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 Solid Drive, running
  - Operating system: QNX 7.0
  - Interface with 3 CAN Buses: 2 for truck info, 1 for sensors
  - WSU DSRC with dual antenna
  - 5 Hz GPS
  - 1 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 for PC-104 Computer
- Power supply
Control System Hardware

- 1 laptop
  - Tablet Driver Display
  - Video camera
  - Serial connection with PC-104
  - Video and DVI data logger
Control System Hardware Structure (simplified)
Control System Software Structure

- GPS Data
- Truck Relative Pos Determination
- Maneuver Coordination: desired position and velocity
- Truck Longitudinal Dynamics: engine, driveline, tire, aerodynamic drag, etc ➔ desired torque
- Engine torque control
- Brake system control: engine brake, E-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
  - Driveshaft
  - 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 writing for each required data item
  - 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

- Outcome: almost all the data have been found available
- Our expected control strategy is feasible
Preliminary Test Plan for Modeling

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

• Need 5 Hz GPS data for
  – Location determination
  – UTC Time stamping

• Using a laptop to interface with the CAN for
  – Data collection