Technical Newsletter

2003 *HVE* Forum * April 28 - May 2 * Las Vegas, NV

The 2003 *HVE* Forum will be at the Hampton Inn Tropicana hotel in Las Vegas, Nevada, from April 28 - May 2, 2003. If you haven't already signed up to attend, you need to do so right now. From the early registration response we have received, it looks to be the largest attendance at an *HVE* Forum yet!

At the 2003 *HVE* Forum, you will learn how to navigate the user interface, build vehicle and environment models, simulate real-world crashes and produce professional quality results. You will also learn how to improve your application of *HVE*-compatible simulation models, such as *SIMON*, *EDSMAC4* and *EDVSM*.

All levels of users, from beginners to advanced, will benefit from attending. Workshops span from introductory concepts, all the way through the use of advanced capabilities such as the *HVE* Brake Designer, ABS Simulation Model, and the *DyMESH* 3-D collision algorithm. It will also include the *HVE* White Paper Session, the *HVE* Jillionaire Game, the *HVE* Simulations Festival and a few other surprises.

With Las Vegas as the location, there are plenty of discounted airfares and other options to make it very convenient and affordable to attend. We have a block of rooms available at the Hampton Inn Tropicana at a rate of $65.00 - $75.00 per night. If a different hotel is your favorite place to stay, visit the *HVE* Forum page on our website to download a map showing where the Hampton Inn Tropicana is located in reference to other hotels around "The Strip".

Workshops and hotel rooms are on a first-come, first-served basis, so be sure to register now to ensure you get the choice you want. Registration forms, workshop shedules and descriptions can all be downloaded from the EDC website. You'll find them on the 2003 *HVE* Forum page located by clicking the 2003 *HVE* Forum link at the top of the home page, or by clicking on the Training link on any page, or by going directly to www.edccorp.com/service/hveforum.html. If you can't access the internet, or have problems downloading the forms, please call EDC Customer Service and we can mail or fax them to you. See you at the 2003 *HVE* Forum!

HVE Simulations Festival

The Simulations Festival is open to all *HVE* and *HVE-2D* users who submit simulation movie files of their work. EDC will combine and title all entries into a single video loop which will play during the Forum. Attendees will vote for the simulations they feel best present the capabilities of *HVE* and *HVE-2D*, and awards will be announced during the week. If you want to participate, please email forum@edccorp.com for additional information about how to prepare and submit your simulation movie files.

Technical Session

Our Technical Session this time deals with a common task: simulating barrier collisions with *EDSMAC4*. Although there are several approaches, we'll illustrate the best approach – in terms of both the mechanics of the collision and the visualization.

The basic steps are as follows:
- ➢ Add the vehicle(s) and barrier(s) to the case
- ➢ Add the environment
- ➢ Set up and execute the *EDSMAC4* event

We see right away that the basic steps are the same for barrier collision simulation as for all other *HVE* simulations. We chose *EDSMAC4* over *EDSMAC* for three reasons: Our crash involves three vehicles and two barriers (*EDSMAC* is limited to one vehicle and one barrier; *EDSMAC4* has no such limitation). Second, *EDSMAC4* simulates objects with no wheels (e.g., *barriers!)*. Third, the *EDSMAC4* collision algorithm has some features that better facilitate barrier collisions. The procedure for setting up and executing this simulation follows.

Description of Crash

In our sample crash, two vehicles (a 1999 Volkswagen Jetta and a 2002 Chevrolet S-10 Extended Cab Pickup) sideswipe each other on a freeway, sending the Jetta spinning into the median barrier. After rebounding back into the traffic lanes, the Jetta is struck by a third vehicle, a 2001 Ford Expedition. The crash is illustrated in Figure 1. Let's build the *EDSMAC4* simulation.

Adding Vehicles and Barriers

From the EDC Custom Vehicle Database, add the 1999 VW Jetta, the 2002 Chevrolet S-10 Extended Cab Pickup and the 2001 Ford Expedition. Then add two Generic SAE J850 Fixed Barriers (because of the length of vehicle-barrier contact, we'll use two barriers).

Next, edit the exterior dimensions of both barriers: Set CG to Front to 500 in; CG to Rear –500 in; CG to Right 200 in; CG to Left –200 in. These exterior dimensions make the barrier long enough to be struck by the spinning vehicle and wide enough to maintain its aspect ratio (see the March 2000 Newsletter Technical Session for further information regarding aspect ratio).

Adding the Environment

Next, go to the Environment Editor and add an environment. Open the 3-D Geometry file browser and choose the geometry file we created for our environment. This 6-lane divided highway was created from a total station survey. It depicts a construction zone in which the traffic flow has been rerouted.
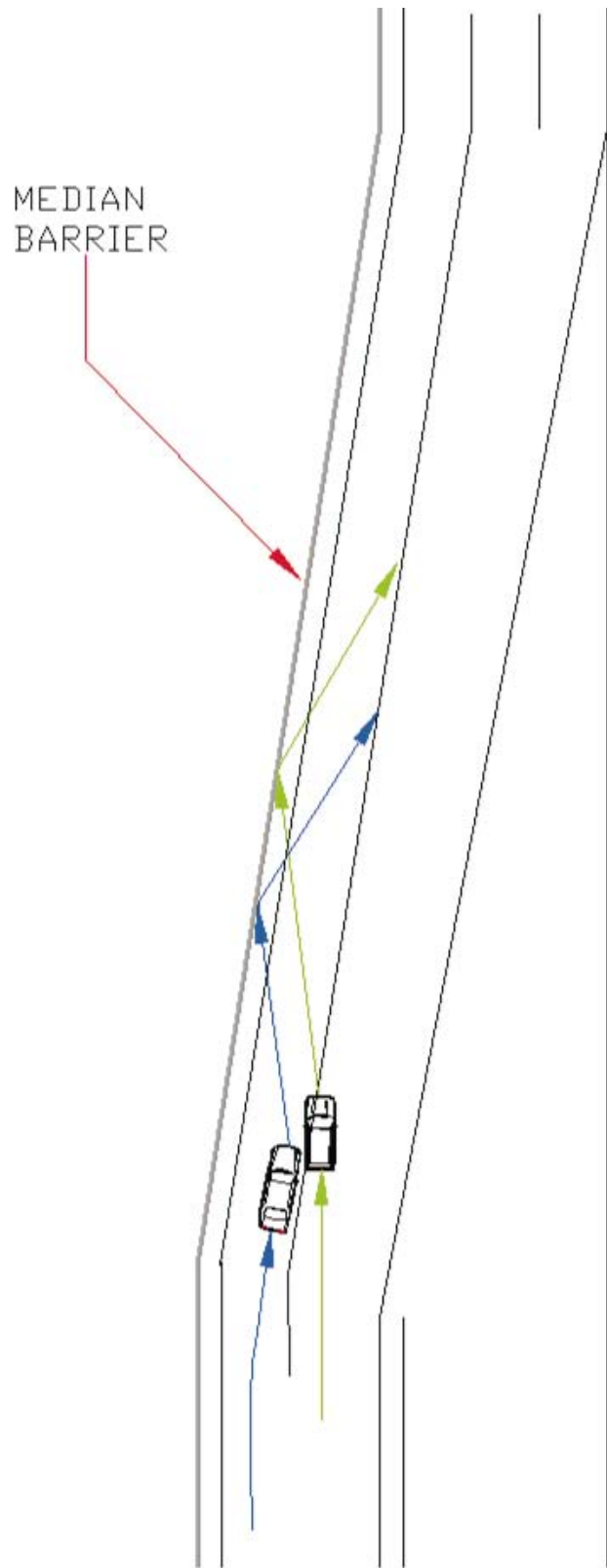

MEDIAN BARRIER

Figure 1 - Schematic of Crash Sequence

Figure 2 - 1999 Volkswagen Jetta 4-Dr

Figure 3 - Chevrolet S-10 Extended Cab Pickup
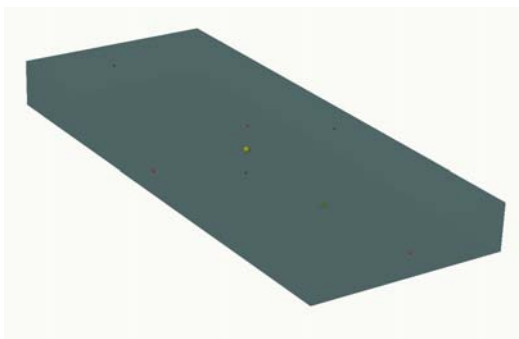

Figure 4 - Ford Expedition 4-Dr Sport-Utility

Figure 5 - SAE J850 Fixed Barrier (2)

Setting Up and Executing

Now go to the Event Editor, select *EDSMAC4*, and add the vehicles and barriers. Position each of the vehicles and barriers, and assign velocities, as shown in the following table:

Vehicle Name	X (ft)	Y (ft)	Y (deg)	V_{tot} (mph)
Volkswagen Jetta 4-Dr	480.2	20.4	180.0	55.0
Chevrolet S-10 Extended	512.0	9.4	180.0	65.0
Ford Expedition 4-Dr	570.0	20.0	180.0	60.0
SAE J850 Fixed Barrier	150.0	31.7	5.25	0.0
SAE J850 Fixed Barrier 2	66.5	24.1	5.25	0.0

Note the position of the barriers. Each was carefully positioned so its right side was coincident with the struck face of the median barrier (see Figure 6).

Next, assign driver controls for each vehicle. The steering and braking for the Volkswagen Jetta are as follows:

Time (sec)	Steering Wheel Angle (deg)	Braking (% Available Friction)			
		R/F	L/F	R/R	L/R
1.50	8.0	-	-	-	-
2.50	8.0	-	-	-	-
3.00	0.0	-	-	-	-
3.70	0.0	0.00	0.00	0.00	0.00
3.80	200.0	0.20	0.75	0.00	0.00

The steering for the Chevrolet S-10 is as follows:

Time (sec)	Steer Angle At Axle (deg)	
	R/F	L/F
4.0	0.0	0.0
4.1	0.0	25.0

Finally, the steering for the Ford Expedition is as follows:

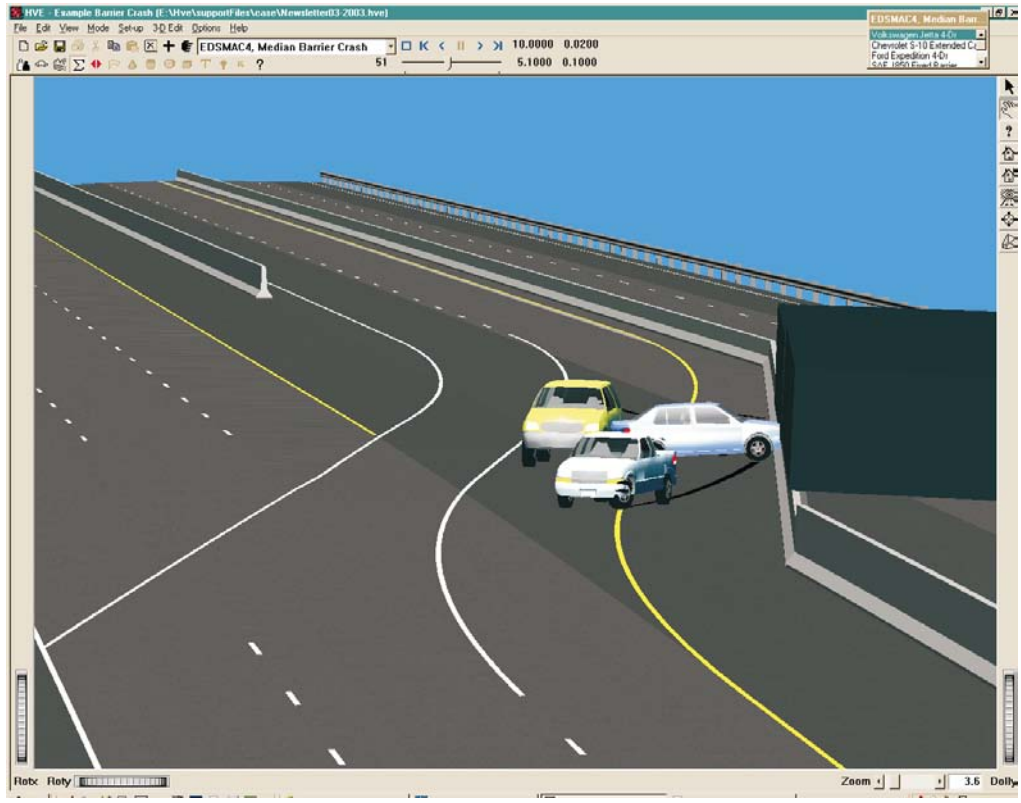| Time (sec)	Steering Wheel Angle (deg)
1.5	0.0
2.5	8.0
3.5	8.0
4.0	0.0

Figure 6 - Snapshot of barrier 3-vehicle barrier crash simulation. The fixed barrier is visible in this view
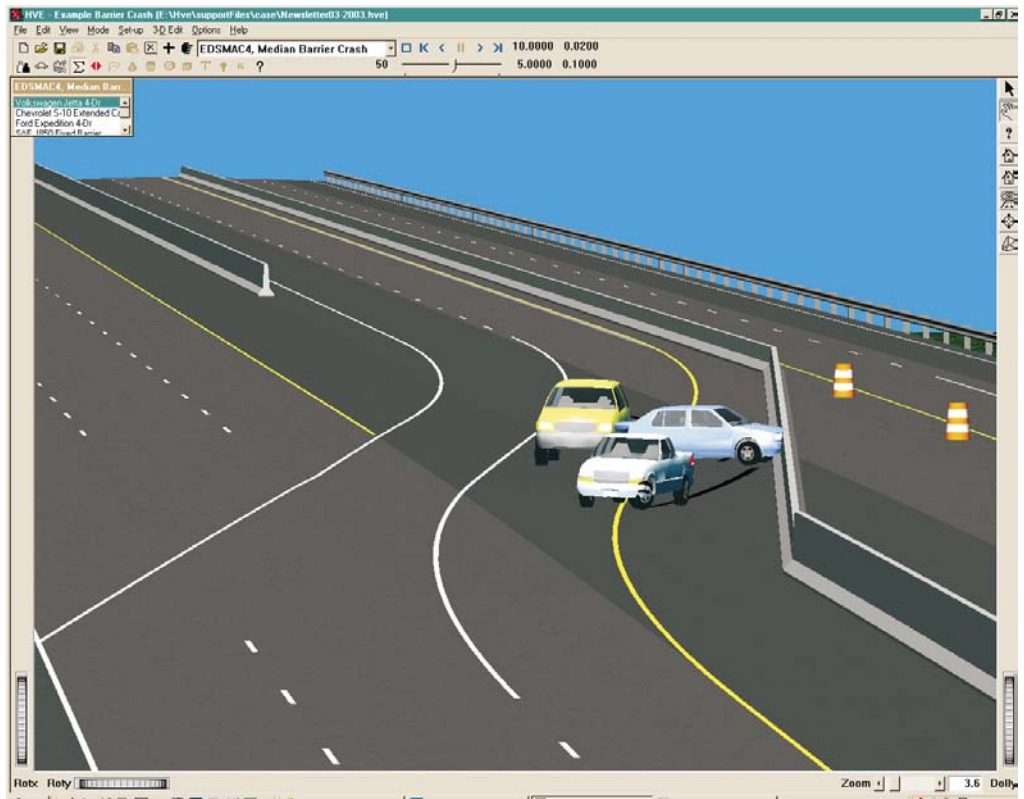

Figure 7 - Snapshot of barrier 3-vehicle barrier crash simulation. The fixed barrier's geometry has been removed in this view

Now execute the *EDSMAC4* event. A snapshot is shown in Figure 6.

But what if we don't want the Generic Barrier objects showing? After all, it's really the median barrier that was struck by the vehicles during the actual crash. There's a simple solution: Go to the Vehicle Editor. Add a Geometry File to each Generic J850 SAE Barrier, selecting NoBody.h3d (the name speaks for itself). Now, return to the Event Editor and reset the event. You'll see the Generic Barrier disappear (actually, the generic geometry has been replaced by NoBody.h3d). Execute the event. The resulting vehicle motion will be the same as before (see Figure 7). This is expected because the *EDSMAC4* collision algorithm is not using the geometry file in its calculations; the geometry is being shown for visualization purposes only.

Would you like to visualize this crash sequence? Go to www.edccorp.com/support/examples.html and use the link to download MedianBarrierCrashSimulation.mov.

If you would like to download the *HVE* case file and view and edit this crash sequence (i.e., play around – we won't tell anyone), use the links on the same web page as the movie file to download the *HVE* case file MedianBarrierCrashSimulation.hve.

Finally, if you would like a detailed tutorial describing the above process, use the link to download the file MedianBarrierCrashSimulationTutorial.pdf.

(Thanks to Baker-Sneddon Consulting, in Chicago, IL, for providing the 3-D environment geometry model.)

Computer Recommendations

With the price of computers at record lows, many users have been calling EDC to determine if their *HVE* or *HVE-2D* software will run on a new computer they want to buy. Here is our basic recommendation:

"*HVE* and *HVE-2D* are fully compatible with Windows 98, Me, NT4.0, 2000 and XP operating systems. However, try to avoid computers that are configured with ATI Radeon graphics cards. The drivers for the Radeon cards do not provide robust support for OpenGL applications such as *HVE*, so you will have unexpected program behaviors and crashes."

If you have questions about a particular computer configuration or graphics card, please contact EDC Technical Support for assistance.

EDSMAC4 vs. *EDSMAC*

The Technical Session in this newsletter pointed out three reasons why a user may choose to work with *EDSMAC4*, instead of *EDSMAC*, for simulating vehicle collisions. Those reasons were that *EDSMAC4* supports more than two vehicles in a collision, supports objects without wheels (e.g. barriers), and has features that facilitate barrier collisions.

More detailed information about *EDSMAC4* can be found in SAE Paper 1999-01-0102, "An Overview of the *EDSMAC4* Collision Simulation Model". Here is a brief excerpt from that paper:

"This paper reports on an extended version of the *EDSMAC* program, called *EDSMAC4*. These extensions resulted in significant changes to major portions of the original code. In particular, the control routine logic was revised to allow:

➢ Simulation of any number of vehicles
➢ Simultaneous collisions with multiple vehicles
➢ Improved collision detection

The collision algorithm was extended with:

➢ an improved force-deflection model
➢ different stiffnesses for front, back and sides
➢ support for barrier crashes
➢ damage profile simulation/visualization
➢ support for articulated vehicle crashes

The vehicle dynamics model was extended with:

➢ support for tandem axles and dual tires
➢ calculation of load transfers
➢ support for wheel displacement during impact
➢ support for the tire blow-out model
➢ support for articulated vehicles"

A copy of the complete paper may be downloaded directly from the Technical Reference Library section of the EDC website. You can find this page at www.edccorp.com/library/techref.html

EDSMAC4 has been available to *HVE* users since the late 1990's, and was introduced for *HVE-2D* users in December 2001. Many *HVE*-2D users have upgraded from *EDSMAC* to *EDSMAC4* to take advantage of its capabilities.

If you have questions or would like to add *EDSMAC4* to your *HVE* or *HVE-2D* software package, please contact EDC Sales for further assistance. Call 503.644.4500, or send an email to sales@edccorp.com.

HVE and *HVE-2D* 4.40 Feature Overview

The latest version of the *HVE* and *HVE-2D* system software provides many significant improvements that users will want to take advantage of. Updates were shipped by mid-February to all users with current Update/Technical Support policies. If you haven't received your copy yet, please contact EDC Customer Service for assistance.

If you have received your update, but just haven't made the time to install it, here are a few of the improvements waiting for you in Version 4.40:

Autosave

This new feature provides a "safety net" for the unfortunate situation when your program or your computer crashes before you have properly saved your file. Turning Autosave on in the Options, Preferences menu will provide for a temporary file of your current work to be saved in the Temp folder at a specified time interval. This does not save directly to the existing case file you are working on, but is a second file named Autosave.tmp. Although this is a case file, you cannot select this file to open as you normally could for a case file. This file is only used if your *HVE* or *HVE-2D* software experiences a fatal crash before you have properly saved the file. Under normal conditions, if you save your case file, the Autosave.tmp file is removed from the Temp folder. However, if you crash before you save your case, you will see a dialog stating "A temporary recovery case file was found. Would you like to recover this case?" when restarting your *HVE* or *HVE-2D*. You can then do a Save As and save it as the filename you specify. This has been put into place as a safety measure only, and we hope that you never have to rely on the temporary file. But because of the variety of computers in use, we still get reports of crashes related to graphics drivers.

Improved DXF translator

Version 4.40 offers improved support for importing DXF files. Users who previously found that lines of their scene drawings either did not appear at all, or had lost their assigned color when brought into *HVE-2D*, will now find that what they prepared in AutoCAD is what they see as their background environment in Version 4.40. The 3D Editor has also been made more robust, allowing the selection and editing of text and lines of translated DXF files. Users working with 3D terrain models built in 3D Studio or Rhino will find that VRML 2.0 format models are now supported in Version 4.40.

Shortcut Keys

Version 4.40 offers the user several keyboard shortcuts to perform actions previously available only by selecting from the toolbar or main menu. These keyboard shortcuts can help you become more efficient with using your software, especially when setting up events. To perform the action corresponding to the menu selection, simply press the two keys indicated simultaneously. Here is a list of the "hot keys" to use:

File Menu

Ctrl + N	New Case File
Ctrl + O	Open Case File
Ctrl + S	Save Case File
Ctrl + P	Print

Edit Menu

Ctrl + X	Cut
Ctrl + C	Copy
Ctrl + V	Paste
Ctrl + Del	Delete

Mode Menu

Ctrl + 1	Human Mode
Ctrl + 2	Vehicle Mode
Ctrl + 3	Environment Mode
Ctrl + 4	Event Mode
Ctrl + 5	Playback Mode
Ctrl + I	Object Information

Set-up Menu

Ctrl + P	Position/Velocity
Ctrl + D	Driver Controls
Ctrl + M	Damage Profiles
Ctrl + U	Collision Pulse
Ctrl + W	Wheels
Ctrl + T	Contacts

3D Edit Menu

Ctrl + L	Launch 3D Editor

Options Menu

Ctrl + R	Render
Ctrl + Y	Simulation Controls
Ctrl + J	Calculation Options
Ctrl + F	Preferences

User Hints and Tips

This section contain useful hints and tips to help *HVE* and *HVE-2D* Users make the most of their software.

➢ Want to add a dimensional reference to Site Drawings you print out from the Playback Editor? Two new environment library objects have been added to Version 4.40 to provide you with a Scale (one is in feet, the other in meters). Using the 3D Editor, you can insert these objects from the Environment Objects Library (they are named Scale-Feet.h3d and Scale-Meters.h3d) onto your environment drawing or model and position them appropriately.

➢ When creating an event involving an articulated vehicle such as a tractor-trailer, you must add vehicles to the Event Humans and Vehicles section of the Event Information dialog in a specific order. The proper order is to select them from the Vehicle List, proceeding from the front to the rear of the combination. If you don't select the vehicles in the proper order for their connections to match up, *HVE* will issue an error message and prevent you from creating the event.

➢ Version 4.40 allows users to copy selected rows and columns of data directly from the Variable Output report into spreadsheet programs like Excel. If you have been using the procedure of printing the Variable Output report to a text file and then importing the text file into Excel in order to produce detailed graphs previously, you will want to try selecting the data in the Variable Output report and then using the Ctrl + C (copy) and then Ctrl + V (paste) shortcut keys to quickly achieve the same goal.

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: I made a simulation movie of a 15 second event. I then transferred the AVI file to a CD and gave it to my client to play on his computer. When he tried to play the movie directly off the CD, the cars motions were very jerky and it did not play in real time. What happened?

A: Your movie file from a 15 second simulation is probably quite large. If you try to play it directly from the CD, the limitation of the data transfer rate from the CD to the computer can cause the movie to play slower than real time and appear to stutter. To overcome this, just have your client copy the movie to their hard drive and play the movie directly from there. The data transfer rate will be much faster and the movie will play as expected.

Q: I have made a simulation movie and I want to display it full screen on my computer. When I do play it full screen, it appears fuzzy and "blocky". I have checked the properties of the AVI file and it is only 640 x 480 resolution. Can I increase the size to better match my screen resolution, which is set to 1280 x 1024?

A: At this time, the answer is no. The size of the movie file produced from the Playback Window has been set to 640 x 480, which is formatted for NTSC Video standards. Since most presentations of simulation movies were made using VCR's, this format was suitable for a time. However, with the increase in popularity of DVD and computer based media presentations, the request for sizes other than 640 x 480 has grown. In the short term, you could try to convert the 640 x 480 AVI movie file to other sizes and formats using editing programs like Adobe Premier. However, you will most likely lose some image quality depending upon the changes you make.

Q: I have just installed the new Version 4.40 update and now when I try to run it, I get a message that reads something like "Application is Node Locked". My 4.30 software worked just fine and I've never seen this message before. What happened?

A: You must use a license file that matches the version of the software you are trying to run. If you didn't install the new license file for the update, then you are trying to run the new version with an old license. You will get the error message that the "Application is Node Locked", meaning that you don't have a proper license file and the program will only operate in Demo Mode.

Did you remember to install the new license file that was included with your Version 4.40 update? (It is on the black 3.5" diskette included with your Version 4.40 CD.)

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/support/faq.html, or just follow the links for Support from any page of the website.

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 20 - 24, 2003

Miami, FL . . . . November 10 - 14, 2003

EDC Reconstruction

Los Angeles, CA . . . . January 19 - 23, 2004

Miami, FL . . . . November 2004

Theoretical & Applied Vehicle Dynamics

TBA . . . . Fall 2003

2003 *HVE* FORUM

Las Vegas, NV . . . . April 28 - May 2, 2003

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 no longer actively scheduling the COMPTAR and MATAR courses which used *EDCRASH* and *EDSMAC*. The material previously covered in these courses is available 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.