



This research initiative is funded under the auspices of the CFIRE Tier 1 University Transportation Center.

Title: Mining Automatic Identification Systems (AIS) Data for Improved Vessel Trip Analysis Capabilities

Description:

Automatic identification systems (AIS) provide communication between vessels and for vessel traffic control in congested ports and waterways. Vessels digitally broadcast information, including position, call sign, course, speed, and navigation status. Although public domain data is aggregated to protect business confidentiality of shippers, CFIRE researchers at the University of Toledo and Vanderbilt University have demonstrated the feasibility of using shore-based AIS receivers to archive data on vessel movements.

This project will develop a methodology for processing AIS data from multiple sites in near real-time as well as develop a capability to support ad-hoc data queries. Such analyses can identify high-risk locations, generate better travel time estimates, detect vessel arrivals, identify key traffic areas for investment and enhancement, and in general lead to a better understanding of vessel traffic within a given area.

Key research tasks include installing additional shore-based AIS antennas at strategically selected Great Lakes and inland waterway locations, and developing the server and database management system that can quickly receive and process the data from multiple sites.

Benefits of AIS automation include increased levels of information regarding boat location and trajectory which supports safer waterway operations, more efficient lock operation and lead times, and increased shipping efficiencies as waterway traffic is better understood and managed.

Outcomes:

This project is expected to produce a methodology to process large amounts of AIS data in near real-time from geographically diverse AIS antenna locations. The value of such archived AIS data will be demonstrated using a case study approach that will include a range of operational performance measures of the fleet and port infrastructure facilities.

Deliverables:

The outcomes above will be realized by a normalized database design to store the AIS messages, a network of antennas at various locations, a methodology to publish and query the data in an Internet GIS format, and automated stop detection methods for both inland rivers and Great Lake locations.

**Industry Impact:**

This project will impact the marine transportation industry with a review document of AIS data uses throughout the world, a normalized data structure for archiving the data, generation of vessel size and trip distribution patterns, correlation of trip data with weather conditions and automated detection of vessel stop events.

Marine carriers, terminal operators and agencies that rely on marine transportation performance data will benefit from more detailed information about fleet vessel events without added crew burden. By storing archived AIS data, vessel casualties such as allisions, collisions, and groundings may be replayed and analyzed.

Research Team:

- Richard Martinko, University of Toledo (Executive Committee Representative)
- Jimmy Dobbins, Vanderbilt University (Project Co-coordinator)
- Peter Lindquist, University of Toledo (Project Co-coordinator)
- Richard Stewart, University of Wisconsin-Superior

Funding:

- Total: \$337,800
- UTC Funds: \$168,900

Duration:

- 18 months

Student Involvement

- University of Wisconsin-Superior: One student hourly
- University of Toledo: One graduate student for one year