New Research Facilities: ITS Lab and Driving Simulator

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Introduction

- Large amounts of ITS data from surveillance and monitoring systems
- Data supports traffic management functions such as travel time estimation / prediction, personalized traffic information dissemination, highway performance evaluation, automated incident detection, to name a few
- A need to maximize the use of current and future ITS data to improve various operational and management functions
- A need for a permanent facility to house and process ITS data for researchers and practitioners
- An ITS lab is proposed to house the data at the LTRC facility

Study Objectives: (Phase I)

- Investigate and lay the foundation for establishing a state-of-the-art ITS lab at LTRC
- Examine the current hardware and communication infrastructure
- Acquire information on current state-of-the-art ITS labs in other states
- Identify the main hardware and software components required to operate the new ITS lab
- Establish operating and maintenance policies on how ITS data will be collected, stored, and mined for immediate and future use, as well as user access privileges
- Define a set of applications or functions that ITS data will support and are of significant importance to both travelers and traffic management agencies

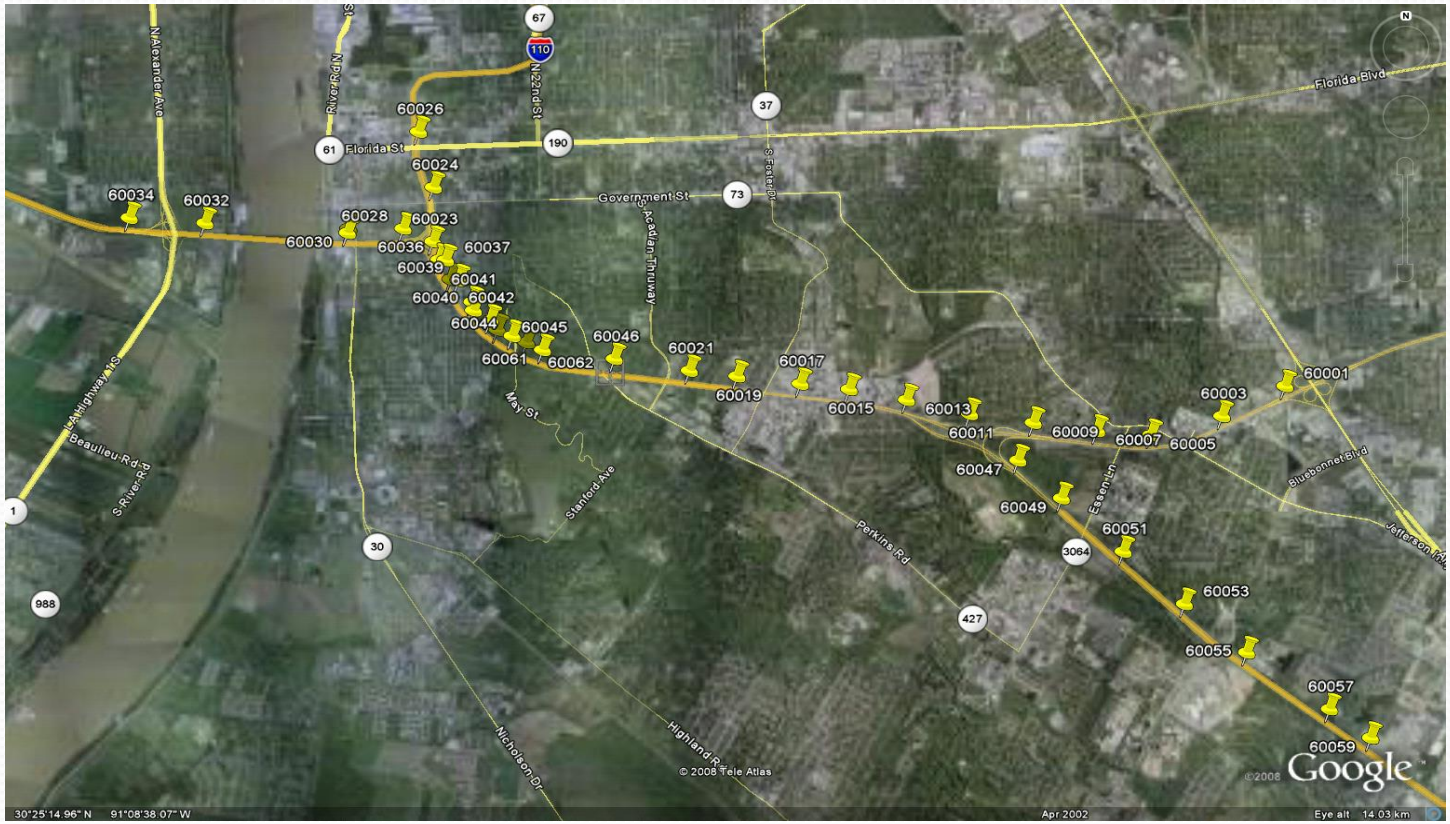
Study Objectives: (Phase II)

- Examine the space allocated for the lab at LTRC and develop a layout for the equipment and a remodeling plan.
- Purchase and install the hardware and accessories required for the lab.
- Identify and update the data sources from which the lab will be collected data routinely.
- Develop a protocol and a procedure for data collection from each identified source and a mechanism to store the data on a database server for easy and efficient retrieval and analysis.
- Develop a web interface for basic data retrieval and analysis functions.
- Establish lab operating policies and protocols for data access and research conduct.

Current Hardware and Communication Infrastructure

- The main data source: the Advanced Traffic Management Center (ATMC) in Baton Rouge
- Two types of data to stream in real time: Numeric (volume, speed, and lane occupancy) and Video (cameras)
- Other types of data include data from signalized intersections, Bluetooth data through traffic cast, and DCMS data.

Detector Locations (MIST)



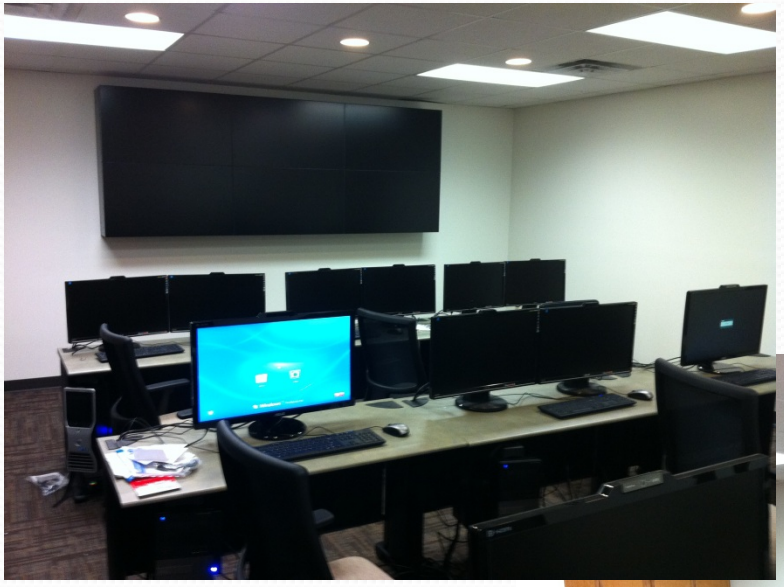
Sample of Detector File

Field 1		Field 2	Field 5: Average Speed (mph)	Field 7: Vehicle Count	Field 8: Lane Occupancy (%)
Time	Prefix header	Device ID			
15:42:30-	B238I4DD:	6004701	65	8	3.0
15:42:30-	B238I4DD:	6004702	63	6	4.0
15:42:30-	B238I4DD:	6004703	53	7	7.0
15:42:30-	B238I4DD:	6002801	58	9	10.0
15:42:30-	B238I4DD:	6002802	41	9	18.0
15:42:30-	B238I4DD:	6002803	69	2	1.0
15:42:30-	B238I4DD:	6003601	60	8	7.0
15:42:30-	B238I4DD:	6003602	67	2	3.0
15:42:30-	B238I4DD:	6003603	13	13	36.0
15:42:30-	B238I4DD:	6003604	0	0	0.0
15:42:30-	B238I4DD:	6004001	21	15	18.0
15:42:30-	B238I4DD:	6004002	38	13	18.0
15:42:30-	B238I4DD:	6004003	49	17	16.0
15:42:30-	B238I4DD:	6004004	0	0	0.0
15:42:30-	B238I4DD:	6001501	8	8	35.0
15:42:30-	B238I4DD:	6001502	6	8	42.0
15:42:30-	B238I4DD:	6001503	10	11	39.0
15:42:30-	B238I4DD:	6001504	33	14	28.0
15:42:30-	B238I4DD:	6001505	52	9	9.0
15:42:31-	B238I4DD:	6002901	61	14	14.0
15:42:31-	B238I4DD:	6002902	56	11	7.0
15:42:31-	B238I4DD:	6003701	0	0	0.0
15:42:31-	B238I4DD:	6003702	63	10	4.0
15:42:31-	B238I4DD:	6003703	51	9	4.0
15:42:31-	B238I4DD:	6003704	46	9	13.0
15:42:31-	B238I4DD:	6003705	53	11	7.0

Other Data Sources

- Southern Region of LA (I-10, I-12, I-49, I-55, US 171, US 190)
- 25 AUTOSCOPE devices
- Traffic data constantly polled from detectors and transmitted to a web server for DCMS (Data Collection and Management Service) by Econolite
- DCMS traffic data includes traffic volume, average speed, and lane occupancy

ITS Lab Layout



Benefits and Applications of ITS

- Examples include:
  - Automatic Incident Detection Systems
  - Travel Time Estimation and Prediction
  - Work Zone Management
  - Crash Prevention and Safety
  - Improving Freeway Operation with Ramp Metering
  - Managed Lanes
  - Congestion Pricing
  - Freeway Breakdown Analysis
  - Optimizing Traffic Signal Control
  - Calibration of Traffic Simulation Models

LSU Driving Simulator

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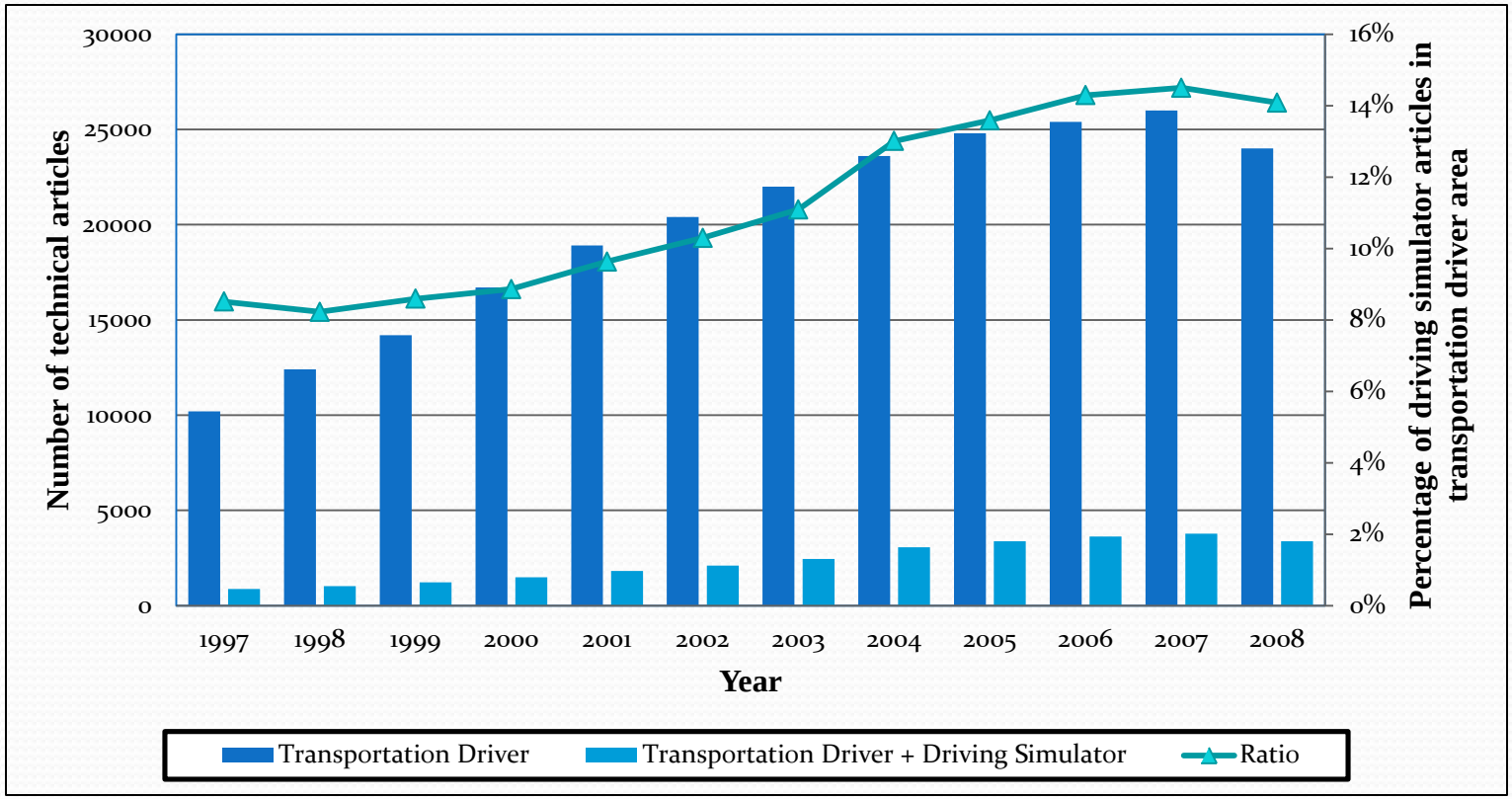
What is it?

Full-body Ford Fusion (minus wheels) combined with a series of cameras, projectors and screen to provide a virtual environment

Motivation

- To enhance the transportation research facilities at LSU by studying:
  - The impact of human factors on driving tasks (influence of alcohol, drugs, fatigue, etc.)
  - The driving performance for different groups (elderly) and under different environmental conditions (fog, rain, snow, etc.)
  - New designs or assessment of new in-vehicle gadgets
  - Potential improvements in highway geometric design standards

Research Trend



Funding

- LSU Board of Regents: $180K
- LA DOTD: 40K (Dan Magri)
- Civil Engineering Dept.: 5K (initially) + 25K (later for digital cameras and upgrades)
- Total Cost = $250K

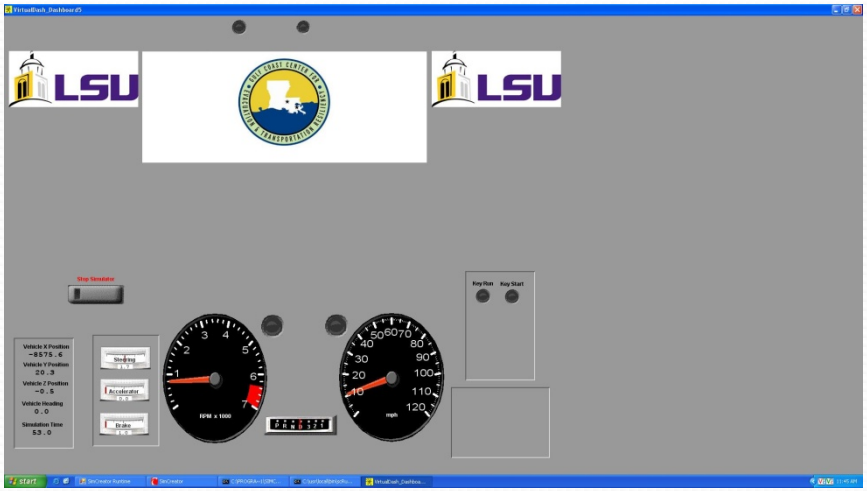
Simulator Features

- Developed by Realtime Technologies Inc., (RTI).
- Provides 180° multichannel audio/visual display plus real time one degree of freedom motion simulation.
- Capable of creating new networks and simulation scenarios with open architecture software tools, and allows for data collection during simulation experiments.
- Software: SimVista, SimObserver, Maneuvre Design, Internet Scene Assembler, Data Distillery.

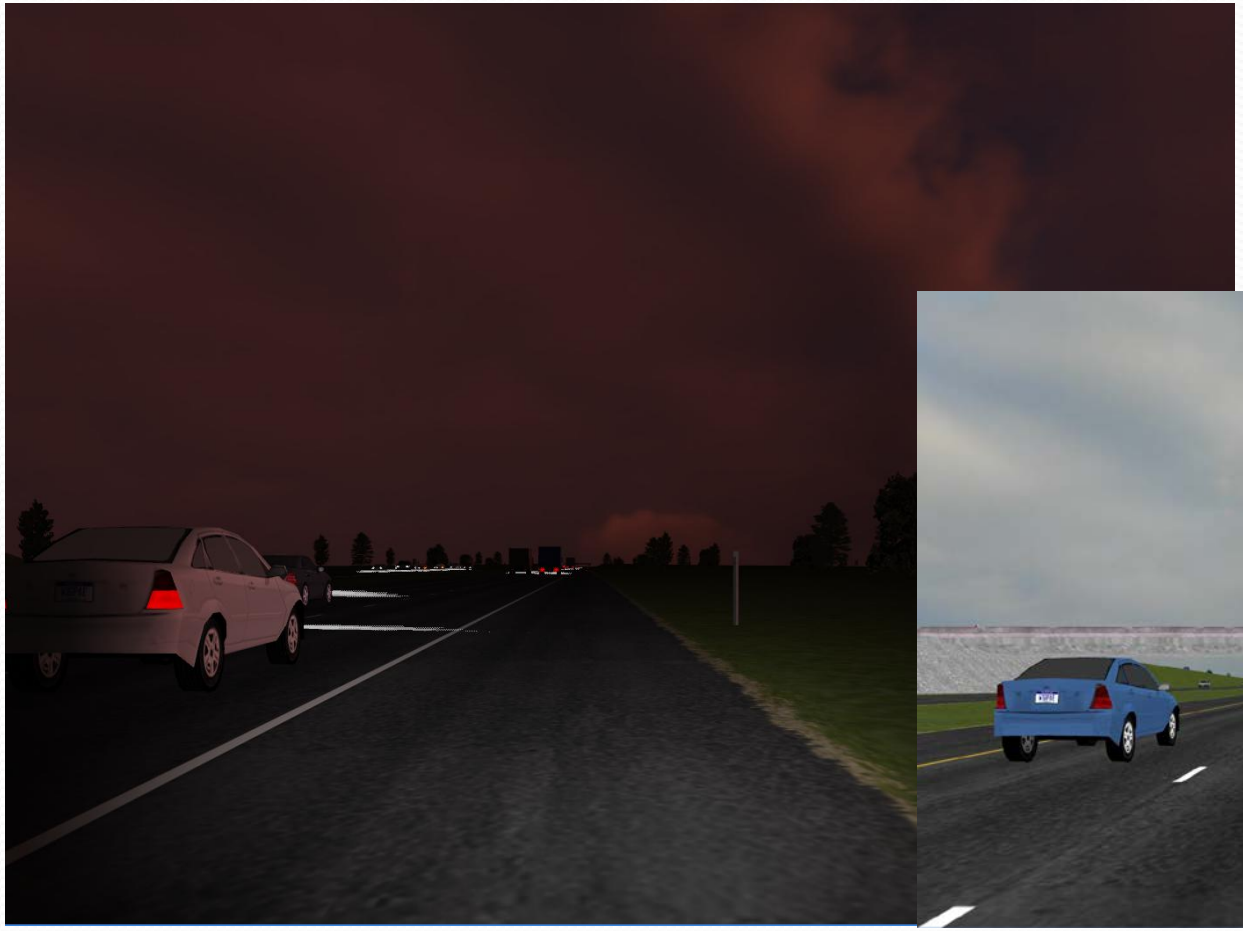
Simulator Features

- A library of residential, urban, rural, commercial, industrial, highway, intersection and traffic signal control sections;
- Autonomous, interactive ambient traffic, variable roadway friction and weather effects;
- Extensive, interactive, scripted vehicle activity;
- Requires similar driving efforts as in an instrumented vehicle.

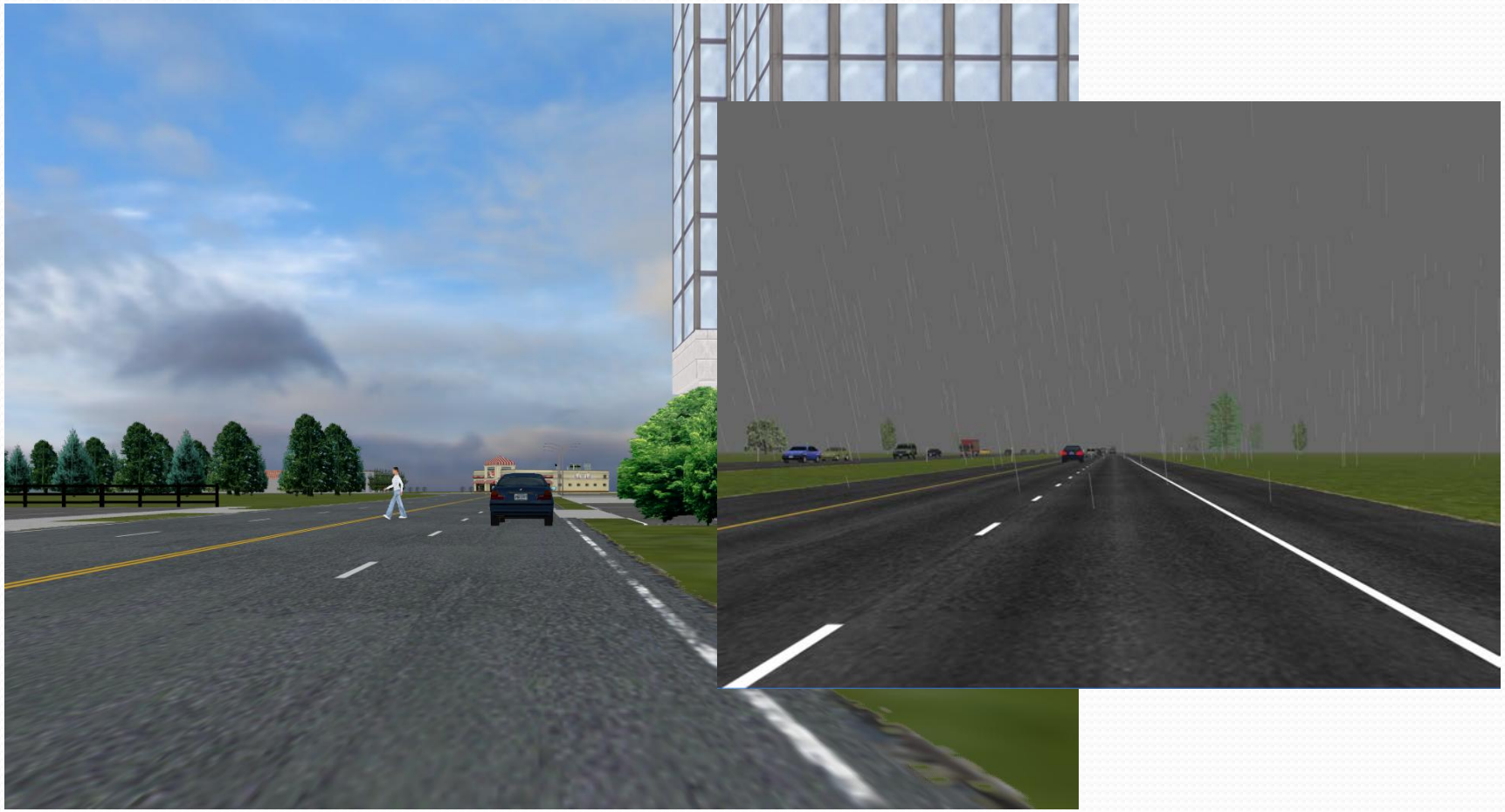
SimObserver



Day vs. Night Time



Weather Conditions



Video Clip

Research Potential: Safety

- Over 30,000 people killed in motor crashes each year in the United States resulting in $41 billion cost to U.S. and $969 million to Louisiana (Center for Disease Control & Prevention, 2005)
- Crash Analysis Issues:
  - The approach is passive in that it relies mainly on the analysis of crashes that have already occurred, rather than proactive to prevent or reduce the likelihood of crashes
  - The timeline for collecting crash data is usually long, at least one year, in order to make any kind of statistical inference on the safety conditions.
- Vehicle simulation makes it possible for inexpensive alternatives and sometimes impossible (unethical or safety implications) field tests to be undertaken
- Such experimentation results in valuable safety related findings that may have significant impact on current practices in roadway design and safety

Research Ideas

- Work zone safety: lighting effects, lane narrowing, awareness and compliance with speed limits.
- Driver experience: differences in visual behavior (scan paths) with different levels of driving experience
- Task difference (type, quantity, and complexity) on visual stimulus recognition and driving performance
- Effect of human factors (aging): signal recognition, visual fixation strategies.
- Effect of vehicle assistive technology: heads-up displays, GPS/navigation systems, etc.
- Effect of fatigue

For more information

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