Truck CACC Project Status:
Development of CACC Control System

California PATH Team
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Truck Work Status

- Control System Hardware
- Control System Structure
- Control Actuation Strategy
- Preliminary Truck Test Plan for Modeling
- J-Bus Data Requirement List
Control System Hardware

• PATH PC-104 computer with large enough SD, running
  – Operating system: QNX 7.0
  – Interface with 3 CAN Buses: 2 for truck info, 1 for sensors
  – WSU DSRC with duel antenna
  – 5 Hz GPS
  – 1~2 Wide angle Sick Lidar
  – Connecting with a laptop for system development
  – Emergency switch to cut-off the link with J-Bus
  – Interfacing with J-bus
  – Interfacing with Volvo XPC
  – Control data logger
  – Shock-absorber of PC-104 Computer

• Power supply
Control System Hardware

- 1 laptop
  - DVI Display
  - Video camera
  - Serial connection with PC-104
  - Video and DVI data logger
Main Data Flow between PATH Computer and XPC

- PATH Linux Laptop
- PATH PC-104 QNX RTOS
- J-Bus interface
- Engine/brake control commands
- Volvo XPC: sensor data processing
- Fused sensor data
- Tablet DVI
- Mini-ITX
- Ethernet connection
Control System Software Structure

5Hz GPS Data → Truck Relative Pos Determination

Driver cmd SW → Maneuver Coordination: desired position and velocity

Truck Longitudinal Dynamics: engine, driveline, tire, aerodynamic drag, etc → desire torque

Engine torque control
Brake system control: engine brake, air brake
Control Actuation Strategy

- PATH PC-104 Computer directly interface with J-1939 Bus for control actuation
  - Engine torque control
  - Engine retarder control (braking)
  - EBS Control
  - No Transmission Retarder
Preliminary Field Test Plan for Modeling

- Data reading from J-Bus
- Command writing to J-Bus
- Data collection for modeling
  - Engine
  - Engine retarder
  - Transmission
  - Drive-shaft
  - EBS (electronic Braking System)
J-Bus Data Requirement List

- Stefan is currently in Greensboro to handle J-Bus interface and investigate feasibility of data reading and command wring for each required data items
  - Engine (torque, engine brake, engine speed, …)
  - Driver control signal (accelerator, brake, switch, …)
  - Onboard integrated sensor
  - Driveline: (Transmission, Drive shaft)
  - Vehicle speed
  - Fuel rate
  - Truck weight estimation
  - Control command activation
  - …
Preliminary Test Plan for Modeling

• Manual driving test along I-580 between Buchanan and Bayview: about 3300m, reasonably flat and straight
Preliminary Test Plan for Modeling

- Need 5Hz GPS data for location determination
- Using Volvo XPC for
  - Interfacing with J-Bus
  - Data collection