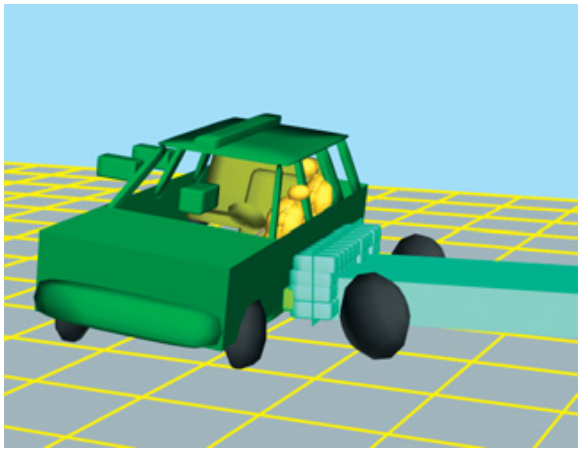
Dynamic Research,Inc.

VEHICLE AND DRIVER-VEHICLE SIMULATIONS

Dynamic Research, Inc. (DRI) has developed and applied on behalf of its clients a range of computer simulations for vehicle dynamics and control analysis. Available versions involve a wide range of vehicles, such as:



- Cars
- Trucks and utility vehicles
- Articulated vehicles
- Motorcycles
- All terrain vehicles
- Buses
- Aircraft

These have been developed in connection with projects for the public and private sectors. They range from relatively simple, linearized lateral or longitudinal models to more complicated nonlinear, all axis models involving large motions. Simulation programs are typically in FORTRAN, C, or C++.

DRI also owns or licenses large scale software systems to support simulation and analysis on behalf of its clients. These typically are used to model entire vehicles and their occupants and include the following:

- ATB, US Air Force "Articulated Total Body" program for modeling of multi-body systems and impacts (equivalent to NHTSA CVS crash simulation)
- DRI/ATB1, which couples the LS-DYNA3D non-linear finite element code to ATB
- MADYMO, multi-body and finite element program for the analysis and modeling of crash mechanics
- ADAMS, for multi-body vehicle dynamics modeling and simulation

Human Models

DRI has developed and applied for its clients a range of human response and control models and simulations applicable to the following areas:

- Driver (pilot, rider, etc) active control of vehicle motions (e.g., steering, throttle, braking) in a variety of on-road and off-road tasks, maneuvers and conditions, for predictive modeling of driver behavior and handling performance
- Human body active and passive response as related to vehicle control (e.g., human limb impedance, body-active control of small vehicles, etc).

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- Human body biomechanical response to impacts and large amplitude motions, for purposes of vehicle crash and rollover simulations
- Human injury potential models, probabilistic models based on measured biomechanical forces and motions, and expressed in normalized injury cost terms, as are useful in injury risk-benefit analyses
- Human comfort rating models, statistically derived empirical models of juries of human subjects, for predictive quantification of comfort due to measurable physical variables, in the areas of vehicle ride, handling, noise and vibration

Parameter Measurement

DRI's R&D activities in support of R&D frequently involve measuring and determining vehicle or human parameters for the foregoing applications. DRI has developed instrumentation, apparatus, methodologies, software, and related expertise for performing such measurements, and also has access to a variety of parametric databases, which support its simulation activities on behalf of clients.

Supporting Software

DRI has a wide range of software which it uses to support its R&D activities. This includes both proprietary and licensed software for analysis in the following areas:

- System identification and optimization
- Multi-variable statistical analyses
- Large scale experimental data post-processing and analysis
- Time series and frequency domain analysis
- Control systems analysis
- VISIONFORM, for high speed 3D graphics and animation of time history results and simulator roadway scenes (licensed through Kinetic Visuals, a DRI subsidiary)
- AUTOCAD, for modeling and translating client models of 3D objects
- MATLAB, for PC based analysis and data reduction
- Designer toolboxes, for developing user friendly and other special interfaces in Windows and other environments

Supporting Hardware

The analytical capabilities of DRI are supported by a range of in-house computer systems, which include a Silicon Graphics ONYX IR super computer, Silicon Graphics workstations, networks of Windows and Linux PC microcomputers, and an extensive array of peripheral devices.

DRI specializes in applied research, development, and consulting in the areas of vehicle dynamics and control, man-machine systems, human factors, biomechanics and structural mechanics. For further information please contact us at 310-212-5211, visit our web site at www.dynres.com, or email us at info@dynres.com.