The latest advancements in Computer-aided design render forensic scientists far more helpful to attorneys, with far less effort, than ever before.

The pivotal facts governing personal injury cases, mechanical patent infringement cases, and other cases involving mechanics, can be complex and illusive. Juries, and other interested parties, need to digest the information in a form that's clear and makes things seem simple. It is said that "A picture is worth a thousand words" - but a computer-aided design (CAD) model is worth a thousand pictures. Due to the visual and three-dimensional nature of a CAD model, its impact is far stronger than what can be understood from the most carefully created poster board graphics.

The well-constructed high-end CAD model facilitates the additional advantage - animation. Members of the jury can actually see the accident happen from the most advantageous point of view – even multiple points of view. They get the feeling that they've watched the actual accident happen. In this TV and podcast society, the citizenry expects information to be in this format. Using CAD, the forensic scientist can also calculate breaking forces, stress and strain, friction, velocities, weights and any other physical measurement that is necessary to construct a powerful argument and animate it.

The latest CAD software can produce accurate three-dimensional models of any situation or sequence of events. These are the same tools used to design automobiles, bridges, buildings and almost every other mechanical component imaginable. The software is available to "reverse engineer" an accident scene. Even the people that are involved can be easily modeled accurately, based on their anthropomorphic measurements. Once the models have been created in separate computer files, the forensic scientist has the ability to manipulate each model into its exact position as suggested by whatever photos, GPS data, blueprints, and/or surveillance videos suggest.

The advanced physics that is required to predict what happens to each item in a step-by-step format is calculated by the CAD tool that has hundreds of thousands of man-years of experience data and scientific technique locked up inside of it. What would take months of hand calculations to predict ten years ago is performed in a few seconds using high-end CAD systems.

The disadvantage of CAD and animation has always been its cost, but these days attorneys and their clients are benefiting greatly from the rapid advancement of CAD technology and powerful computer hardware. In recent years, there's been an exponential reduction in the expense of powerful CAD systems that enable an experienced user to perform a first-class forensic analysis. The hardware that is available these days for $3,500 is far more powerful than what cost $50,000 ten years ago. The number of people who are able to perform the service has been steadily growing as the cost of the tools, and therefore the barrier to entry, has gone away. The result is more readily available analyses that are less expensive and have a far greater impact.

Along with an exponential increase in computer power and marked reductions in cost, the amount and quality of analyses afforded by CAD has increased. For example, a line-of-sight analysis is now far easier. In a recent accident case that occurred at a construction scene, a section of tubing fell and injured a worker. The point of contention was what made the tubing fall. A half dozen witnesses were deposed and using building blueprints, and on–site

measurements, an accurate 3-D model of the building and the location of each participant was modeled. All the depositions agreed in almost every detail except the position of the key witness. He claimed to be standing in a location that he thought would allow him to see the cause of the accident even though all other witnesses agreed he was in a different location. Once all the CAD models were done, a line-of-sight analysis was performed. It was easily shown in the CAD model that the key witness was not able to see what he claimed from either position. It was very damning to the case of opposing council.

Another example was a slip and fall case. A woman wearing "flip-flops" walked through a puddle in a grocery store and slipped, causing debilitating wrist injuries. A friction force analysis was performed on the floor in both dry and wet conditions. The woman's measurements were carefully taken, and a CAD model was created of her body and the shoes that she was wearing at the time of the accident. An animation of the entire accident was created, complete with pause and play functions to enable viewing with emphasis on the most pertinent areas. The actual breaking points were highlighted and expanded in order for the jury to see the internal damages. The resulting animation showed more detail than could be seen if the jury witnessed the actual accident as it happened.

Yet another example is that of a patent infringement case involving a jack hammer-like device. A certain spring and pressure actuated mechanism was used in a new design that was very similar to one that had been patented. Since viewing the inner mechanics of the actual device as it worked was not possible, the device was reverse engineered; CAD models were created and animated such that the actual mechanics could be seen more clearly and in slow motion. Opposing council was able to see far more clearly that the device in question truly infringed on the claims of the patent.

Opposing council finds it very difficult to repudiate the conclusions of expert witnesses that are backed up by CAD models with animation. The jury sees a level of detail and powerful images that transcend the spoken word. The CAD model is difficult to attack without rechecking every measurement that was taken and going over every calculation that was made. Theoretically, the sheer number of calculations that are made can be in the millions when the computer applies iterative regression techniques to solve complex dynamics problems. The only way to truly argue with a CAD model is to make another CAD model with different assumptions. When opposing council requests a copy of the animation and the CAD model used to generate it, opposing council receives a CD with the information on it. That information can only be scrutinized if opposing council has access to the software that the analysis was performed on and an experienced person to drive the software. This can be very difficult to obtain on short notice.

In the end analysis, computer-aided design, like any other tool, is only as good as the person who uses it. The forensic scientist must be more than highly educated; they must have great presentation skills as well as a keen sense of the science and the ability to make it seem simple. Animations augment that ability.

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