ITS Field Operational Test Summary

Atlanta Driver Advisory Service

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Introduction

The Atlanta Driver Advisory Service (ADAS) ITS Field Operational Test assessed a comprehensive Advanced Traveler Information Service (ATIS). In the Atlanta, Georgia metropolitan area, ADAS provided information to drivers of approximately 170 vehicles equipped with receiving units. The test data collection occurred from October to December 1996.

The main objective of the operational test was to evaluate the performance of the wide area driver advisory system, the two-way messaging system, and the local area driver advisory system.

Project Description

The ADAS communicated a selection of traveler information to specially equipped vehicles via three wireless links. The service provided congestion and incident alerts and local weather information. It also displayed current information on sports and entertainment events. As drivers traveled on the instrumented interstate highway, the service notified them of the next Interstate exit and informed them about the services available at the exit. The system also provided two-way messaging capabilities.

ADAS consisted of several subsystems. The Subcarrier Traffic Information Channel (STIC) subsystem of the Wide Area Driver Advisory (WADA) broadcast segment congestion levels, incident information, weather information, and event information via two FM radio stations located near central Atlanta. The Two-Way Messaging subsystem sent messages over a multiple channel, two-way radio link established on top of a central Atlanta building. This subsystem was capable of exchanging text messages with the vehicle drivers. The Local Area Transceiver (LAT) of the Local Area Driver Advisory (LADA) broadcast traveler services maps and in-vehicle signing from six short range transceivers located along Interstate 85.

Two other components completed the system. The ADAS System Controller (ASC) allowed operators to prepare, coordinate, transmit and receive messages and information. Georgia DOT's Transportation Management Center housed both the ASC and the DOT's Atlanta Transportation Management System (ATMS). The ASC extracted and relayed congestion and incident information from the ATMS. ASC operators entered weather and event information manually whereas in-vehicle signing and traveler service maps were preloaded into the ASC computer. The last component was the In-Vehicle subsystem that consisted of a mobile radio set, a global positioning system (GPS), a data processing interface unit and a display system. Figure 1 presents a block diagram of the ADAS components and their linkages.

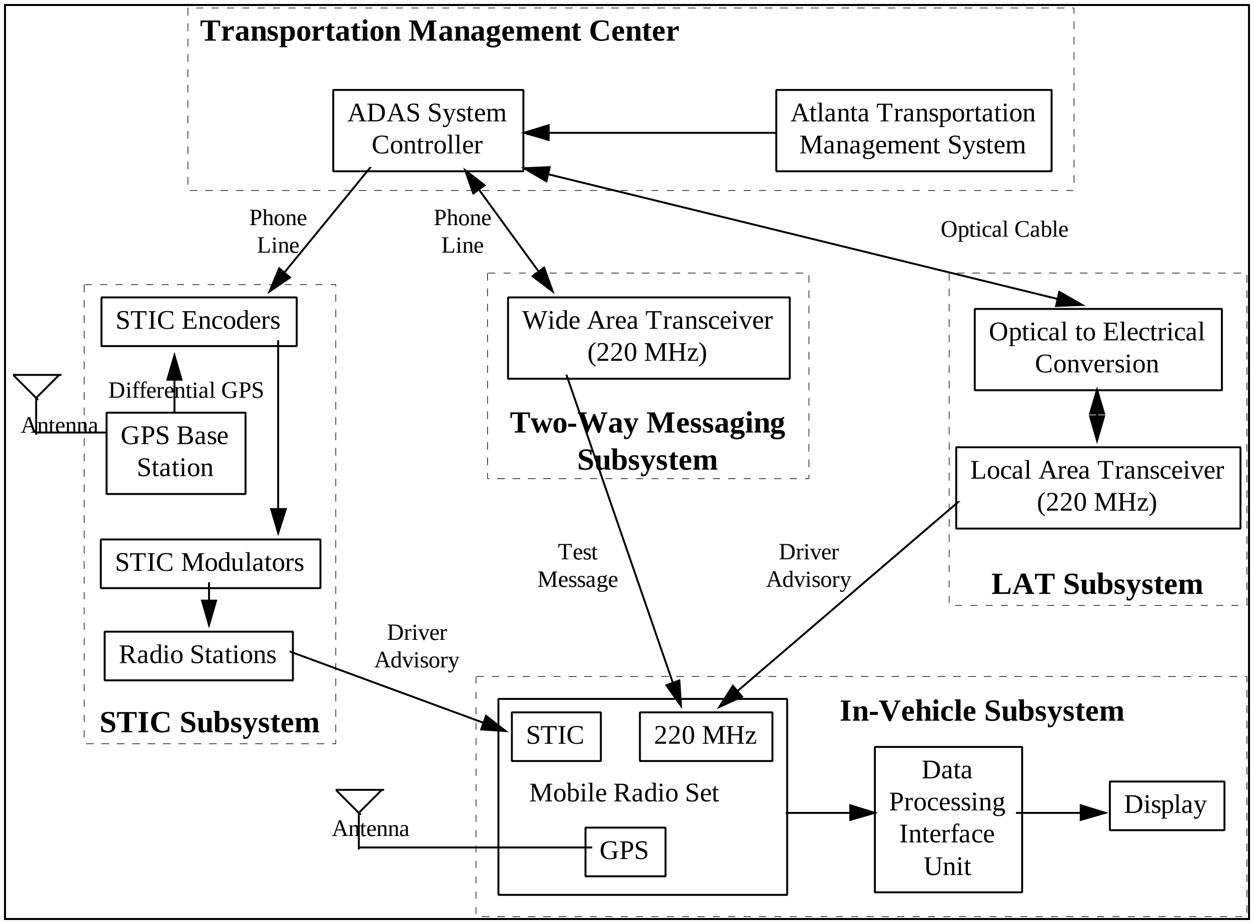

Figure 1: ADAS Block Diagram

ADAS operation consisted of preparing and transmitting information at the ASC and receiving and exchanging information in the test vehicles. When the driver started the test vehicle, the in-vehicle subsystem automatically displayed a metro map screen on the display. The subsystem overlaid congestion and incident information on the map, based on information received over the STIC. The driver could change the display by touching one of three buttons on the screen. Different buttons would display the events screen, the send message screen, or the current roadway screen.

The metro map was divided into 16 sectors. The driver could zoom the display in and out of a sector by touching the sector on the metro map. The map screen displayed congestion information on segments of the interstate system by presenting one of four icons representing different ranges of traffic speeds next to the segment. From any of the zoom screens, the driver could display text details of the congestion situation by touching the desired congestion icon. The maps also displayed icons representing incidents adjacent to the segment where they had been reported. The driver could display text details of the incident by touching the desired icon on one of the zoom screens.

The Two-Way Messaging Service provided drivers full communication with the ASC. The driver could both send a message to the ASC and receive a messages from the ASC. The driver could initiate a message by touching the “Send” button on the message screen. The in-vehicle unit sent the message and the Wide Area Transceiver (WAT) received it, sent an acknowledgment to the vehicle, and transmitted the message to the ASC. The ASC received the message, recorded it and sent an acknowledgment, via the WAT, to the vehicle. During the test, only vehicle identification messages were sent. In an actual deployment, a driver could send various messages depending on the situation.

The LAT broadcast traveler service maps and in-vehicle signing. Based on the position of the vehicle as determined by the in-vehicle GPS, the in-vehicle subsystem would switch to the appropriate LAT frequency to receive information. The information consisted of in-vehicle signs announcing the next intersection and traveler service maps showing the services available at the upcoming intersection.

The test originally intended to evaluate the ADAS technical system performance, extendibility, compatibility with the national architecture and user acceptance of the system. The evaluation was reduced to include only the key features of the technical system performance because adequate funds were not available.

The evaluation of the test involved assessing technical performance aspects of the system against a set of desired hypotheses. Evaluators assessed the technical performance of the STIC subsystem, the Two-Way Messaging Service, and the LADA Service. In addition, evaluators commented on the extendibility of the ADAS system to other circumstances and locations and on the possible changes to improve the system.

Results

The overall technical performance of the system was less than the desired efficiency. The system was able to accomplish most of the planned functions but was not able to accomplish them consistently. It is well to note that these findings are based only on the partial evaluation that could be accomplished within the available budget. Evaluators only studied the technical system performance. If all the planned tests would have been accomplished, these results could have been interpreted differently.

The WADA demonstrated its capability to collect and transmit congestion and incident information from the ATMS to the vehicles. Reception of messages, however, was only around 58% instead of the desired 99% and coverage was only 48% instead of the desired 95%.

ADAS was able to demonstrate the capability of exchanging messages with test vehicles. The probability of successfully transmitting a message and receiving a reply averaged 70% rather than the desired 95%. Drivers received a notification of a successful message within 12 seconds and received a notification of an unsuccessful message in less than 40 seconds. During testing, the vehicles were in motion when drivers initiated a message. Evaluators felt that, since the messages were to simulate mayday messages, in actual operation, the sending vehicle would be stationary. From a stationary vehicle, evaluators felt that the number of successful messages would have been much less than the reported 69.7%. The 69.7% figure was based on vehicles in motion.

The LADA service successfully demonstrated its capability to transmit and receive traveler information. The in-vehicle systems were able to use the GPS to properly tune the receiver to the correct frequency to receive appropriate information. In some cases, however, the in-vehicle signs and traveler service maps did not appear with sufficient lead time before an exit.

Concerning extendibility, evaluators felt that standards must be developed before attempting to implement similar systems throughout the country. Among the possible improvements suggested were: better in-vehicle displays and positioning of displays, and synthetic voice assistance to supplement displays. Other suggested improvements included: increased coverage for the STIC and the Two-Way Messaging service, and more timely display of traveler service maps and in-vehicle signs.

Legacy

The use of the technology was discontinued at the completion of the test. STIC, the Subcarrier Traffic Information Channel, has been adopted as the roadside communication technology for the Metropolitan Model Deployment Initiative projects in Phoenix and San Antonio. This technology is also under consideration as the standard for long range roadside communication to vehicles.

Test Partners

Clark Atlanta University

Concord Associates

Federal Express

Georgia Department of Transportation

Georgia Tech Research Institute

Oak Ridge National Laboratory

Scientific Atlanta

TRW

References

Garnto, I. (Georgia Tech Research Institute); System Performance Test Report from the Independent Evaluation of the Atlanta Driver Advisory System, Final Draft, August 1997