Fundamentals for HVE & HVE-2D

Fundamentals for HVE and HVE-2D – Parts I, II, III, IV and V

Instructor: Eric Hunter, P.E.
Time: Part I - Monday, 8:45 AM
Part II - Monday, 1:30 PM
Part III - Tuesday, 8:30 AM
Part IV - Tuesday, 1:30 PM
Part V – Wednesday, 8:30 AM

We recommend that students that are new users (1 year or less) of HVE/HVE-2D take this series of classes.

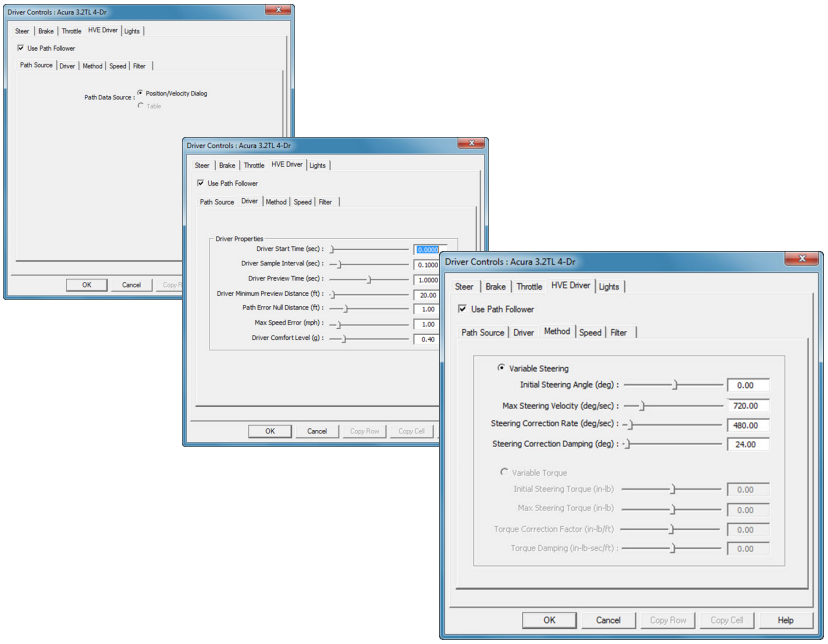
Description:

This workshop series is designed for the new user who wants a basic understanding of how simulation programs help them investigate vehicle crashes and loss-of-control scenarios. Through a combination of lecture and hands-on computer labs, the student will learn how *HVE*-compatible simulation programs model vehicle behavior using physics-based calculation routines to predict vehicle trajectories based upon user entered vehicle and environmental factors, initial conditions and driver inputs.

EDSMAC4 will be used extensively in these workshops.

Topics to be covered include:

- Anatomy of a Simulation
- Inputs
- Outputs
- Tire Model
- Tire Force Calculations
- Friction Circle
- Calculation Method
- Vehicle Connections
- Collision Modeling
- Driver Controls



Each student should bring their own laptop computer to use for hands-on simulation exercises, such as single vehicle path modeling, two vehicle collision analysis, multi-vehicle collision analysis and articulated vehicle modeling. Students should be generally familiar with the use of the Vehicle, Environment, Event and Playback Editors in their *HVE/HVE-2D* software, as they will be used extensively in creating and executing *EDSMAC* and *EDSMAC4* simulations.

Each part of the workshop series builds upon experiences from the previous part, so students should plan to attend from start to finish. Upon completion of the workshop, the student will have gained a general understanding of how simulation programs work, and also a greater insight into their use for real-world applications.

Students are strongly encouraged to bring their computers to work through examples in these series of workshops.

Intermediate HVE & HVE-2D

Intermediate *HVE* & *HVE-2D* - Parts I, II, III, IV and V

Instructor: James P. Sneddon
Times: Part I - Monday, 8:45 AM
Part II - Monday, 1:30 PM
Part III - Tuesday, 8:30 AM
Part IV - Tuesday, 1:30 PM
Part V – Wednesday, 8:30 PM

We recommend that students have taken the Fundamentals for HVE and HVE-2D class before taking this series of classes.

Description:

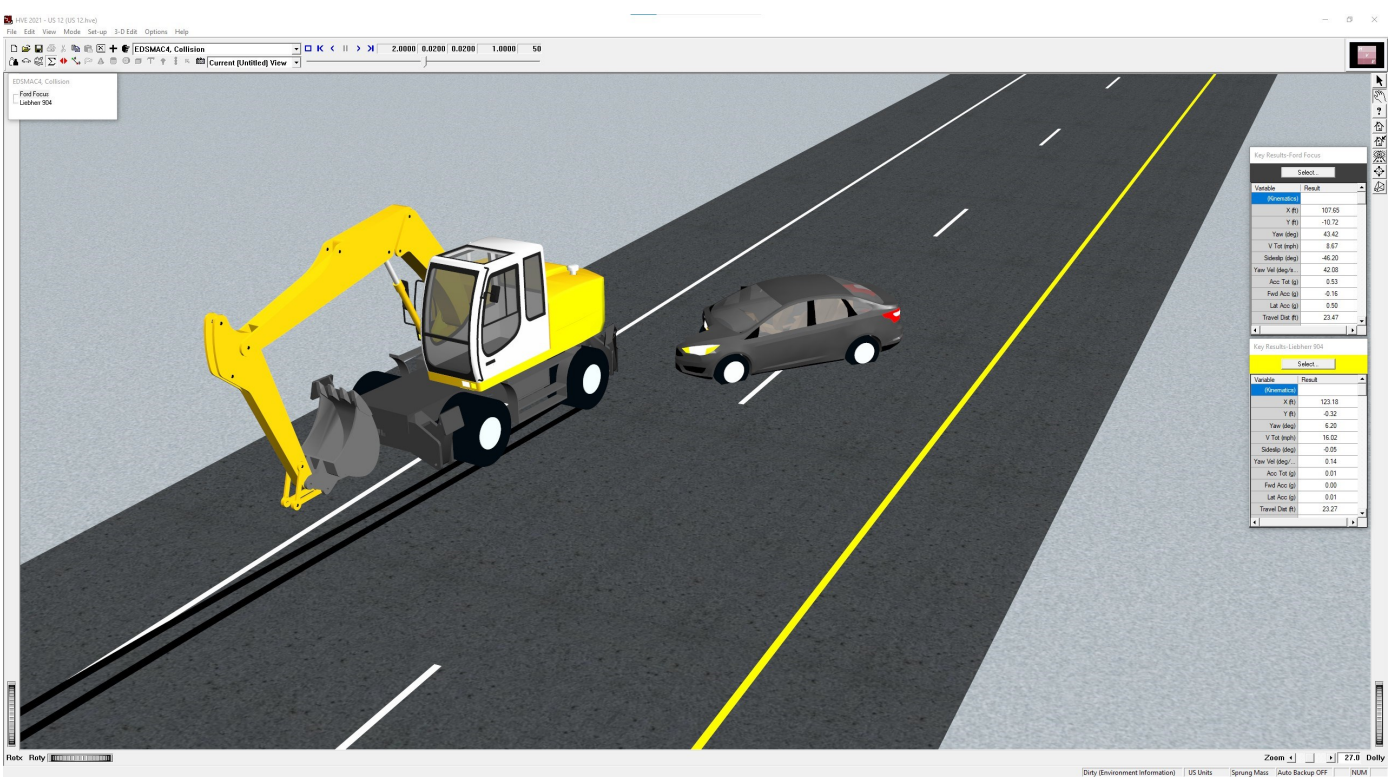
This workshop series is designed for the user who really wants hands-on exposure to using *HVE* or *HVE-2D* to simulate and reconstruct vehicle crashes and potential loss-of-control scenarios. The student will edit environments, build and edit vehicles and then use these objects in simulation studies based upon examples applicable to the real-world. If you are looking to learn solid, proven techniques for applying *HVE* or *HVE-2D* to your work, then this is the workshop series for you.

Attendees of this workshop series should be familiar with the use of all the editors (Vehicle, Environment, Event and Playback) of the *HVE* and *HVE-2D* simulation environment, as they will be used extensively in the workshops. Both *HVE* and *HVE-2D* users will be using the *EDCRASH* and *EDSMAC4* physics models. Case studies will be conducted on planar environments to accommodate *HVE-2D* users.

Each workshop builds upon experiences from the previous workshop, so students should plan to attend all parts. It is highly recommended that each student brings their own laptop computer to use during the workshops.

Upon completion of the workshops, the student will have a solid understanding of how to use the actual vehicles and the actual roadways in their simulations and reconstructions. They will also have greater insight into the capabilities of the physics models for real-world applications, which will help improve their accuracy, efficiency and workflow as a user.

Students are strongly encouraged to bring their computers to work through examples in these series of workshops.



Advanced *HVE*

Advanced *HVE* - Parts I, II, III, IV and V

Instructors: Anthony D. Cornetto, III, P.E. Terry D. Day, P.E. Wesley Grimes, P.E.
Other Guest Instructors

Times: Part I - Monday, 8:45 AM
Part II - Monday, 1:30 PM
Part III - Tuesday, 8:30 AM
Part IV - Tuesday, 1:30 PM
Part V – Wednesday, 8:30 PM

We recommend that students have taken the Intermediate HVE and HVE-2D class before taking this series of classes.

Description:

This workshop series is designed for the advanced user who wants an interactive learning environment that addresses *HVE*'s most sophisticated features. A combination of open discussions and hands-on examples provides the ultimate exposure to *HVE*'s powerful capabilities. In-depth examples include the *DyMESH* Wheel Impact Model, Hydroplaning, Brake System Analysis, ABS and Electronic Stability Control. The Advanced *HVE* workshop teaches problem-solving techniques for complex simulations. The workshop includes a special focus on using new features added in the latest version of *HVE*.

NOTE: The specifics of the Advanced *HVE* workshop are not available at the time this booklet is published.

Attendees to this workshop series should be very familiar with the use of all editors (Vehicle, Environment, Event and Play-back) of the *HVE* 3-D simulation environment, as they will be used extensively in the workshops. Attendees should also have significant experience using *EDSMAC4* and *SIMON,* and the *DyMESH* 3-D collision model.

Upon completion of the workshops, the student will have a solid understanding and greater insight into the full capabilities of *HVE*.

Students are strongly encouraged to bring their computers to work through examples in these series of workshops.

HVE White Paper Session

HVE White Paper Session

Moderator: L. Daniel Metz
Time: Wednesday, 1:30 PM

Description:

This session is an opportunity for *HVE* users to showcase their skills to other *HVE* users, as well as to non-*HVE* users who may require the services of a consultant. The following subjects may be addressed in the presentations:

- *HVE* Case Studies
- Innovative Tips and Techniques Using *HVE*
- Any Application of *HVE* Showcasing its Capabilities (especially events involving important 3-dimensional vehicle behavior)

Papers from each year's *HVE* White Paper Session are made available to download directly from the Library section of the EDC website, thereby expanding the awareness of the work beyond just the attendees of the *HVE* Forum.

Tips, Tricks and Tech Support Session

Tips, Tricks and Tech Support

Instructors: Anthony D. Cornetto, III, P.E. and Danny Peralta
Times: Wednesday, 8:30 AM

Description:

This workshop series is designed for all users seeking general advice on improving their HVE capabilities and answers to common technical support questions. The goal is for the users and instructors to have an open discussion where everyone can share their experiences with HVE. Mr. Peralta, having provided users with tech support for over 12 years, will be sharing solutions to some of the typical tech support questions. Mr. Cornetto will be sharing some of his "tips and tricks" as an HVE user with 20+ years of experience.

Example topics: Importing custom vehicle geometries, Environment maps, Texture maps, Using 360 imagery, Resolving Excessive Wheel Deflection and Max Suspension Force errors, Extending numeric limits within HVE, Data driven video overlays, Google Maps elevation data, USGS TNM Download and EarthExplorer.

The Theory Series

SIMON Model Overview

Instructor: Terry D. Day, P.E.
Time: Thursday, 8:30 AM

Description:

The *SIMON* (SImulation MOdel Non-linear) vehicle simulation model was built by EDC from the ground up. *SIMON* incorporates not only new, object-oriented design technologies, it also is the first model to use all of *HVE*'s advanced features. The following materials are covered:

- Basic Model Overview - The student learns about the basic features incorporated into the *SIMON* program.
- Vehicle Dynamics Model - The student learns how a truly 3-dimensional vehicle dynamics model is designed and implemented.
- *SIMON* Extended Options - The student learns about options for performing single vehicle and articulated vehicle simulations, and for performing true 3-dimensional collision simulations using EDC's patented *DyMESH* technology.
- *SIMON* Output - The student learns about all the output parameters produced by SIMON, and how to debug and improve simulation results by evaluating the output parameters.
- Examples - This workshop provides numerous examples of the use of *SIMON* for vehicle handling and collision studies. A special emphasis is placed on reviewing and understanding *SIMON's* output variables to improve analysis and interpretation of complex events and maneuvers.

Upon completing this workshop, the student will understand *SIMON*'s general design assumptions and feature set.

DyMESH

Instructor: Terry D. Day, P.E.
Time: Thursday, 1:30 PM

Description:

The purpose of this workshop is to acquaint the student with the capabilities of the updated *DyMESH* collision model. The following material is covered:

- Basic *DyMESH* Version 4 Overview - The student is exposed to the basic modeling approach used by *DyMESH* Version 4, and how *DyMESH* calculates forces between vehicles.
- Modeling of Wheel Impact - The student learns how *DyMESH* calculates forces acting on a vehicle's wheels.
- Differences Between Version 3 and Version 4 - A discussion of changes in Version 4 and how those changes affect results.
- *DyMESH* Integration into *SIMON* - The student learns how *DyMESH* Version 4 is incorporated into the *SIMON* model to provide a complete simulation of a collision event.
- *DyMESH* Output Parameters - The outputs resulting from a collision simulation are presented and explained.
- *DyMESH* Validation - Validations are presented providing examples of the use of *DyMESH* for vehicle vs. vehicle and vehicle vs. barrier crashes.

Upon completing this workshop, the student will understand the theory of *DyMESH* and its applications to real-world 3-dimensional collision and rollover simulation events

The Theory Series, Continued

HVE BrakeDesigner, ESS and Traction Control

Instructor: Terry D. Day, P.E.
Time: Friday, 8:30 AM

Description:

In this workshop the student will learn the theoretical basis and practical application of the *HVE* Brake Designer. Specifically, the course will cover:

- Free-body analysis of various brake types
- Overview of the new heavy truck disc brake model (air brake)
- Temperature (thermodynamic) model for a drum brake
- Recently introduced temperature (thermodynamic) model for a disc brake
- Using the *HVE* interface to simulate a complete brake system, from the brake pedal to the wheel brake assemblies
- Examples using the *HVE* Brake Designer for parametric studies and ways to accurately simulate a failed brake system

The student attending this workshop will also learn about the *HVE* ABS and ESS Simulation Models. Specifically, the course will cover:

- An overview of ABS/ESS and current ABS/ESS methodologies
- A detailed discussion of the *HVE* ABS and ESS Simulation Models user interface and how various parameters are used.
- The updated model for displaying skidmarks from tires on ABS/ESS-equipped vehicles
- Examples comparing maneuvers with ABS/ESS-equipped and non-ABS/ESS-equipped vehicles

Upon completing this workshop, the student will have the background and practical knowledge necessary to incorporate custom brake and ABS/ESS simulation models into their *HVE* vehicle simulations.

Theoretical and Applied Vehicle Dynamics, Parts I, II and III

Instructor: Dr. L. Daniel Metz, Anthony D. Cornetto, III, P.E.
Times: Part I - Thursday, 8:30 AM
Part II - Thursday, 1:30 PM
Part III – Friday, 8:30 AM

Description:

This workshop will provide an overview of vehicle dynamics and dynamic and transient model concepts discussed in greater detail in the EDC Theoretical and Applied Vehicle Dynamics course. This workshop will also provide a hand-on understanding of vehicle dynamics by performing simulations of vehicle handling maneuvers and proving ground tests using *HVE*.

The following material will be discussed in this workshop:

- Introduction to Vehicle Dynamics
- Tire Mechanics
- Control Theory Concepts
- Dynamic/Transient Handling Models
- Dynamic/Transient Acceleration Models
- Dynamic/Transient Ride Models

Upon completing this workshop, the student will have an increased understanding of dynamic and transient models related to vehicle dynamics.

Building Environment Models

Advanced 3-D Environments, Part I & II

Instructor: James P. Sneddon
Times: Part I - Thursday, 8:30 AM
Part II - Thursday, 1:30 PM

Description:

The purpose of this workshop is to extend an *HVE* User's abilities to build detailed three-dimensional terrain models for their simulation studies. A terrain model will be built of a real-world roadway from point cloud data acquired with a three-dimensional scanner. Rhinoceros 3D modeling software will be used in conjunction with the 3-D Editor to create an environment model. The same methods can be applied to a total station survey. **It is highly recommended that each student installs an evaluation copy of Rhinoceros on their laptop computer.**

The following material is covered:

- Review of actual site and identification of key elements
- Planning terrain model requirements
- Discussion of surveying and data collection methods
- Creating a three-dimensional terrain model from a point cloud
- Add additional roadway markings such as center lines and fog lines
- Establishing mesh density and surface normal orientation
- Importing 3-D Environment from 3rd party CAD or COGO software
- Quality checking the finished terrain model using simulations of vehicles driving on the surface

Upon completing the Advanced 3-D Environments workshops, the student will understand the methodology used to build a environment model and be able to acquire point data themselves using a 3D scanner or total station, or work with a surveyor to develop a model for their use in *HVE*. Additionally, the student will be familiar with the processes required to build detailed models of any roadway or terrain required for their own detailed simulation studies.

Building Vehicle Models

Building Vehicles

Instructor: Daniel Peralta
Time: Thursday, 1:30 PM

Description:

This workshop introduces the processes and standards EDC uses to build vehicles for *HVE*. The following material is covered:

- The process used by EDC to obtain the necessary vehicle data as well as the format required by the *HVE* Vehicle Data structure. A sample Vehicle Data File is reviewed in detail.
- How to prepare custom vehicle geometries for use in HVE and an overview of how custom vehicle geometries can be created from scratch
- Creating custom vehicles by editing the data of a class specific generic as well as the process of saving this customized vehicle into the User database for use in future cases
- Adding functional lights and an undercarriage texture to custom vehicle geometries

Upon completing this workshop, the student will have a good outline to follow for building *HVE* and *HVE-2D* compatible vehicles as well as the necessary tools for customizing the appearance and data of an existing vehicle.

Using The 3-D Editor

3-D Editor: Functionality, Friction Zones, Overlays & Importing Models

Instructor: Daniel Peralta
Time: Thursday, 8:30 AM

Description:

This workshop will expose the student to the features and capabilities of both the Environment Editor and its 3-D Editor. The Environment Editor is used to create 2D Aerial Photo Environments as well as import 2D and 3D terrain files. The 3-D Editor allows you to enhance an imported environment model by assigning friction factors, applying textures, or even adding functioning traffic signals. When necessary, the 3-D Editor can also be used to create simple environment models.

The following material is covered:

Navigating the 3-D Editor
Editing imported environments
Supported file types
How to prep environment models to successfully import them into *HVE*
How to import and scale 2D aerial images
Applying a sky image and the HVE sky dome
Adding friction zones and how they are used by HVE
How to use the Scissors tool to extract portions of a mesh and decrease its polygon count.
HVE Overlays (a.k.a. Layers)
What happens when overlapping surfaces exist (i.e., tunnels, bridges, road lanes) and how HVE determines which surface to pay attention to and which to ignore

Simulation Movies

Video Creator and Movies

Instructor: James P. Sneddon & Daniel Peralta
Time: Friday, 8:30 AM

Description:

The purpose of this workshop is to acquaint the student with the capabilities of the HVE Video Creator. The following material is covered:

- Creating Trajectory Simulations - The student will learn how to select Trajectory Simulations produced by each simulation event.
- Viewer Basics - The student will learn how to use the two basic methods available for setting the view: Viewer Thumb Wheels and Set Camera dialog.
- Using the Video Creator - The student will learn how to combine multiple simulations within the Video Creator Window and the "rules of precedence" will be addressed.
- Object-based Cameras - The student will learn how to attach the camera to a moving object (e.g., camera car).
- Creating Simulation Videos - The student will learn how to use the HVE Video Creator to create real-time and slow-motion HD videos.

Upon completing this workshop, the student will be able to create and view trajectory simulations. The student will also be able to create a multiple-event accident sequence, as well as create and replay high-definition simulation videos.

2023 *HVE* Forum Travel Information

The 2023 *HVE* Forum will take place February 20 – 24, 2023, at the Crowne Plaza Ft. Myers at Bell Tower Shops. To receive the special hotel room rate of $199 + tax per night, visit www.edccorp.com and use the 2023 *HVE* Forum Hotel Room Reservation Link on the 2023 *HVE* Forum page. Reserve while space is available in the room block. The room block will expire on January 27, 2023. It is strongly recommended to make your reservations as soon as possible.

Hotel Details:

Address: Crowne Plaza Ft. Myers @ Bell Tower Shops
13051 Bell Tower Drive
Fort Myers, FL 33907

Website: https://www.ihg.com/crowneplaza/hotels/us/en/fort-myers/fmyso/hoteldetail?cm_mmc=GoogleMaps-_-CP-_-US-_-FMYSO

Reservations: **Phone**: 239.482.2900
(Indicate that you are with the "EDC *HVE* Forum 2023", or use the Group Code: EDC to be added to the room block)

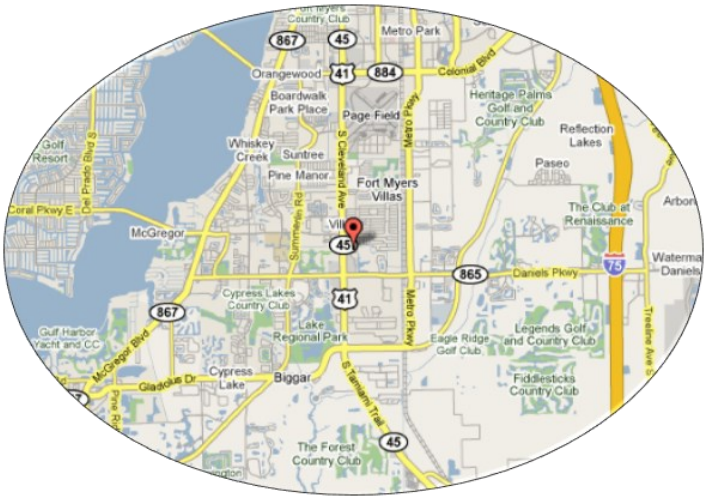
Online: www.crowneplaza.com/ftmyersfl (Use the Group Code EDC)

About The Hotel:

The newly renovated Crowne Plaza Fort Myers Hotel is adjacent to the Bell Tower Shops. Home to Dave & Busters, TGI Fridays, Outback Steakhouse, World of Beer, Williams & Sonoma, and The Fresh Market to name just a few. All just steps away from the hotel front door. The hotel also features Shoeless Joe's Sports Cafe off the hotel lobby serving breakfast lunch and dinner along with in-room dining. Included in your stay is free WI-FI, free parking, an updated fitness center.

On-site amenities include:

- Complimentary Wi-Fi throughout the hotel.
- 24-hour business center with remote from room printing capability
- Shoeless Joe's Sports Café, Society Restaurant and Treehouse Lounge for on-site dining
- Recently upgraded Fitness Center and Swimming Pool
- 5 area Golf Courses with a 5 miles radius.
- Within walking distance to the Bell Tower Shops
- 7 miles from Southwest Florida International Airport (RSW)



Hotel Parking:

- Free parking to overnight guests (no Valet parking).

Airport Transportation Suggestions:

- Southwest Florida International (RSW)
  Distance from Hotel: 7 miles
  Drive Time: 15 min.
- Taxi Fare (estimated) - $22 - $27 one way
- Uber - $19 - $22
- Bus Service - $2/person (line 50, 27 minute ride to hotel)

Other Hotels Nearby:

If you find that your choice of room at the Crowne Plaza is not available, please call EDC Customer Service for other hotels nearby.

See you in Ft. Myers!