

SOFTWARE ADVANCES BOLSTER ROLE OF CRASH SCENE DIAGRAMS

Accident reconstructionists and traffic officers who work the nation's crash scenes every day can expect to stay busy when you consider the vehicle accident statistics for U.S. roadways.

For a revealing look at the vehicle crash rate, you may need go no further than some statistics offered by the Fatality Analysis Reporting System (FARS). FARS is a nationwide census providing the National Highway Traffic Safety Administration (NHTSA), Congress and Americans yearly data regarding fatal injuries suffered in motor vehicle traffic crashes.

In 2008, FARS reports there were 34,017 fatal crashes. This is down from 2007's more grim number of 37,435 fatal crashes. Nevertheless, the crash count has remained in the mid- to high 30,000 level since 1994, the FARS data shows.

Undoubtedly, each of these crashes has been investigated, diagrammed and shared among various agencies. Many cases involving fatal crashes end up in court, making a thorough, detailed diagram crucial.

Thanks to advancements in software, the high quality of these diagrams has helped juries better understand the events which led to a crash. Consequently, crash diagramming software's role in documenting crash scenes is expanding.

This article examines how crash scene diagramming technology has advanced within past years, the trends which are strengthening its role in crash investigations, and the benefits it yields.

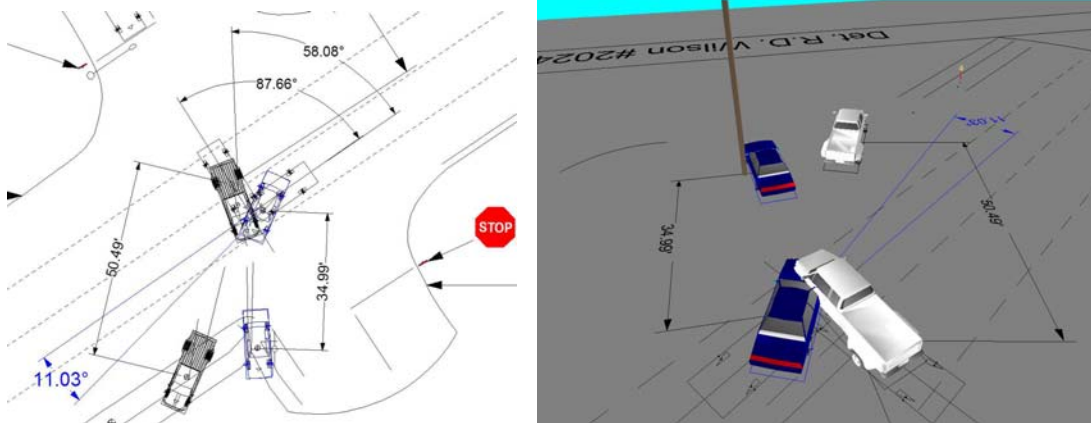
To help explain these facets, representatives of three of the leading diagramming software programs—The Crash Zone, Visual Statement, and Easy Street--offer their perspectives.

Higher Functionality Expected

For years, a static, 3D crash scene diagram seemed all that was needed in court. As crash scene diagramming software has improved, however, juries are wanting more demonstrative evidence in crash scene views.

"It's been referred to as the 'CSI Factor', " explains Anna Ristau, Sales Manager for The Crash Zone software, The CAD Zone, Inc. (www.cadzone.com) , Beaverton, Oregon. "Based on what people see on television, with crime shows such as *CSI*, the jury is expecting more sophistication such as 3D views at numerous angles, and animation.

Such an expectation may seem quite valid. Nevertheless, cautions Ristau, “You have to keep it (detailed 3D views and animation) fact-based. Sometimes it can become a bit too realistic. So juries have to be reminded that the diagram or animation is a representation only.”



These 2-D (above) and 3-D views (below) of a crash scene, created with the Crash Zone diagramming program, show the impact and post-impact locations for the vehicles in the crash. The depiction of crash scenes in 3D has become a major tool offered in most drawing software packages for showing crash scene details.

Ristau notes that numerous specialized drawing tools have been added to Crash Zone to make specific tasks easier. Among these tools are easy 3D animations, vehicle specifications database, skid analysis, momentum calculations, and an easy-to-use 3D body poser.

Electronic Crash Reports On Rise

What is contributing to the increased implementation of software-based diagramming solutions? Trends indicate that electronic reporting capabilities, as well as the ability to capture and share data are becoming more critical, according to Shad Durfee, software sales engineer with Trancite Logic Systems, maker of Easy Street Draw (www.trancite.com). More states today require accident reports to be sent electronically.

Crash diagramming software firms offer electronic accident reports that are an exact replica of your state’s reports. Visual Statements’ QuickCrash module, for example, offers these reports, and once you’ve created a crash diagram you can automatically embed it into your crash report.

Similarly, The CAD Zone works with other publishers of state crash reports, like CTS America and TraCS, to ensure that Crash Zone and Quick Scene diagrams can be embedded in their reports.

This makes the accident report more complete, and helps other personnel who may need to view it understand the numerous details associated with the crash scene.

“A lot of times, if it’s a serious (crash) case or something that will need more investigation, the automated crash report will be forwarded over to the appropriate person in the reconstruction unit for follow-up,” said Keegan Kinney, Visual Statement’s Director of Sales.

Mobile Computers Allow Quick On-Scene Diagrams

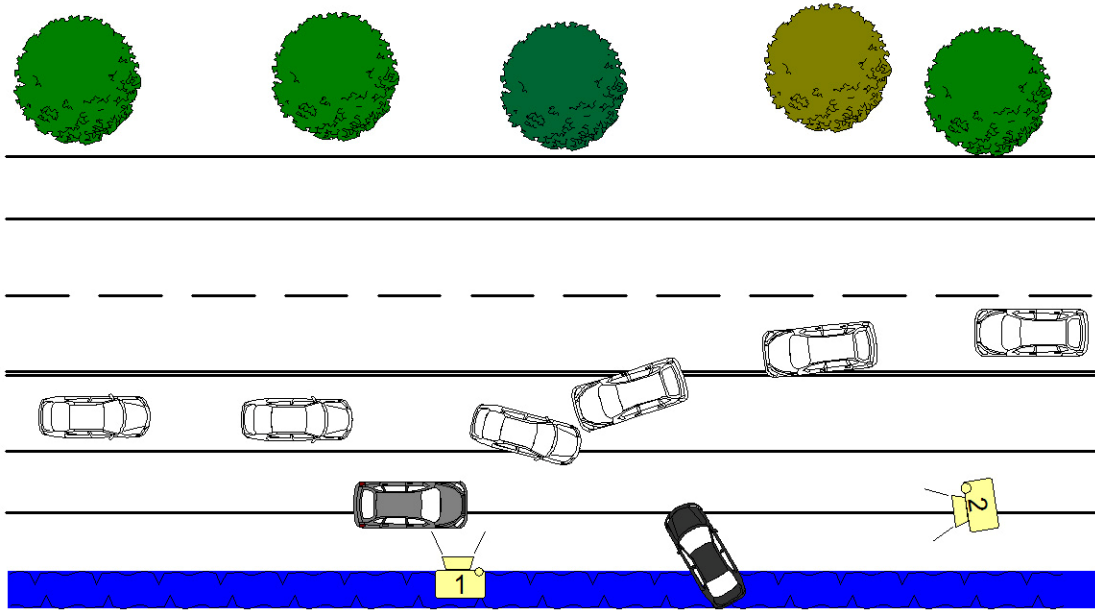
Another trend points to more widespread use of mobile data computers installed in patrol units. “And officers are getting younger,” notes Trancite’s Durfee, meaning a new generation of officers who are more tech savvy than their older predecessors. “A lot of older officers have been promoted, or are retiring, so they are not involved in diagramming as much,” Durfee said.

Mobile computers are allowing traffic officers and reconstructionists to capture crash scene data at the scene and then, using handheld data capture devices, to quickly create a simple, scaled diagram in real time.

According to Rande Repp, an officer and trained reconstructionist with the Salina, Kansas, Police Department, it is easy to overlook a piece of evidence from a crash scene before leaving it. Says Repp, who uses The Crash Zone software: “If you have the software at the scene and you can look at it and see that all the lines connect and everything makes sense, you’re much more confident when you go back to the station that you’ve obtained all the evidence that you’ll need.”

The FX 3 from Visual Statement, and The Pocket Zone from CAD Zone, Inc., are good examples of portable data collection software that can be used at a crash scene with total stations or laser devices. The data that is collected, in the form of points, arcs, curves, notes, and so on, is then imported into the diagramming software of choice.

Says CAD Zone’s Ristau: “The Pocket Zone data collection program runs on a Pocket PC handheld computer which connects to a total station or laser, and allows you to see your data as you shoot it at the scene. With the visual display of Pocket Zone, it allows you to detect anything you may have missed or to see errors so you can correct them.”



Photos and diagram of a crash involving the driver of a Honda who fled from a county sheriff's deputy, rounded a corner too fast, then encountered a full-size car hauler. The Easy Street software diagram here shows pre-collision roadway, crash evidence and dynamics diagram.

Also, Ristau adds, because the Pocket Zone is designed to work with the Crash Zone and Crime Zone diagramming programs, "it allows you to pre-define the description codes so you can set the layers, colors, and line type, and specify a symbol. This saves significant drawing time afterwards."

Digital Photography Now Part of Diagrams

Officers or reconstructionists investigating crash scenes are routinely shooting digital photos of scene evidence. Among today's diagramming software improvements is the ability to receive photo and videos to help provide a keener understanding of crash events.

Signature Scene, another offering from Trancite Logic Systems, for example, enables users to attach digital evidence to the diagram file, including photos, video, and audio files. Signature Scene also allows you to annotate each piece of digital evidence, edit photos (with labels), and show exactly what you want a person to see in the photo.

“Every photo on the file becomes a thumbnail,” explains Trancite’s Durfee, “so you can easily drag and drop these thumbnails onto the diagram right where you want it, making it simple to show where the photo was taken and from what direction.”

The CAD Zone’s Ristau concurs that digital photos are playing a bigger role in their usage with crash scene diagrams. “You can substantiate your diagram against photo evidence,” she said. “We’re seeing users scanning photos into their Crash Zone diagrams as background to add more realism to the overall crash diagram.”

The Crash Zone’s current Version 8 improves the ability to work with digital photographs, including a two-point scale and the ability to fade if used as a background such as an air or satellite photo. “We’ve also added a *set and lock layer command* to make it easier to work with photos and trace over them,” Ristau added.

Layering a Big Improvement

Most crash diagramming programs today offer layering of various crash scene aspects. Reconstructionists in particular favor this capability as it saves valuable time and gives a variety of separate, individual scene perspectives.

Users of crash diagramming software can now sort, name, and lock individual layers. In addition, a layering function in the software allows the user to review and eliminate unnecessary layers when importing a diagram from another computer aided-design program.

“You can build base layers; so your first layer would be roadway geometry, and then on top of that you can place your tire marks, any other evidence marks, point of (vehicle) rest, and AOI (accident occurred area of impact,” explains Officer Dave Cameron with the Campbell, CA, Police Department and a trained reconstructionist. “With these different layers, you can turn them on and off and you’re able to print out several different diagrams from one scene, at different scales,” adds Cameron, who uses the Visual Statement software.

Animating Crash Scenes May Help Clarify Events

Perhaps one of the biggest strides achieved in crash scene diagramming software is the ability to show 2D or 3D motion of any symbols in a diagram. The user just draws the path of the symbols he wishes to put in motion (vehicles, commercial trucks/trailers,

bullets, people, etc.) based on measurements captured at the crash scene. Then, after adding variances of velocity and rotation, the whole scene can be animated.

But do animations really give an accurate representation of scene events as they most likely occurred? Many reconstructionists feel they do, but agree that any animation must be accompanied by other data and evidence.

“A movie is worth a thousand pictures,” says Repp, the Salina, KS, reconstructionist. “The ability to have expert witness giving testimony *and* showing animation and graphics and computer visuals would seem to carry a lot more weight with the jury than expert witness testimony alone,” Repp added. “It’s (the animation) more than a guess or a hunch,” Repp continued. “It’s not ironclad, but based upon the evidence, the

testimony, the totality of circumstances, this is the best that we can reproduce as accurately as possible.”

Customer feedback favoring animation led Visual Statement to add the ability to animate articulated vehicles to its FX3 crash diagramming software. The animation can be applied to tractor-trailer units, passenger vehicle towing boats, SUVs, and trucks hauling trailers.

The makers of Easy Street Draw program have chosen to stay out of the 3D arena and just offer 2D diagramming capability. Says Easy Street’s Durfee: “We’ve found by taking a 3D representation into court, you have to avoid making certain assumptions about what happened. Because of this, we’ve decided to with 2D to make a representation as clean and simple as possible,” Durfee continued. “This is why we have digital evidence attachments, so you can show the actual evidence and avoid assumptions altogether.”

More Mapping Tools

Along with changes in diagramming software have been equal advances in the way crash scene data is mapped and collected. Mapping technology such as total stations, laser systems and photogrammetry now are used routinely by reconstructionists.

Photogrammetry, for example, has become a very useful tool for mapping a crash scene and helping reconstructionists build accurate diagrams.

With this technology, 3D measurements can be extrapolated from 2D digital camera images acquired from various angles at the scene. These are then fed into special software, which processes the data points captured and produces a 3D model.

The 3D photogrammetry modeled points and lines are then converted into a 3D diagram using a computer-aided drawing program such as those offered by CAD Zone and Visual Statement, among other vendors.

Reconstructionist Rande Repp recalls working one crash scene where he and his colleagues were unsure of the approach and departure angles of the vehicles in the intersection.

“We knew basically what happened,” Repp explains, “but as far as the exact angles from the linear momentum were concerned, these may have been off by a few degrees.” So Repp turned to photogrammetry to help solve this problem.

“When we used photogrammetry, we could see that the side of the car was demolished, but it wasn’t that visible,” Repp continues. “By processing this through photogrammetry, you could see the exact outline of the truck’s grill guard. It’s lined up perfectly with the exact approach into the collision,” Repp said. “This made it much easier to view the entire crash model once it was diagrammed with Crash Zone.”

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