

Technical Newsletter

2004 HVE Forum - Faster Than A Speeding 'Bullitt'

Union Square in San Francisco proved to be an excellent setting for the 2004 HVE Forum, and even helped provide the theme used on the back of the T-shirt and in the activities of the Monday night social hour. This year's winners of the "Who wants to be an HVE Jillionaire?" game received "Bullitt Bucks" towards the future purchase of EDC products or services. If you knew the answer to the question, "During the chase scene, about how fast was Frank Bullitt driving his '68 Mustang down Taylor Street?", then you too could have been a winner.

Seriously though, everyone who attended this year's HVE Forum was a winner according to the evaluation forms. From the Opening Remarks on Monday morning, to the close of the final workshop on Friday afternoon, attendees were continuously exposed to new concepts and ideas, along with tips and techniques. The Users Group meetings, the HVE White Paper session and the evening social hours provided an additional opportunity for users to share their own experiences.

DyMESH Unveiled

Incorporated into the Opening Remarks was a brief overview of the enhancements available in Version 5, along with a demonstration of the ease of use and power of the DyMESH 3-D collision algorithm. Within a matter of minutes, Terry Day, President of Engineering Dynamics Corporation, was able to create a two-car crash simulation and clearly show the roll and pitch effects of the crash to the attendees. Later that same day, the DyMESH workshop discussed the theory and application of DyMESH to real-world crash simulation in great detail.

2005 HVE FORUM - Miami, Florida

After two years of HVE Forums held at locations in the Western region of the United States, it was decided to move the 2005 HVE Forum to a location on the East Coast. It was also decided that an earlier time in the year would help to avoid potential conflicts in scheduling. As a result, the 2005 HVE Forum will be



held in Miami, Florida at the Mayfair House Hotel in Coconut Grove from February 21 - 25, 2005.

Next year's event looks to be extremely interesting for long-time users of HVE, as many of the workshops will be reworked with new material and several new workshops will be added. The new workshop descriptions, workshop schedules and registration forms will be available to download on the HVE Forum page of the EDC website before the end of Summer. While it may seem a long way off, February 2005 is just around the corner, so make a note on your calendar and start thinking about travel arrangements to join your colleagues at the 2005 HVE Forum.

The Mayfair House Hotel is an all-suites hotel located in the heart of Coconut Grove. Within walking distance of the hotel are a large selection of restaurants, shopping and other activities. Workshops and hotel rooms will be on a first-come, first-served basis, so be sure to register as soon as the forms are available to ensure you get the choices you want.

By the way, Frank Bullitt's '68 Mustang was traveling at about 30 mph down Taylor Street. How do we know? We used HVE to simulate the chase scene!

**REMEMBER TO MARK YOUR CALENDAR . . .
FEBRUARY 21 - 25, 2005 IN MIAMI**

Technical Session

This Technical Session describes how to use the *HVE* Path Follower. A previous Technical Session (see May, 1999) provided a backgrounder on how the Path Follower works. For an in-depth description of the technology, see SAE Paper No. 2000-01-1313, *The Simulation of Driver Inputs using a Vehicle Driver Model*.

The *HVE* Path Follower will be implemented in the next release of *EDSMAC4*, giving *HVE-2D* users an opportunity to take advantage of a very useful capability (the Path Follower is currently implemented only for *SIMON*, *EDVSM* and *EDVDS*).

Briefly stated, the *HVE* Path Follower asks the user to specify the desired path of a vehicle; the Path Follower then determines the steering inputs required to follow that path. We will illustrate the use of the Path Follower through two examples. The first example will be simple and straight-forward; the second example will be more detailed and will exercise more of the model's features and options.

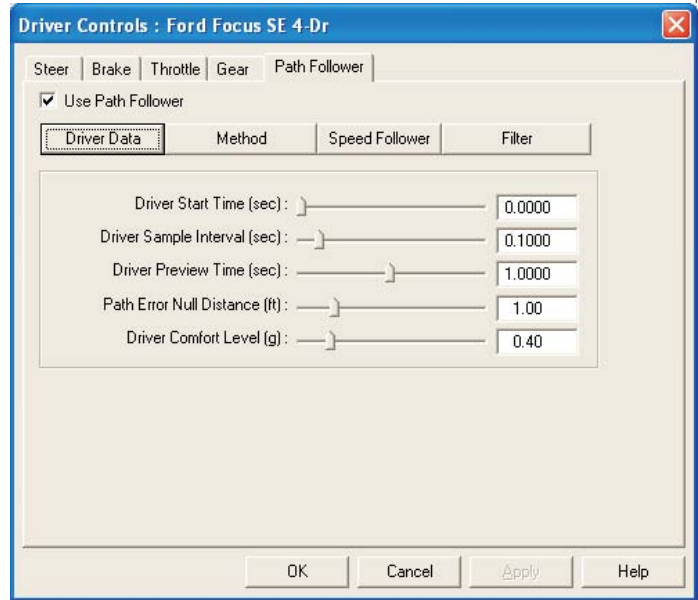


Figure 1 - *HVE* Path Follower, Driver Data dialog

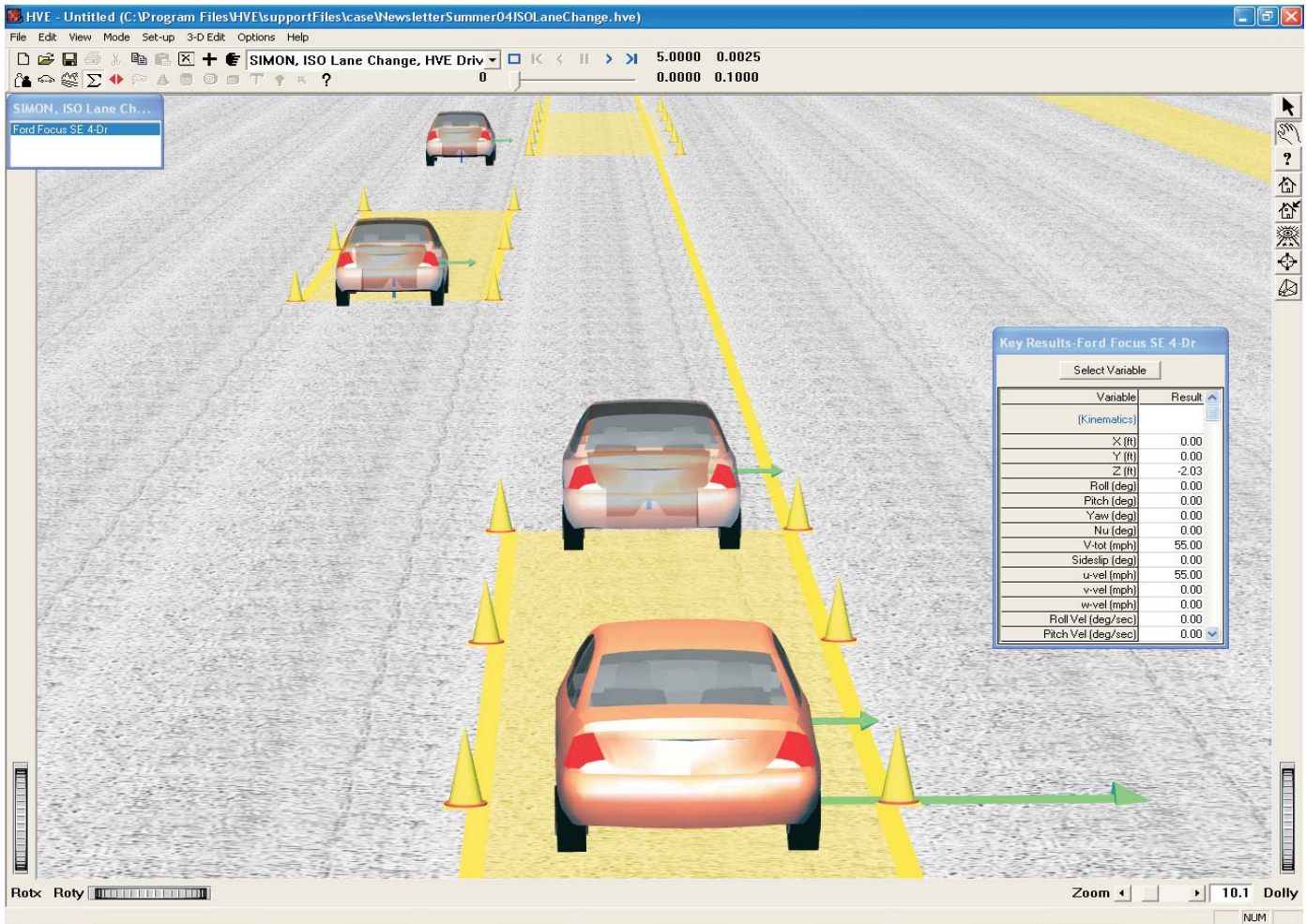


Figure 2 - Event Editor showing *SIMON* event set up with initial position and three target positions. The targets are used to define the path used by the *HVE* Path Follower.

Lane Change Maneuver

To simulate a single lane-change maneuver using *SIMON* or *EDSMAC4*, one could rather quickly determine a steering table through trial and error that would achieve the desired result. An alternative (and even quicker) approach would be to use the *HVE* Path Follower. Using the Path Follower involves two steps:

- Turn on the *HVE* Path Follower. This is done by choosing *Driver Controls* from the Set-up menu, then choosing *Path Follower* and clicking the *Use Path Follower* check box (see Figure 1). The model will be used for the selected vehicle when the event is executed.
- After entering the starting position, enter three *target positions*: one at the start of the lane change, one at the end, and one farther down the road (see Figure 2). The last position is important. It prevents the Path Follower from turning off prematurely, and also ensures the vehicle continues straight down the road after the lane change is complete.

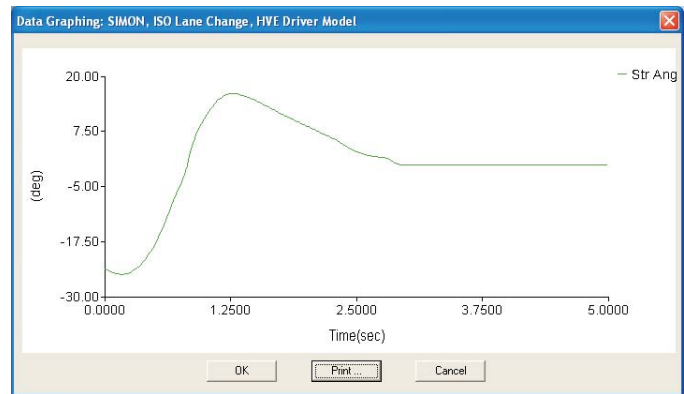


Figure 3 - Steering input required for the lane change maneuver, as simulated by the *HVE* Path Follower.

After assigning any other required event set-up parameters (our example uses an initial velocity of 55 mph), execute the simulation as you would normally. The required steering inputs as determined by the *HVE* Path Follower are shown in Figure 3.

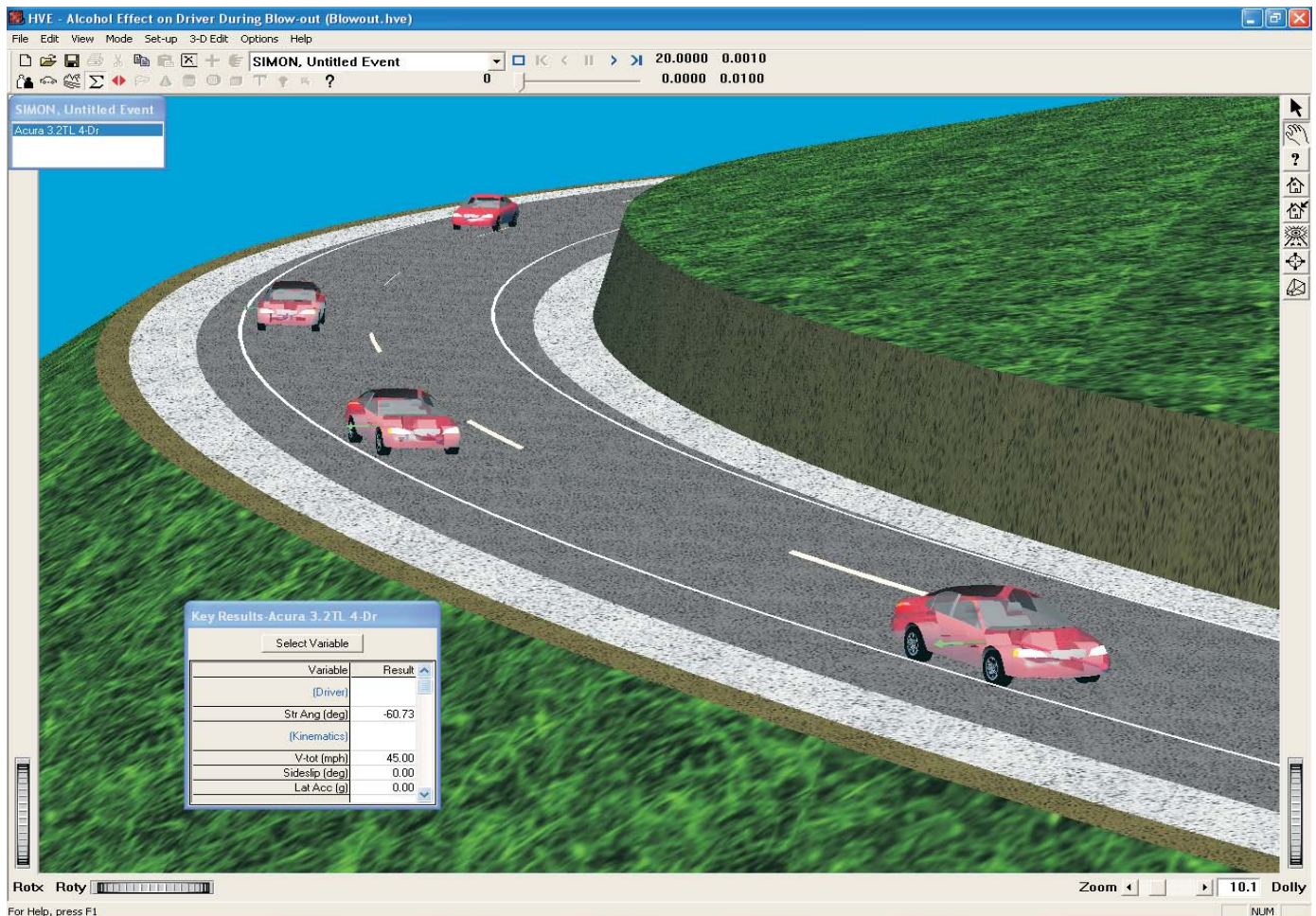


Figure 4 - Tire blow-out simulation using the *HVE* Pat Follower to study the steering inputs of a drunk driver.

As we can see from the this example, using the Path Follower is quite easy and very efficient. However, the model also has many features and options that allow the user to modify the driver's characteristics and observe the effects on vehicle behavior. We'll illustrate some of these modifications in the following example.

Blow-out On A Curve

In this example, a vehicle blows an outside rear tire while negotiating a curve at highway speed (55 mph) and pulling 0.2 lateral G's. This is a moderate level of lateral acceleration.

The first step is to set up the event, assigning an initial position and velocity and several target positions along the desired path (see Figure 4).

Next, let's use the HVE Tire Blowout Model (see SAE Paper No. 980221, *3-Dimensional Simulation of Vehicle Response to Tire Blow-outs*) to blow the right rear tire 4.0 seconds into the event. This is done by choosing *Wheels* from the Set-up menu and selecting the *Blow-out* tab. Choose *Axle 2, Right Side* and click the *Tire Is Blown* check box. Finally, set the *Start Time* to 4.0000 seconds.

Now, let's turn on the HVE Path Follower. This is done as before: Choose *Driver Controls* from the Set-up menu, then choose *Path Follower* and click *Use Path Follower*. Now, execute the event. The steering required to maintain control is shown in Figure 5. A little hunting is observed as the driver model approaches each target position. However, the effect of the tire blow-out on steering is not observable in the graph (careful comparison of the steering inputs required with and without the blow-out does show a small change in steering shortly following the blow-out).

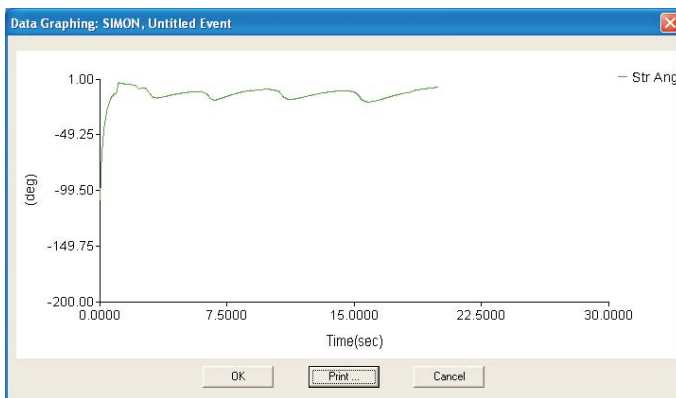


Figure 5 - Steering input required to maintain control during a blow-out on a curve.

Now let's examine how an intoxicated driver might behave during the same event.

To modify the default characteristics of the driver, choose *Driver Controls, Path Follower* (as done previously). Modify the parameters to simulate an intoxicated driver: Increase the *Time Delay*. Choose *Set-up, Driver Controls, Path Follower* and display the *Neuro-muscular Filter* settings. Note that the default *Time Delay* is 0.00 seconds. (NOTE: This is *not* the same as *perception/reaction* time! See SAE Paper No 2000-01-1313 for an explanation of this parameter and a comparison with perception/reaction time.) Increase the *Time Delay* to 0.20 seconds. Then re-execute the event. The resulting steering input is shown in Figure 6. Note the change in vehicle response associated with an impaired driver.

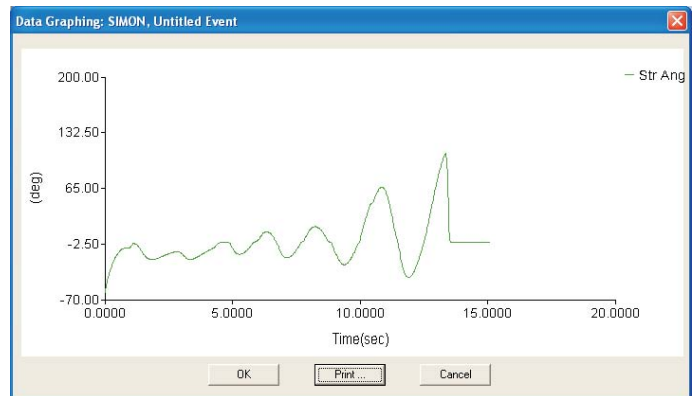


Figure 6 - Steering input simulated for same event with an impaired driver.

The above example is a glimpse of an area that EDC is currently researching. We hope to present in the near future a detailed report on the characteristics of an impaired driver as simulated using the HVE Path Follower.

NOTE: In future HVE releases, the name Path Follower will be changed to HVE Driver Model.

A compilation of Technical Sessions, F.A.Q.'s and Tips & Techniques sections from previous newsletters is available:

EDC Library Publication 1080 - US\$ 45.00

2004 *HVE* Forum Top 10 Wish Lists

Each year at the *HVE* Forum, attendees to the User's Group meetings develop a "Wish List" of additional functionality or enhancements for *HVE* and *HVE-2D*. The groups suggestions are then narrowed down by voting for their Top 10 choices. Here are the results, ranked in order of importance (including tie votes) :

HVE Users' Top 10 Wish List

1. Incorporate Tire Test Data
2. Many more than eight target positions
3. Add vehicle to existing event
4. Scale grid option/measure tool
5. Quasi-static load shift: cargo & occupant
5. Link Human Editor to GEBOD
5. Yaw stability
5. Keep ghost image of original car in damage view
5. Hi-res graphics (off-screen renderer)
10. Default/remember Save or get files from any folder
10. Rubber band Select window in Environment Editor
10. Tire sidewall interacting with environment
10. Change hierarchy of friction zone
10. Saved User Set-up Preferences

HVE-2D Users' Top 10 Wish List

1. Include Path Follower with *HVE-2D*
2. Create *EDSMAC* event from *EDCRASH* results (like *EDVAP*)
3. Audit trail of simulation (History of initial inputs)
3. *HVE-2D* to use total yaw moment of inertia only (not sprung)
5. Date and time on printouts to be optional
5. Offer *SIMON*, *EDVSM*, and *EDVDS* to 2D users
5. Colored skidmarks by vehicle or tire position (set transparency) (LR, LF, etc)
5. Provide target overlay image of the measured damage profile for comparison
9. Reference to friction zone use in playback reports
9. Optimize vehicle geometry import procedure
9. Enable non-perpendicular camera views
9. Traced tire path (regardless of slip or Fz)

2004 *HVE* Forum White Paper Session

Once again, the *HVE* Forum White Paper Session provided valuable information for users. This year's papers presented topics of interest ranging from visibility issues to 3D crash simulation. The following White Papers may be downloaded directly from the EDC website:

WP-2004-1 "Human Performance - Can Visual Phenomena Be Recreated in *HVE*?", Lawrence E. Jackson, Kristin M. Poland, Ph.D., and Paula Sind-Prunier, Ph.D., National Transportation Safety Board

WP-2004-2 "Creating an *HVE* Vehicle Geometry from Orthographic Diagrams", James P. Sneddon, Baker Sneddon Consulting.

WP-2004-3 "Comparison between *EDVSM* and *SIMON*: Automobile Handling Characteristics", Daniel A. Fittanto and Adam Senalik, Ruhl Forensic, Inc.

WP-2004-4 "Computerised simulation of car and 4WD impacts into alternative median barrier profiles using the *DyMESH* collision algorithm within the *HVE* simulation environment", Grant Johnston and Iwan Parry, TRL Limited; Clint Bradley, Grant Johnston Consulting Engineers Pty. Limited.

Call for 2005 *HVE* Forum White Papers

HVE users interested in presenting a technical paper in the "HVE White Paper" session for the 2005 *HVE* Forum are invited to submit an abstract for consideration. This session is an opportunity to showcase unique skills or specialized applications of *HVE* to other *HVE* users as well as to non-*HVE* users who may be interested in the utilizing the authors services. White Papers are made available to the general public on the *HVE* White Papers section of the EDC website following each years event.

The following subjects are considered: *HVE* Case Studies, Innovative Tips and Techniques Using *HVE*, or Any Application of *HVE* Showcasing its Capabilities.

If you are interested in presenting a white paper, please submit your abstract of 100 to 250 words in length to EDC Customer Service before September 1, 2004.

Downloadable “Patch” Files for Version 5.00

Since the release of the Version 5.00 update, EDC has received two important “remedies” for potential problems in the operation of *HVE* and *HVE-2D*. These solutions have been provided by the vendors of the licensing and 3-D graphics tool kits used by the *HVE* source code. Both solutions only improve the operation of the user interface and do not have any effect on the results of reconstruction or simulation events. These solutions are specific to Version 5.00 only, as future updates will incorporate these solutions along with additional enhancements and features.

To help users understand and address these potential problems, we created a set of questions and answers and posted them on the Support F.A.Q. page on our website, as well as including them in this newsletter :

Q: I am using Version 5.00 and it seems to take about 30 seconds from the time I click to launch the application until I see the program window appear on the screen. In previous versions, it took about 4 seconds. Why is this happening with Version 5.00 and how can I fix it?

A: This delay is due to the reading and verification of a valid license file when using an EDKEY. This delay can be reduced to between 3 to 9 seconds by replacing the *Isapiw32.dll* file found in your *HVE* or *HVE-2D* program folder with an updated version. This updated file is available in the Version 5.00 Patch zip file.

Q: In Version 5.00, I am not able to see .jpg or .tif images that I would like to use for textures on my environment models. I also see the HVE Error Console telling me that the .jpg or .tif files used in previous environment models I created cannot be found. How can I fix this?

A: You need to add five additional files to your *HVE* or *HVE-2D* main program folder. These files need to be in the same folder as *hve.exe* in order to provide for the use of .jpg and .tif textures. These files are available in the Version 5.00 Patch zip file.

These questions and answers can be found on the Support F.A.Q. page on our website, along with a link to download the zip file. You may also download the file directly by typing the following address into your web browser:

www.edccorp.com/support/downloads/Hve500PatchFiles.zip

The New Procedure For Assigning Inter-vehicle Friction in *EDSMAC4*

Long-time users of *EDSMAC4* have found they had to change their event set-up procedures after installing their update to Version 5. An important change made in the user interface moved the location for assigning the value for Inter-vehicle Friction from the Calculation Options dialog to the Vehicle Mesh Options dialog. One of the greatest benefits of this change is that users can now assign different inter-vehicle friction values between pairs of vehicles involved in the same *EDSMAC4* event.

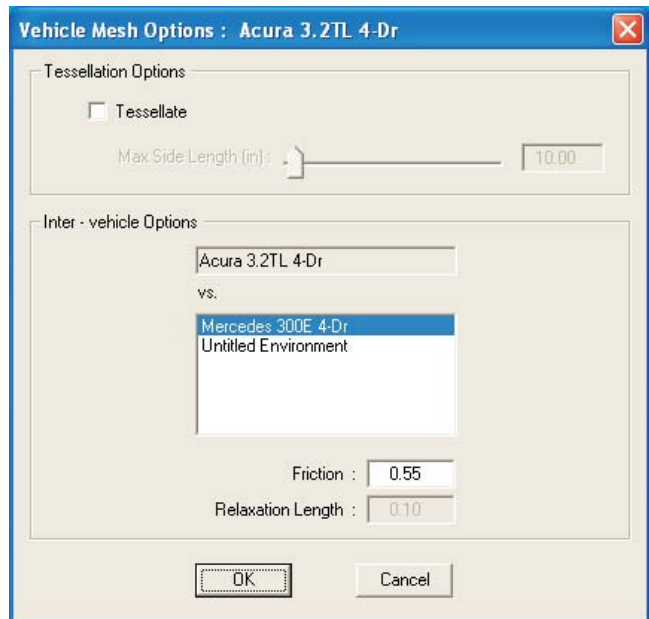


Figure 7 - Vehicle Mesh Options dialog used to assign the Inter-vehicle Friction between objects involved in collision simulations.

If the user does not edit the value for Inter-vehicle Friction, the default value of 0.55 is used for all collisions in the event. If a different value (or values) are desired, the users can select the primary vehicle on the event active objects list and then choose Vehicle Mesh from the Set-up menu. In the Vehicle Mesh Options dialog (shown in Figure 7), the user selects the target objects one at a time and assigns the value of inter-vehicle friction between each pair. Once this has been completed, the user clicks the OK button to close the dialog. After the event has been run, the values assigned in the dialog can be found in the Program Data report in the Playback Editor.

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

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

Q: When I needed to simulate a vehicle backing up in previous versions, I was able to enter a negative value in the Total Velocity field in the Position/Velocity dialog. In Version 5 however, this does not have the same effect? Why?

A: In previous versions, the dialog actually let you develop a bad habit. Total Velocity is actually the absolute value of the velocity of the vehicle and therefore should not allow a negative value. The u component of the velocity of the vehicle is the one that reflects the direction of vehicle travel. In order to simulate a vehicle traveling backwards in Version 5, you will need to enter a -180 value for Sideslip, and then you will see the negative value displayed in the u velocity field.

Q: I was working in the Event Editor and had reset and run my simulation about 20 times or so. The next time I pressed the reset button, I noticed that the geometry of my vehicles had changed to generic images and an error message was displayed on the screen indicating "Inventor Read Error. Could not read texture file . . . ". I closed the error message dialog and then tried to change to the Vehicle Editor to look into the loss of the the vehicle geometry files. But in the process of changing editors, HVE experienced a fatal crash and shut down. What happened?

A: This "Inventor Read Error" is caused by a resource control not functioning properly for the display of wheel texture bitmaps on vehicles. It may happen in a few as 15 event resets or as many as 80-100 event resets depending upon the computer and operating system. This error can happen to both HVE and HVE-2D users, even though HVE-2D users normally do not see the texture images. This bug will be fixed in the next release, but for now, please follow this advice to either avoid the problem or to limit the "loss of information" caused if you have a fatal crash:

To avoid the problem, remove the wheel texture image from the vehicle. In the Vehicle Editor, click on a wheel and choose "Wheel Image" and then choose New. The wheel image is removed from that location. Repeat for all wheels on the vehicle.

Limit the loss of information in your case: While HVE does have an Autosave feature that creates a

temporary backup in case of a fatal crash, this file will not contain any work since the last Autosave operation. If you cannot work without the wheel textures on the vehicle, the best plan to follow is to save your case frequently, about every 8 - 10 times you reset your event or change between the Vehicle Editor and Event Editor. This will provide you with your own manually created backup case file.

Q: I cannot run a simulation to completion. My simulations seem to stop at random timesteps during the event. (This applies to users with Windows XP with Hyper-Threading Technology enabled and all Windows 2000 users)

A: For Windows XP users: This behavior is caused by the Hyper-Threading Technology available in the latest Pentium 4 processors. Simply stated, it is disrupting the process of displaying the results of the physics calculations. This is easily overcome by disabling the Hyper-Threading Technology setting in your BIOS. If you require assistance in disabling your Hyper-Threading Technology setting, you need to contact your computer manufacturer.

For Windows 2000 users: This behavior can be affected by changing the Performance Options setting for your Windows 2000 operating system. Follow these steps to change your Performance Options setting: On your Windows desktop, click on *Start*, choose *Settings*, then *Control Panel*. In the browser that appears, double-click on the *System* icon. On the *System Properties* dialog that appears, click the *Advanced* tab. Under *Performance*, click the *Performance Options* button. Under *Application Response*, change the setting from *Applications* to *Background Services*. Apply these settings. While this change is not a 100% fix for the behavior, it does reduce the random pausing of the event by over 95%. If you do encounter this random pause, simply reset and re-execute the event again and it should run to completion the next time.

Important Note: This behavior will be completely fixed in the next release. This means you will not have to disable Hyper-Threading Technology or adjust the Performance Options settings in future releases.

F.A.Q.'s on EDC Website

The EDC website provides a special section dedicated to Technical Support, including answers to F.A.Q.'s from this and previous Newsletters. We encourage you to visit this page to search for answers to your questions before contacting Technical Support for assistance. Go to www.edccorp.com and follow the link to Support.

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 17 -21, 2005
Miami, FL November 2005

EDC Reconstruction

Los Angeles, CA January 2006
Miami, FL November 8 - 12, 2004

Theoretical & Applied Vehicle Dynamics

TBA. Fall, 2004

2005 HVE FORUM

Miami, FL. February 21 - 25, 2005

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 and ACTAR credits. See you at our next course!

Related Training Courses

Northwestern University Center for Public Safety (NUCPS) is offering the COMPTAR and MATAR courses once again. These courses are designed to provide law enforcement officers with a better understanding of using *EDCRASH* and *EDSMAC* for accident reconstruction. For more information or to register for these courses, you will need to visit the NUCPS website at www.northwestern.edu/nucps or by contacting the NUCPS office at 847-491-5476.

Engineering Dynamics Corporation
8625 SW Cascade Blvd, Suite 200
Beaverton, Oregon 97008 USA
Phone 503.644.4500 / FAX 503.526.0905
Email: info@edccorp.com
Website: www.edccorp.com

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.

SIMON and DyMESH (Patent number 6,195,625) are registered trademarks of Engineering Dynamics Corporation. All Rights Reserved.

GATB is a trademark of Collision Engineering Associates, Inc.