THE SMART HIGHWAY PROJECT:  
SMART HIGHWAYS  
SMART VEHICLES  
SMART ENGINEERING  

TRANSPORTATION BEYOND 2000:  
Technologies Needed for Engineering Design  

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CENTER FOR TRANSPORTATION RESEARCH

- Interdisciplinary
- Multidisciplinary
- Decentralized

Resources:
- 14 Core Staff Positions
- 24 Students (50% MS, 50% Ph.D.)
- 14 Cooperating Faculty
- 6 Cooperating Labs
- $9 Million Total Value of Research Awarded
DESIGNATIONS AND RELATIONSHIPS

- ITS Research Center of Excellence (FHWA)
- Mid-Atlantic University Transportation Center
- Associate Participant, National Automated Highway System Consortium (NAHSC)
- Capital Beltway Safety Advisory Committee
- Participant, Virginia Transportation Research Council (VDOT)
SURFACE TRANSPORTATION FACILITIES SERVE A VARIETY OF PURPOSES AND ARE EXTREMELY IMPORTANT TO MODERN LIFESTYLE

- Provide for the efficient movement of people and goods necessary to support a modern economy and mobile lifestyle
- Serve adjacent land uses
- Enhance personal mobility
- Give access to services and support economic growth
- Permit flexibility in the selection and maintenance of quality of life choices
THE "SMART HIGHWAY" WILL BE A TEST BED AND TEST TRACK FOR INTELLIGENT TRANSPORTATION SYSTEMS (ITS) RESEARCH

- The road is a critical part of the highway network in the region and is expected to carry 20,000 vehicles each day by the year 2015.
- This is the only ITS research facility being designed and built from the ground up to accommodate evolving technologies in each subsequent stage of construction. Will serve as a full scale test bed and test track for AHS research in cooperation with the NAHSC.
- The potential research market associated with the Smart Highway could be up to $100 million over the next 20 years.
- Environmental studies are completed, and preliminary design is underway. Final Public Hearing is October 18, 1995 in Blacksburg.
THE NATIONAL AUTOMATED HIGHWAY SYSTEM CONSORTIUM (NAHSC) WILL DEFINE FUTURE HIGHWAY SYSTEMS

- The NAHSC is a federally established entity which is intended to define the nature of future highway systems and then develop and demonstrate one or more prototypes of a fully automated highway.
- The NAHSC budget is $150 million for research over the next 7 years.
- This is a public/private partnership involving top national industries including General Motors, Delco Electronics, Lockheed Martin, Hughes Aircraft, Bechtel, Parsons Brinckerhoff. Also includes Carnegie-Mellon, Caltrans, UC Berkeley PATH, and USDOT.
- Virginia Tech was selected in the first group of Associate Participants and will serve in a variety of research areas including evaluation.
Short Term:
- Automated vehicle identification, as on Dulles Toll Road
- High speed weigh in motion, as at I-81 Troutville weigh station
- Road surface sensing for freezing and pavement condition

Longer Term:
- Vehicle to roadside communications
- Vehicle control such as lane following, lateral control, automated steering, and headway distance
- Collision avoidance
- Automatic trip routing
- Fully automated highway systems
VIRGINIA TECH'S EVALUATION APPROACH

SOFTWARE
Software simulation will use mathematical models to help evaluate and design AHS features.

FLASH LAB
1/15th scale model of AHS systems for the evaluation and testing of automatic controls, communications, AHS products, traffic management systems, and system performance.

SMART HIGHWAY
Full scale Smart Highway can be used as a test bed or test track for AHS operations.

DEPLOYMENT
Deployment will include follow-up monitoring and maintenance.

*FLASH refers to a flexible, low cost, automated, scaled highway system. The system can be portable.
COOPERATIVE INFRASTRUCTURE MANAGED SYSTEM

- Ultra-wideband communication in roadway beacons
- Obstacle detection and other sensors in vehicles
- Vehicle/infrastructure cooperation
- Global management
COOPERATIVE INFRASTRUCTURE MANAGED SYSTEM CHARACTERISTICS

- Infrastructure impact is low to medium
- Instrumentation distribution is mixed between highway and vehicles
- Uses global strategy to synchronize traffic
- Permits active infrastructure control
- Gives access to conventional and automated vehicles
- Operating speed is variable by conditions, up to 100's possible
- Includes all vehicle classes
- Uses rubber tire vehicles
- Power is on-board vehicles
ULTRA-WIDEBAND TECHNOLOGY FEATURES

- Low cost device due to solid state electronics
- Highly accurate radar ranging (better than centimeter accuracies possible)
- Good range (200 feet currently, 2 miles or better expected)
- Multiple communications possible
- Interference not a problem
- Can penetrate solids and go around corners
OTHER ITS APPLICATIONS OF ULTRA-WIDEBAND

- Automatic vehicle identification
- Advanced traveler information systems (roadside to vehicle information)
- Transportation planning
- Advanced traffic management systems (probe vehicle tracking, link travel time)
- Parking management (space sensor)
- Collision avoidance (proximity detector, blind spot detector, headway sensor)
- Automated highway system (cooperative ranging, vehicle to vehicle communications, vehicle to roadside communications)
THE PRODUCT OF THIS TECHNOLOGY BEYOND 2000

- Foot off the gas
- Hands off the wheel
- Brain off the driving task

To produce a safe, modern, efficient transportation system