SNS COLLEGE OF TECHNOLOGY
COIMBATORE - 641 035.
(An Autonomous Institution)

DEPARTMENT OF MECHANICAL ENGINEERING

19MEZ404-Connected and Automated Vehicles

UNIT II CONNECTED VEHICLE INFRASTRUCTURE

Connected vehicle (CV) technology exchanges information between vehicles, mobile devices, and traffic control systems using vehicle-to-vehicle and vehicle-to-infrastructure wireless communication. CV data can be used to enhance safety, improve traffic flow, increase fuel efficiency, and reduce emissions.

Two research teams supported by the Federal Highway Administration (FHWA) Exploratory Advanced Research (EAR) Program tested CV technology using actual vehicle performance data incorporated into modeling and simulation platforms. The hardware-in-the-loop research will help engineers who are developing CV applications and need a reliable, standardized way to test the technologies under a wide range of simulated conditions.

Researchers at Texas A&M University Transportation Institute (TTI) worked with partners at Battelle Memorial Institute and Siemens Corporation on a project titled “New Approaches for Testing Connected Highway and Vehicle Systems.” The researchers developed a simulation environment that incorporated data from real entities—a connected vehicle and signals in a roadway network—into a simulation.

Figure 2. Equipment collecting data from connected vehicles and a traffic signal at a test track.

Using a simulation platform that they developed called Connected Vehicle Assessment Simulation, or CONVAS for short, the researchers merged features from a conventional traffic simulation with features from an open source wireless communication simulation. They also integrated hardware-in-the-loop features that feed real data from the roadway infrastructure and a connected vehicle into the model. This mix of real and simulated elements demonstrated how these systems communicate and interact in real time.

Researchers at the University of Michigan and the University of Minnesota worked on the project "Building a Hardware-in-the-Loop Simulation Testbed," which linked an actual powertrain with vehicle and traffic simulations to measure fuel consumption and emissions under various CV scenarios. The in-the-loop system the researchers developed transmits CV simulation data to a laboratory-housed engine and dynamometer, allowing them to evaluate the CV system in an efficient, safe, and economical fashion.

By providing real-time data on traffic patterns, alternate routes, and vehicle performance, CV technology will help impact fuel efficiency, improve air quality, and reduce greenhouse gas emissions. However, creating simulations requires realistic modeling of vehicle fuel economy and emissions in

complex and changing traffic situations. Gathering accurate information about these parameters is difficult. That is what makes the hardware-in-the-loop research that combines a real engine into a simulated CV environment so useful.

A fact sheet about the projects is available

For more information on the projects,