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Animated Reconstruction of Forensic Animation

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FORENSIC ANIMATION

Animated reconstruction

Forensic animation and computer graphics visualisation can transform accident reconstruction. **Albert Hala** and **Ertugrul Unver** describe how it works

FORENSIC COMPUTER graphics animation for accident reconstruction is about to make an impact in the UK with the advent of the first showing of an animated accident reconstruction in an English courtroom, intended to be used in the near future. Computer graphics animated reconstructions shown in court are cost effective, save valuable time, clearly and simply illustrate complex and technical issues, are realistic and can prove or disprove arguments or theories with reference to the perplexing newtonian physics involved in many accidents: this technology may well revolutionise accident reconstruction, thus enabling prosecution and defence to be more effective in proving their claims. The legal profession, police forces and court officials are likely to benefit through valuable time and money being saved. Animated reconstructions have been utilised in America for many years, increasing the effectiveness and outcome of cases brought to court.

What is forensic animation?

Forensic animation is the use of computer graphics animation which can be shown in court, to simply and clearly illustrate technical and complex issues. Computer graphics animation techniques are used with computer generated three dimensional models which give the illusion of movement by quickly displaying a series of images that show slight incremental changes in the depicted objects. When these images are played back fast enough, the eye perceives movement. You can create entire worlds within the computer with photo-realistic scenes. Given the right software and hardware, animated sequences with very high levels of realism can be created, as portrayed in feature films such as Jurassic Park.

Creating forensic animation

To create an animation, for example of a vehicle accident reconstruction, various processes have to be carried out. To begin with, recorded evidence, eyewitness reports and, where relevant, land surveys of topography, exact measurements and estimated speed of vehicles have to be collated and translated into three dimensional computer generated models by computer-aided

design and graphics software packages. The completed models are then imported into animation and rendering software packages where positions of lights, colour of objects, textures, shadows, reflections and even atmospheric effects such as rain, fog and snow can be specified. The illusion of driving through a scene from any viewpoint can be created, such as from inside a car, viewed from the kerbside by a witness, or even from above. Light sources can also be moved around and their intensity varied simulating day, dusk or night. The computer automatically updates the reflections and shadows within the artificial reality of the photorealistic scenes thus created. In fact it is possible to create such realism that people relive the accidents portrayed. Other specialised technical software can recreate real time animated sequences with the ability to calculate and illustrate speeds, acceleration, inertia, momentum, mass, centre of gravity at any point in time of the reconstruction, therefore when used in court, an eyewitness account of misjudged speed can be proved otherwise, demonstrating that certain speeds could not have been possible. Obviously many other scenarios can also be demonstrated.

Current usage

In the USA forensic animation and computer graphics visualisation has been used for eight years or more for patent claims, vehicle collisions, accident reconstruction, product liability, structural analysis and manufacturing processes as court evidence. Many other areas, such as medical claims and even murder trials, have also benefited. Here in the UK forensic animation has been used by the West Midlands Police Accident Investigations Unit for four years, working in conjunction with other police forces reconstructing accidents. Attempts to use animation for accident reconstruction by the police in court have not previously been shown, possibly because to the realism portrayed may cause undue distress.

Advantages of forensic animation

Reconstructions are realistic and in real time.

- Computer animations can be quickly produced and save valuable time in court.

- Appropriate mathematical software analysis of the newtonian physics involved can be illustrated in animated form with on screen data, to explain and prove points being made to the court.

- Animations are more convincing to juries, who are keyed to them because every night they see computer graphics illustrated as charts, graphs and animations on news and current affairs programmes.

- Juries are more comfortable with animated events than with verbally stated facts and figures.

- Animations can be output to either a computer and monitor or transferred to video cassette and shown on television.

- Provides simple and clear illustration of technical and complex issues in the courtroom. Presentation of information as an animation produces interest, may educate even entertain, thus holding the court's attention for longer and enabling vastly superior retention of events portrayed.

- Advantage is gained through use of leading edge technology.

Disadvantages

- Cost of producing computer generated animation.

- Transportation and setting up of computer and monitor or video recorder and television in court.

Future developments

Animated multimedia presentations with sound effects and, if required, commentary from expert witnesses are easily possible today. Providing a computer is used in court then interactive multimedia presentations can also be produced enabling audio as well as video presentations, multiple choice of expert opinion, slow motion and animation filmed from different positions, to be reconstructed. Possible but still in its infancy is the use of virtual reality, which recreates a virtual three-dimensional world within the computer, enabling participation in scenes that have been created using computer graphics and design animation software. Amongst the many advantages to be gained from virtual reality software and hardware are the capabilities to simulate, visualise, test and explore events from any angle or viewpoint, thus enabling more effective illustration, demonstration, explanation and visualisation of reconstructed events ■

Albert Hala is a product design consultant and **Dr Ertugrul Unver** is computer aided design/computer aided manufacturing manager, working for Haltech

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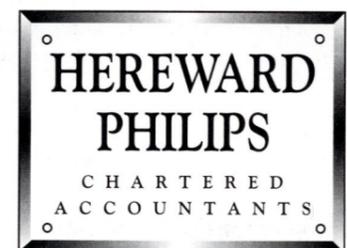
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