. Yet adding roadway lane-miles is costly, and many metropolitan areas have limited land for expansion. Narrowing bus lanes by two feet reduces the right-of-way cost, but causes the buses to go slower for safety concerns. A vehicle assist and automation (VAA) system with guidance and docking functions could enable buses to operate accurately and safely along narrow paths and precisely stop at bus stations, enhancing the BRT's efficiency and quality of service.

The VAA technologies developed in the past years show promise in providing transit agencies more efficient operations and cost savings. However, their full technical feasibility and merits have not been quantified. The U.S. Department of Transportation initiated a pilot program to demonstrate the benefits of VAA applications for full-size public transit buses in revenue service and awarded conducting the program to Caltrans.



LTD VAA test bus

DRISI provides solutions and knowledge that improve California's transportation system.

DRISI

Caltrans Division of Research, Innovation and System Information

Testing Vehicle Assist and Automation Technology in Transit Buses

Research Results

WHAT WAS OUR GOAL?

The goal was to demonstrate the technical merits and feasibility of VAA technologies in real-world applications and to assess the benefits and costs.

WHAT DID WE DO?

Caltrans, in partnership with the University of California, Berkeley Partners for Advanced Transportation Technology (PATH) program, designed, developed, integrated, and field-tested a magnetic-sensing VAA technology. Two test sites were selected:

- In California, a three-mile section of the Alameda County (AC) Transit M line on State Route 92, from Hesperian Boulevard to the San Mateo Bridge toll plaza. The researchers tested the VAA system's lateral guidance ability on the highway and through the narrow tollbooth.
- In Eugene, Oregon, two miles of the Lane Transit District (LTD) Franklin EmX BRT route, largely a dedicated dual-direction right of way. An articulated bus was used to test bus lane guidance and precision docking at BRT stations.

The developed VAA system comprises magnetic sensing, communication, steering actuating, a controller, human machine interface (HMI), and fault detection. The sensing block obtains vehicle positioning and state information. The communication channels transmit the information among all the system blocks. The controller calculates the steering command based on the received information, and the actuator turns the steering wheel according to the command. The bus driver monitors and activates the VAA system through the HMI.

The research team conducted on-road system testing without passengers and in revenue service with passengers.

Magnet track at San Mateo Toll Plaza

WHAT WAS THE OUTCOME?

The buses ran for four months with passengers on board, but no PATH researchers on board—marking this as the first public use of an automated system in the United States. The VAA system maintained a consistent docking performance. The horizontal gap at bus stations was between 3 and 5 centimeters at both the front and rear tire locations. Comments from operators indicated that the VAA system reduces operator stress and improves performance.

WHAT IS THE BENEFIT?

BRT buses equipped with VAA technology can deliver rail-like service in terms of trip reliability and a smoother ride at a fraction of the cost. VAA applications can improve trip times, provide quicker and easier boarding for passengers, and reduce right-of-way requirements. High-quality and cost-effective public transportation solutions improve mobility and reduce congestion.

LEARN MORE

For more information about this research:
www.dot.ca.gov/research/modal/bus_transit/vaa/index.htm

Precision docking at the eastbound and westbound stations