

Technical Newsletter

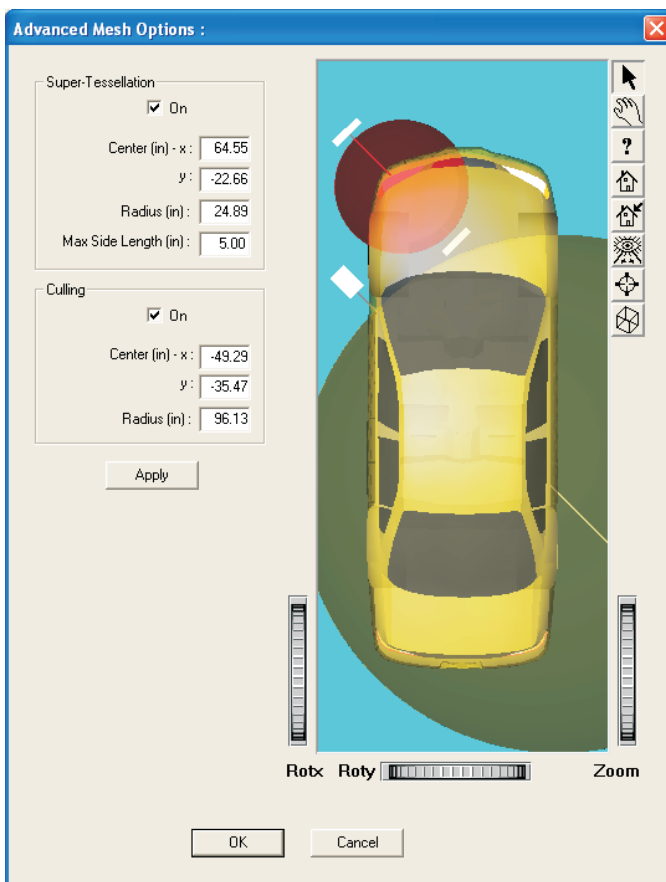
Available on-line in the EDC website Library at www.edccorp.com

HVE & HVE-2D Ongoing Developments

The next version of *HVE* and *HVE-2D* is nearing the final stages of development and is expected to be released later this year. One of the enhancements in this next version is a new dialog for Event Set-up.

Advanced Mesh Options Dialog

DyMESH users will now be able to optimize their simulation runs using the Advanced Mesh Options dialog. The user drags adjustable circles to select the region of the vehicle mesh requiring detailed tessellation, as well as the region to cull nodes/faces that are not involved in collisions. These actions reduce calculation run times and also improve results for pole impact collisions or other simulations where highly detailed vehicle meshes are required.



The new Advanced Mesh Options dialog for Event Set-up.

SIMON 3.13 Update Now Available

A new interim update to the *SIMON* vehicle dynamics simulation model is now available for *HVE* 5.20 users. This update is available to download from the *Downloads* page of the *Support* section of the EDC website. Users will need to contact EDC Technical Support for an updated license file to run *SIMON* 3.13.

Detailed explanations of the changes are included with the download, but here is a brief summary of the changes from Version 3.10:

1. The Steer Degree of Freedom (Steer DOF) model now includes wheel precession torque. This is normally a small contributor, and tends to slightly reduce the current steer angle.
2. The tire model was using an incorrect value for friction, cornering stiffness or camber stiffness if the current vertical tire load exceeded the rated load or the current forward tire velocity was negative. This was due to an error that occurred in the interpolation routine that was used to calculate current friction, cornering and camber stiffness from the table values in the tire data set.
3. Adding auxiliary roll stiffness (i.e., an anti-sway bar) increased the vehicle roll angle, rather than decreasing it as expected. The problem only occurred with solid axle suspensions that used an anti-sway bar; independent suspensions were not affected.
4. The *HVE* Driver Model incorrectly calculated the attempted path when more than one vehicle used the model in the same event. This would cause a vehicle to steer erratically, or to have its path affected by changing the target positions for a different vehicle.
5. The current steering wheel angle (Driver output group) was displayed incorrectly in the Key Results or Variable Output if the vehicle had roll steer or non-zero steering geometry (e.g., king pin inclination, caster). The correct driver steering input angle was used by the simulation, but when the value was displayed it was corrupted.

Technical Session

This Technical Session describes the application of the Steer Degree of Freedom (or simply *Steer DOF*) Model. The Steer DOF Model has been available in *SIMON* since its introduction in 2001, and will become available in the next *EDSMAC4* update, scheduled for later this year.

The Steer DOF Model is an alternative to the (closed loop) Driver Controls Steering Table for determining the current steer angle at each steerable wheel. Whereas the Steering Table assigns the current steer angle directly from a table of driver inputs vs. time, the Steer DOF Model computes the current steer angle based on external forces and moments existing at the tire-road interface, and internal forces and moments existing within the steering system (e.g., friction, steering stops). The Steer DOF Model was described in detail in an earlier Technical Session (see Fall 2002 Technical Newsletter).

Generally speaking, the Steer DOF Model can be used to advantage whenever it is likely that the road has influenced the steering and/or the user cannot determine the steer angles a priori. Two simple examples come to mind. First is the possibility that a tire

hitting a pothole in the road might cause the wheel to steer suddenly. A second example is the situation where a vehicle is spinning and/or sliding after a collision, and the driver is disabled and not providing steering input. In this situation, the vehicle is essentially self-steering based upon its steering system geometry and the current (post-impact) slip angle at each tire. This situation occurs frequently in the world of crash reconstruction. In fact, it probably occurs to some extent following every moderate to severe crash. Inspection of the RICSAC crash test strip chart recording data confirms the dynamic nature of wheel steer angles following a collision. Since there is no physical evidence of these steer angles following the crash, the reconstructionist normally must assume a constant steer angle, probably zero. Because the Steer DOF Model can simulate the post-collision steer angle history, an obvious improvement in the resulting reconstruction is possible.

To describe and illustrate the use of the Steer DOF Model, we will simulate one of the RICSAC crash tests. We will then compare the simulated wheel steer angle history with the actual data recorded during the crash test.

RICSAC Test No. 6 is an angled (120 degree) collision between a 1974 Chevrolet Chevelle and a 1975 Volkswagen Rabbit. The impact speed of each vehicle is 21.47 mph. After impact, the Chevelle was redirected slightly and rolled out to its rest position, while the Rabbit spun clockwise nearly 180 degrees while coming to rest. See Figure 1 for a schematic view of the crash test.

A *SIMON* simulation of RICSAC 6 is already set up in a case file, *SIMONDyMESHValidationSuite3-8.hve*. All we need to do is modify the event by activating the Steer Degree of Freedom Model. To activate the Steer DOF Model, simply choose the Calculation Options dialog from the Options menu and set the Steer DOF option to *Normal* (it is currently set to *Append*, but the effect is over-ridden by the Steering Table, which as the last time entry set to 20 seconds).

Reset the event and then execute it with the new setting. The resulting trajectory simulation is shown in Figure 2.

The simulated steer angles are shown in Figure 3, along with the angles measured during the crash test. The agreement is quite reasonable, especially for a first run using default steering system data.

Remember that, since the steer angles were recorded during the crash test, our RICSAC data sets include the steer angle as inputs to the simulation. Therefore, we know the actual steer angle vs. Time history. But in the

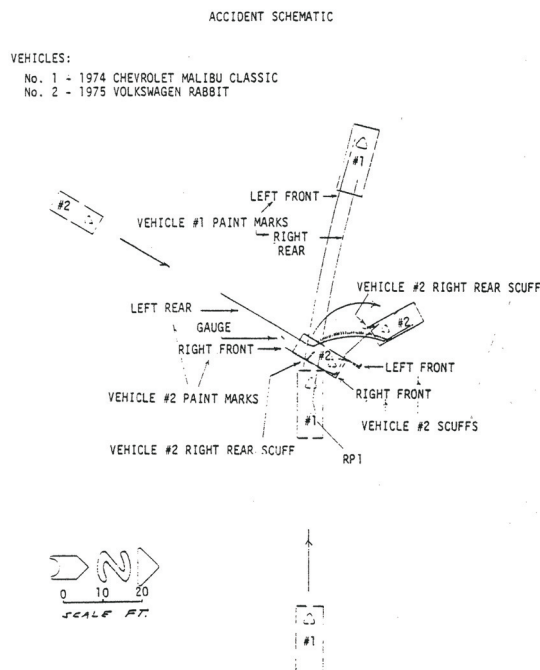


Figure 1 - Schematic view of RICSAC 6 crash test showing basic vehicle trajectories (reprinted from original RICSAC documentation; see EDC Lib. Ref. Number 1005).

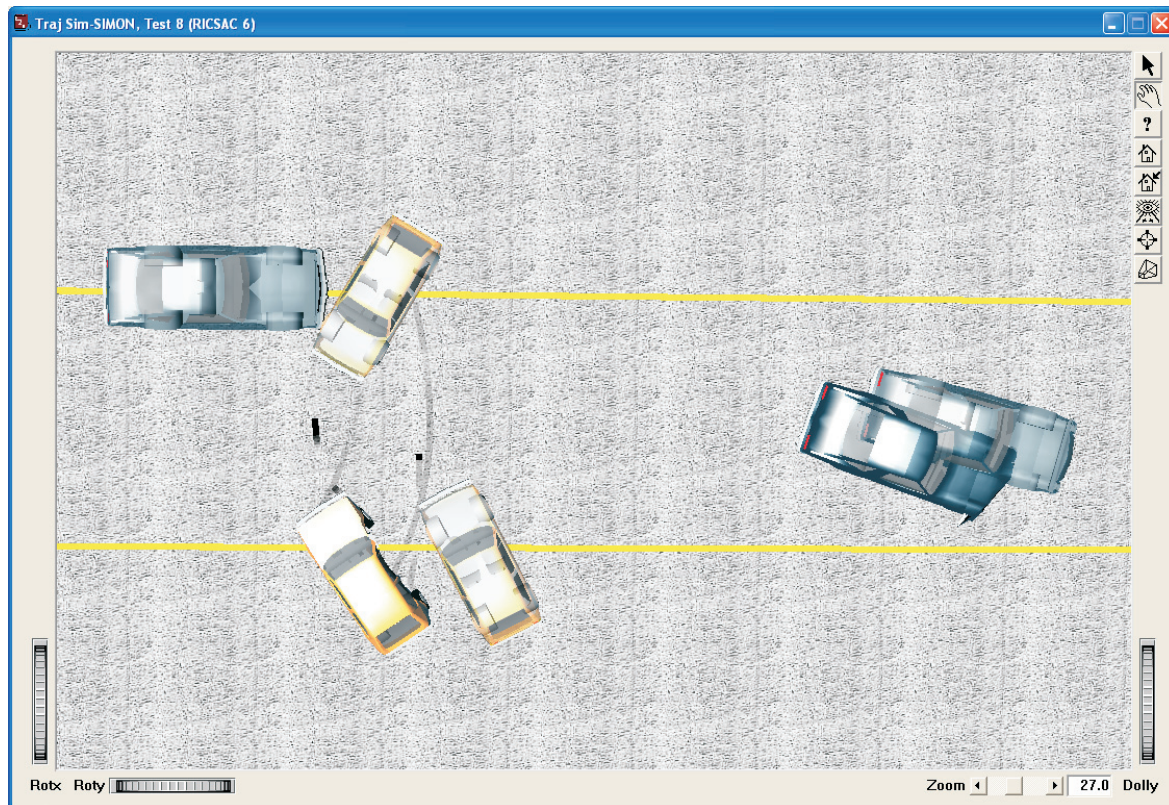


Figure 2 - SIMON/DyMESH simulation of RICSAC 6 using the Steer DOF Model.

typical reconstruction, the reconstructionist really has no idea that this steer history existed during the post-impact phase of the crash. With no physical evidence to the contrary, the reconstructionist often simply assumes zero post-impact steering. To observe the consequence of this assumption, we turn off the Steer DOF option, set the steer angles to zero, and

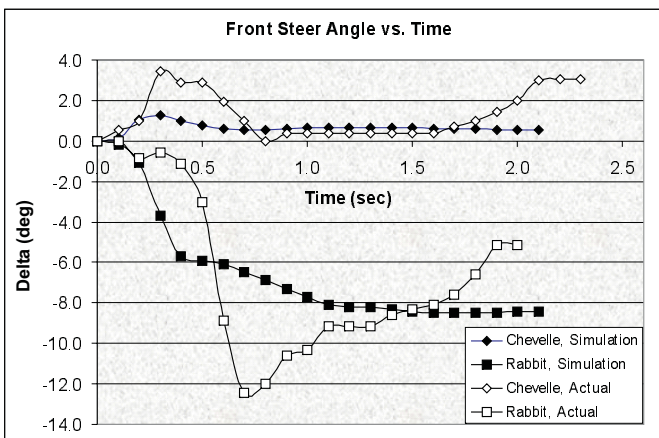


Figure 3 - Steer angles for RICSAC 6 simulated using the Steer DOF Model.

re-execute the event. The resulting trajectory simulation is shown in Figure 4. Compare this result with Figure 2. In particular, note the difference in final/rest positions when the steer angles are zero. This difference might cause the reconstructionist to change the initial speeds in an effort to achieve a better match of final/rest positions. This change, of course, would be an error because the difference in trajectories is caused by incorrect wheel steer angles, not initial speeds!

The use of the Steer DOF Model is new to most reconstructionists. The above example shows that there is much to be gained through the use of the Steer DOF Model. However, there is also much to be learned. EDC encourages all HVE users to gain experience with the use of the Steer DOF Model.

EDC is currently updating the default parameters for the steering system. Once this has been accomplished, we would like to suggest that further research be performed applying the Steer DOF to the RICSAC tests, as well as other instrumented crash tests, to quantify the improvement associated with the use of the Steer DOF Model. Publishing the results would be beneficial to all users. Anyone wishing to take on this task will receive full support from EDC technical staff.

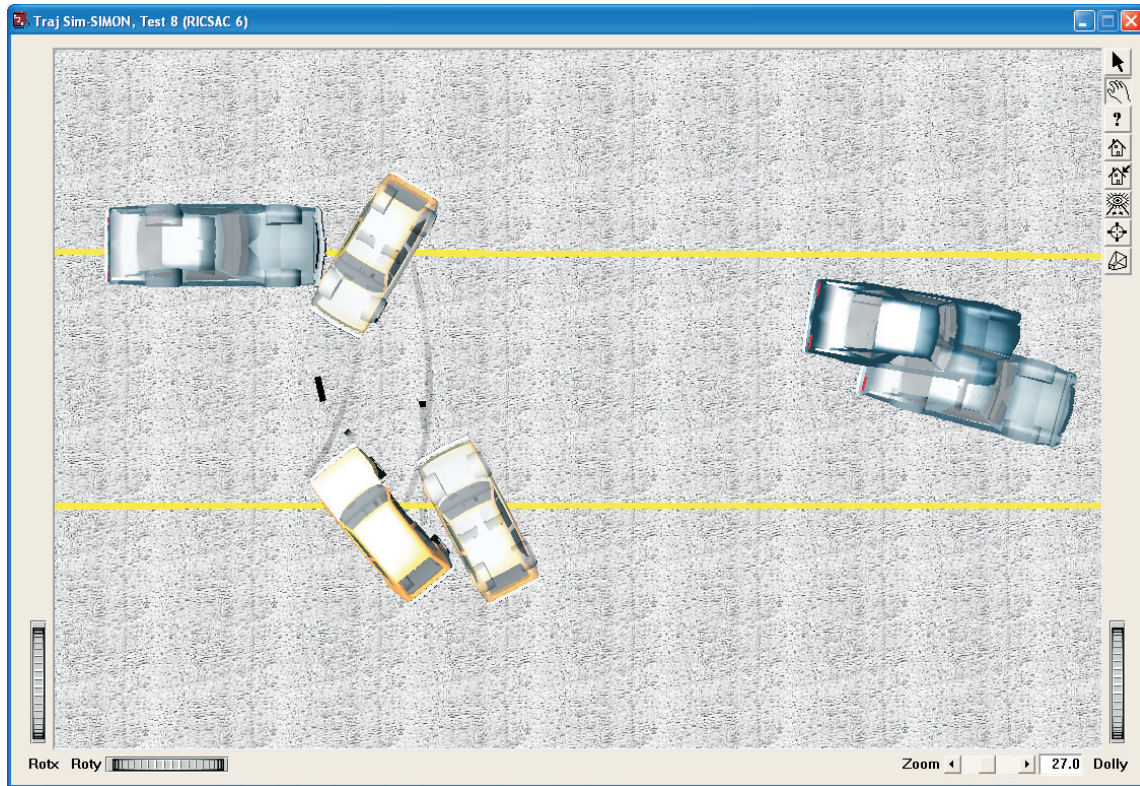


Figure 4 - *SIMONIDyMESH* simulation of RICSAC 6 with no steering table inputs and the Steer DOF Model turned off. Compare with Figure 2. The biggest difference is seen in the rest position of the Chevelle; the Rabbit's rest position is not greatly affected.

Expanded Free Download of Library Publications from EDC Website

The Technical Reference Library section of the EDC website has been updated to allow free downloads of almost all of the listed publications. Previously, only technical papers authored by EDC had been made available for free download.

If you are in need of publications to help you better understand the background and application of physics models or to support and defend your reconstruction or simulation work, please have a look through the list of available publications. Each listing indicates the size of the pdf file that will be downloaded to your computer, and please note that some files may take a significant amount of time to download depending upon your Internet connection.

Library Ref. #	Description	Publication Pertains To	Price
0001	"Differences Between EDCRASH and CRASH3," SAE 860253, Engineering Dynamics Corp., Beaverton, OR, 1985 (0.9 MB)	EDCRASH	Free
0002	"An Overview of the Way EDCRASH Computes Delta-V," SAE 870045, Engineering Dynamics Corp., Beaverton, OR, 1987 (1.0 MB)	EDCRASH	Free
0003	"A Personal Computer Program for Drawing Accident Sites," SAE 880068, EDCAD, Engineering Dynamics Corp., Beaverton, OR, 1988 (0.5 MB)	EDCAD	Free
0004	"An Overview of the Way EDSMAC Computes Delta-V," SAE 880069, Engineering Dynamics Corp., Beaverton, OR, 1988 (1.0 MB)	EDSMAC	Free
0005	"Vehicle Data Sources for Accident Reconstruction," SAE 880070, Engineering Dynamics Corp., Beaverton, OR, 1988 (1.0 MB)	General	Free
0006	"Application and Misapplication of Computer Programs for Accident Reconstruction," SAE 890738, Engineering Dynamics Corp., Beaverton, OR, 1989 (0.9 MB)	General	Free
0007	"Further Validation of EDCRASH Using the RICSAC Staged Collisions,"	EDCRASH	Free

2008 HVE Forum February 18 - 22, 2008 San Diego, CA

Join your colleagues at the 2008 HVE Forum and learn how to "Hang Ten" using your HVE or HVE-2D software. The 2008 HVE Forum offers workshops of interest to every user of HVE and HVE-2D. For example, you might choose to study the background, theory and application for your physics programs. Or you might choose to learn how to build a vehicle from scratch, build a 3-dimensional scene using survey data, run test simulations to adjust vehicle parameters and then work through real-world cases using a variety of analytical approaches and techniques. At the 2008 HVE Forum, you have choices from a large selection of workshops, the HVE White Paper session, User's Groups and interactive social hours for everyone.

As in previous years, we anticipate the Advanced HVE workshops to fill up early, with users eager to learn a tremendous amount of detailed information about how to apply their software to real-world crash analyses. The instructors are currently working up new case studies, examples and exercises to focus on concepts and techniques not covered in last years workshops.

Workshop schedules, descriptions, registration forms and details about the hotel and special room rates are available to download on the 2008 HVE Forum pages of the website. Visit www.edccorp.com or call EDC Customer Service at 503.644.4500 and sign up today!



Attendees of hands-on workshops are encouraged to bring their laptops to work through case studies and exercises presented in each session. Software and temporary licenses are provided for each attendee with a computer.



About the 2008 HVE Forum Hotel

The Holiday Inn San Diego - On The Bay offers a convenient hotel location and San Diego waterfront destination. Just a complimentary shuttle ride from San Diego International Airport and footsteps to the Downtown Gaslamp Quarter. This San Diego lodging is popular for its proximity to fine restaurants, theaters, museums, shops, and sporting venues.

A special room rate of \$165.00 per night has been arranged for your stay during the 2008 HVE Forum. To receive this special rate, you must use the Group Booking Code 'HVE' when making your reservation. This special rate will only be available until January 18, 2008, and while rooms are available. February is a very popular time of year for visiting San Diego, so don't wait until the last minute to make your reservations if you want to stay at the 2008 HVE Forum hotel!

See you in San Diego in 2008!

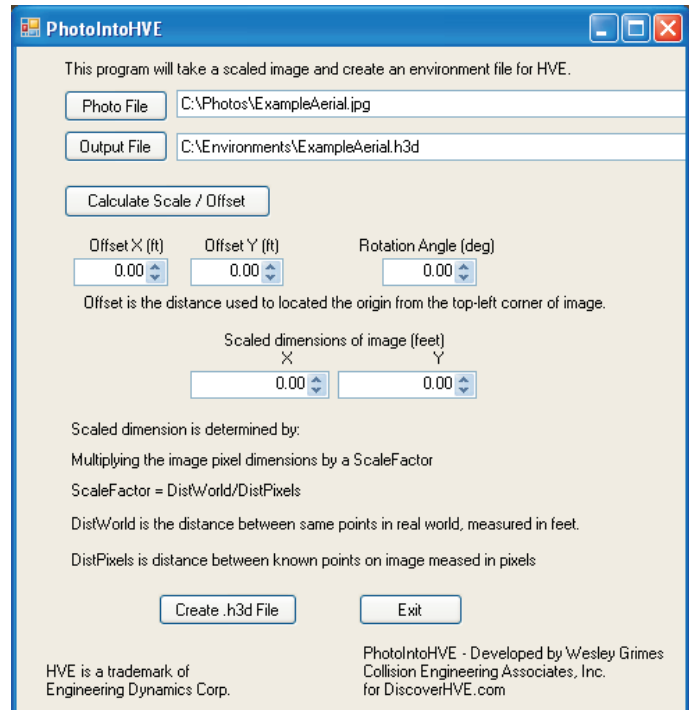
Saving Custom Vehicles for Future Cases

One method for saving your custom built vehicles for later use is to save each one in a unique vehicle database file that can be easily accessed from the Vehicle Editor. You want to save each custom vehicle into it's own unique *.db file rather than adding them to a growing user.db file. It is very difficult to remove incorrect or wrong vehicles from user.db, so by saving each one into it's own *.db file, you know exactly which vehicle it is. The basic procedure is outlined below:

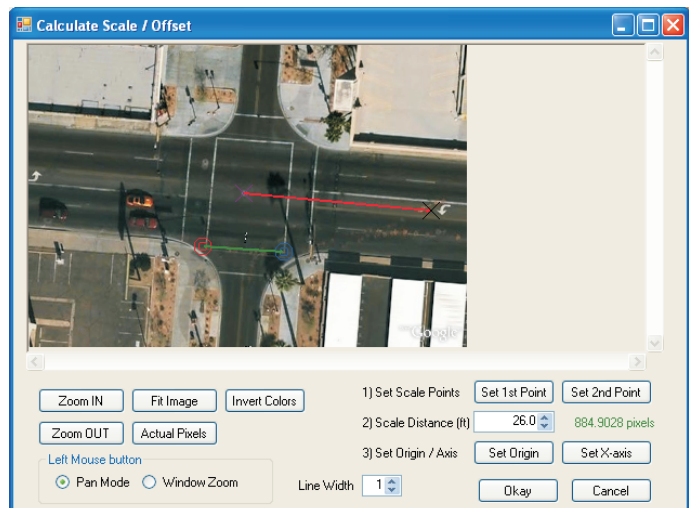
1. Use a file browser and look in the supportFiles/db folder. If you have a file named user.db, rename that file to be user-original.db or similar (if you have never saved a vehicle into the database before, then you will not find a user.db file).
2. Start *HVE* and open a case file with one of your custom vehicles that uses a custom geometry file. Go to the Vehicle Editor and display your custom vehicle in the viewer. Click on the *Object Info* button to display the Vehicle Information dialog. In the Vehicle Information dialog, click on the *Save As* button.
3. In the Save As New Vehicle dialog, make edits to the fields for Make, Model, Year, Body Style, etc.. These fields will be used to select the vehicle from the database later, so be clear and descriptive. Leave the Security Key field blank and leave the Version Information as presented. For the Geometry File Name, it should indicate the geometry file that is used for that custom vehicle. Once these fields are properly completed, press the OK button.
4. You are now looking at the Vehicle Information dialog once again, but it should show the information for the vehicle you just "saved" into a new user.db file. Look at the Source Database field and you will see it shows user.db. You can close the dialog and then exit *HVE*.
5. Now use a file browser and go back to the HVE/supportFiles/db location and rename the user.db file to be something unique, such as YugoGVPlus.db.
6. Start *HVE* again. During start up, *HVE* will read in all of the *.db files located in the db folder. Go to the Vehicle Editor and add your custom vehicle by clicking the *Add New Object* button and then changing the Type, Make, and Model fields until they display your vehicle information. If you set the fields properly, the Source Database will show as your unique file name such as YugoGVPlus.db. Click OK and your vehicle will appear in the viewer!

Utility Program for Using Aerial Photographs

DiscoverHVE.com members now have access to a utility program for quickly using aerial photographs as environment models for their reconstructions and simulations. Visit www.DiscoverHVE.com for more information about this great time-saving application.



The PhotoIntoHVE program allows the user to select a photo, scale, rotate and orient it on a surface, position the origin and then output an environment .h3d model.



The Calculate Scale/Offset viewer displays the photograph and allows the user to select and assign reference point.

HVE and HVE-2D F.A.Q.

This section contains answers to frequently asked questions submitted to EDC Technical Support staff by HVE and HVE-2D users.

Q. I'm noticing that the input values I assign in the Driver Controls, Steer table for the steering wheel angle are not exactly the same as being reported in Key Results for Steer Angle in a SIMON simulation. Why?

A. The current steering wheel angle (Driver output group) was displayed incorrectly in the Key Results or Variable Output if the vehicle had roll steer or non-zero steering geometry (e.g., king pin inclination, caster). The correct driver steering input angle was used by the simulation, but when the value was displayed it was corrupted. This error has been corrected in SIMON 3.13. This update is available on the Support, Downloads section of the EDC website.

Q: I want to open a case file that is on a CD I just inserted into the drive on my computer. When I try to open the case using the File, Open commands within HVE, I receive an error message indicating "Parameter is incorrect" and the file does not open. Is this a corrupt file? Is the case file locked?

A: You have received the error message simply because you are trying to open a case file located on media that is not directly 'writeable' if HVE tried to save edits to the case file. If you copy the case from the CD into the case folder on your own hard drive, you will be able to open and work with the case as expected.

Q. I'm used to working with EDSMAC4 in HVE and simply adjusting the Vehicle Editor tire data for middle load slide friction values when calibrating my vehicle tire data to an actual skid test at the crash site. But since SIMON takes into account additional tire friction parameters and at all loads and speeds available in the Vehicle Editor tire data dialogs, what is possibly a better way to "calibrate" the values?

A. When working with physics models that use more tire friction parameters than you are used to easily adjusting, you should try to use the In-use Factor (%/100) located at the bottom of the Tire Friction dialog and scale the friction values to produce results in a simulation of the skid test that match the deceleration rate measured in the actual skid test. The In-use Factor will be applied to all friction parameters at all loads and speeds and will provide a more accurate simulation of the real-world conditions, rather than simply trying to adjust a single parameter for tire friction.

Q: I was trying to increase my Maximum Simulation Time above the 20 second limit by editing the language.rsc file. However, after I made my edits, saved the language.rsc file and restarted HVE, I received an error message and now several of my dialogs appear distorted and the text is out of position. What did I do wrong?

A: It sounds like you accidentally made some additional changes to your language.rsc file that you were not aware you had made. The language.rsc file has a specific format that MUST be maintained. When you make edits, you should be very careful to change only existing warning and limit range values and to not insert extra spaces or accidentally hit 'Enter' on your keyboard.

The best solution to your problem at this point is to go back to the original language.rsc file before you made your changes. You did make a backup of the language.rsc file before you made the edits, right? If not, you can go to the Support, Downloads section of the EDC website and download a replacement language.rsc file that matches your software version. When you try to make your changes to the language.rsc file again, BE VERY CAREFUL!

Q. I am experiencing the situation where the dragger used to manually position my vehicle in the Event Editor has disappeared. I think it is because I was using a file across the network or something like that. If I simply exit and restart HVE, the dragger is still missing. I have to shut down and restart my computer in order to have the dragger reappear. Is there a better way to easily recover this manipulator?

A. When the dragger disappears, the System Environment Variable required to display the dragger properly has been 'stepped on' by some other Windows action. The quick way to recover the dragger is to exit HVE and then go to the System Properties dialog, select the Advanced tab, then click the Environment Variables button. In the System Variables list that appears, scroll through the list and select the SO_DRAGGER_DIR value. Click Edit to display the Variable Name and Variable Value and then simply click OK to reapply the existing values. You can then close the System Properties dialog. Now when you start HVE, your dragger will appear as expected in the Event Editor.

*Visit the Support section of
www.edccorp.com for the latest
Downloads and answers to F.A.Q.'s.*

EDC Training Courses

EDC Reconstruction & EDC Simulations

EDC offers an excellent training course on the use of the EDC reconstruction program, *EDCRASH*. Both new and long-time users of *EDCRASH* agree that the *EDC Reconstruction* course is extremely beneficial and challenging.

EDC also offers an excellent training course on the use of EDC simulation programs, such as *EDSMAC*, *EDSMAC4*, *EDSVS* and *EDVTS*. The *EDC Simulations* course offers the fastest way to learn what you really need to know – how to efficiently use the program and get the right results.

These one-week courses are designed to fully investigate the program's inner workings. Lectures are full of helpful hints gained from years of experience. During the course, students will use the programs (e.g. *EDCRASH*, *EDSMAC4*) in either the *HVE* or *HVE-2D* simulation environment to complete several workshops highlighting the capabilities of the programs.

HVE Forum

The *HVE* Forum is an excellent opportunity for *HVE* and *HVE-2D* users to jump to a new level of ability. By participating in workshops, attendees brush up on their present skills, learn new techniques, and learn how to use the latest advancements in the software. The *HVE* Forum also presents a great opportunity to meet other users and expand your network of resources.

Engineering Dynamics Corporation Training Course Schedule

EDC Simulations

Los Angeles, CA January 2009

Miami, FL November 12 - 16, 2007

EDC Reconstruction

Los Angeles, CA January 7 - 11, 2008

Miami, FL November 10 - 14, 2008

Theoretical & Applied Vehicle Dynamics

TBD TBA 2008

2008 HVE FORUM

San Diego, CA February 18 - 22, 2008

Vehicle Dynamics

Theoretical and Applied Vehicle Dynamics extends the theory of the basic SAE course and includes direct applications using several vehicle simulation programs (e.g. *SIMON*, *EDVSM*) within the *HVE* simulation environment, as well as a solid theoretical background for such simulations. The course is focused towards vehicle design engineers and safety researchers with an interest in a greater understanding of vehicle dynamics and automotive chassis systems development.

Hands-on Training

Intensive hands-on training on how to use your *HVE* or *HVE-2D* system software, physics programs and databases is available. Contact EDC Customer Service for more information about bringing this two-day on-site course to your office.

Course Registration

You may register for a course by contacting EDC Customer Service at 503.644.4500, or by email to training@edccorp.com. You can also visit the Training pages on our website and download a course registration form. All courses are eligible for Continuing Education Units and ACTAR credits. See you at our next course!

Related Training Courses

Northwestern University Center for Public Safety (NUCPS) is no longer actively scheduling the COMPTAR and MATAR courses which used *EDCRASH* and *EDSMAC*. The material previously covered in these courses is covered in the EDC Reconstruction and EDC Simulations courses. If you are interested in hosting one of these courses at your location, please contact EDC Customer Service at 503.644.4500.

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EDVAP, EDCRASH, EDSMAC, EDSMAC4, EDCAD, EDSVS, EDVTS, EDHIS, EDVSM, EDVDS, EDGEN, EDVDB, HVE, HVE-2D, HVE Brake Designer and GetSurfaceInfo() are trademarks of Engineering Dynamics Corporation. All Rights Reserved.

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