Underlag för kravspecifikation

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Översiktlig målbeskrivning

- Virtuell miljö för att illustrera/studera ECO-driving.
- Modulsystem: Det skall vara möjligt att byta inmatningsenheter, fordonsmodeller, och eventuellt visualiseringsmiljön.
- En miljö som vi kan använda fritt: Undervisning och forskning.

Krav på fordonet

- Enkelt att byta ut fordonsmodellerna, t.ex. implementering i Simulink.
- Dynamiska förlopp med tidsskalor ned till tidsskalor runt 0.1 s skall fångas. Fyllnads och tömningsdynamik.
- Realistiska modeller för motorns bränsleförbrukning: pumparbete, friktion, etc.
- Realistiska förluster i drivlinan och fordon.
- Slipmodeller för hjul.

Goal

Develop a vehicle dynamics model and incorporate it into the visualization environment developed in VISIMOD.
Some interfaces are specified through the documentation of the visualization report in form of the Master thesis report by Karl Mårtensson. See the VISIMOD page.

Visualisation and software environment

- Almost free of choice.
- Open environment for free use is preferable.
- Computers and hardware are supplied.
- Installation and instructions for reinstallation of the software tools must be required.

Vehicle

- Vehicle body with four wheels, driveline, and a dynamic engine model.
- The vehicle should be able to move in all three dimensions, both in the plane as well as up and down hill.

Wheels

- The wheels are connected to the vehicle body through a spring and damper.
- Non linear springs with increasing stiffness for large displacements.
- Wheel friction model based on Pacejka's magic formula and tire model with deflection.
- It should also be possible to specify some noise on the road friction for each wheel.
- The braking of each wheel should be independently controlled.
- Tire road interaction (interface).

Driveline

- Stiff driveline with clutch and differential.
- Front or rear wheel driven.
- Different gearboxes can be implemented, as a first step a sequential manual should be implemented.
- An automatic clutch and gear-shift controller should also be implemented that manages clutch control for vehicle launch.

Engine

- MVEM for a naturally aspirated engine (or turbocharged engine) with pedal to throttle controller.
- Realistic fuel consumption models.
- Idle control and engine start/stop.

Sound effects

- Engine sound (speed and load).
- Tire noise (slip and force).

Sampling of signals

It should also be possible to sample all signals in the vehicle and driver inputs etc for example when investigating driver behaviour and response.

Environment Modeling

Open standard, easily incorporated