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# Behind the virtual wheel

## Simulation technology helps advance autonomous vehicles and intelligent transport

By Antoinette Price

Virtual reality (VR) applications are improving the workplace of diverse industries. From construction, military and mining, to training first responders, practising complex surgery, or enhancing classroom learning, the list of VR solutions being developed continues to grow.

Simulations are part of current best practices for modelling built environments (Photo: Forum8)

### Booming realities

According to a report by Digi-Capital, a company advising Augmented Reality (AR)/VR, mobile and games leaders in Asia, Europe and the US, AR/VR could hit USD 150 billion revenue by 2020, with AR accounting for USD 120 billion and VR for the remaining USD 30 billion.

### Standardization from the outset

In the late 1990s, the Web3D Consortium was established to develop industry standards for web-based 3D graphics. It advanced the VR modelling language (VRML), originally for VR without headsets, to X3D, an open-source standard for VR content distributed by the web.

Today, VR displays follow technology that was created for smartphones. The hardware is comprised of gyroscopes and motion sensors for tracking body, hand and head positions, small screen displays and fast processors. Headsets have further advanced in recent years, thanks to 360-degree cameras, which can produce VR images and video in all directions.

At IEC, several Technical Committees (TCs) and their subcommittees (SCs) produce International Standards for both hard- and software used in this domain. ISO/IEC JTC 1, the Joint Technical Committee of IEC and the International Organization for Standardization (ISO), cover standardization for information technology.

Of its Subcommittees, ISO/IEC JTC 1/SC 24 works on interfaces for information technology-based applications relating to computer graphics and virtual reality, image processing, environmental data representation, support for mixed and augmented reality, and interaction with, and visual presentation of information.

Sensors are vital components of VR technology. IEC TC 47 and its Subcommittees produce Standards for microelectromechanical systems (MEMS), to ensure that sensors and such systems work reliably and efficiently. Additionally, the activities of IEC TC 100 contribute to the quality, performance and interoperability of audio, video and multimedia systems and equipment, while IEC TC 110 covers electronic display devices and certain components, such as dashboard touchscreens in cars.

## Speeding up developments

During the IDTechEx show in Berlin this May, several companies showcased the latest VR solutions, including for future smart transport systems and self-driving vehicles.

## The testing path to autonomy

According to industry experts and authorities, the technology of self-driving vehicles and their required intelligent infrastructure are still years from being completed. More testing is required to achieve fully autonomous vehicles which are safe, if this technology is to be widely adopted. When accidents occur, there is much media scrutiny worldwide. Over the last year, Uber, Tesla and Google incidents have been closely reported, raising first and foremost, the question of safety, but also issues related to legal responsibility and insurance coverage in the event of accidents.

## Broad simulation scenarios target diverse users

In addition to road testing, VR programmes can be used to train drivers safely, allow authorities and car manufacturers to carry out road safety research, as well as test specific needs of certain cars, such as electric vehicles (EVs). They are of great benefit to transport planners and authorities, tasked with planning smart urban transport systems, because these apps can create highly accurate and realistic 3D models of fully smart environments, which have yet to be constructed in the real world.

A Japanese company, specializing in engineering 3D environments, has developed driving simulators used for research into human factors (driver distraction, vision issues or ability to react in different situations), vehicle development, driver training and many other aspects of road safety. These simulators use state-of-the-art, interactive 3D real-time transport simulation and urban modelling software, which replicate the real world.

Users can create cityscapes, adding weather, light and traffic conditions, accidents and other events. They can also set specific vehicle dynamics, and import other specialist third-party software for the ongoing development and validation of advanced driver assistance technologies, for example, steering and braking systems.

These applications are suitable for testing vehicle-to-vehicle (V2V) communication, which allows cars to sense the immediate traffic and objects around them, thanks to sensors and actuators within the car and in the external infrastructure. Then velocity, acceleration and inter-vehicle distances are adjusted accordingly, to avoid collisions, improve congestion and road safety for drivers, passengers and pedestrians alike.

They also apply to vehicle-to-infrastructure (V2I) communication testing and use a driver information system to simulate road traffic updates, jams and restrictions transmitted in real-time. This information eventually could be broadcast to drivers using road displays or directly to vehicles via wireless connections. It would improve traffic flows by enabling drivers to choose different routes if there were a problem.

## Virtual features create real situations

Sophisticated software enables users to customize the vehicle, driving scenarios and create the most realistic surroundings. Some features presented at the Berlin event include:

- Plug-ins for varying vehicle dynamics systems and expanded vehicle controls, such as lights and acceleration
- Eye tracking to measure the driver's eye position and movement. This can be used by researchers to test and understand drivers with some forms of vision impairment, with the goal of improving vehicle design
- Imported laser scanned data for the 3D models and free world maps, which contains roads, tunnels and bridges, and are used to create the precise 3D models
- An EV drive train test simulator, which allows the performance of EV systems to be examined with real drivers in simulated scenarios, and the simulation of a search for electric charging stations in a large-scale 3D environment, set on Jeiu Island, Korea

IEC has recently reviewed its International Standards for EV conductive charging systems, which ensure that these systems operate safely and reliably. Discover more in the article *Safe EV charging* in *e-tech* issue 03/2017, .

Find out how IEC standardization activities contribute to autonomous vehicles and future intelligent transport infrastructure in *e-tech* issue 03/2017.