AR and VR – what does it mean?

As digitalisation progresses, Augmented Reality and Virtual Reality are among the technologies with the greatest potential – and the greatest expectations placed upon them. But what exactly are augmented (AR) and virtual (VR) reality in themselves?

Virtual Reality makes it possible for users to move around a 360-degree virtual world, observing this world from all perspectives and, depending on the application, even enables users to interact with this virtual world. As such, users no longer perceive their real, physical surroundings. Instead, they are completely immersed within the virtual world, perhaps with the assistance of VR glasses. This gives users the opportunity to experience videos or pictures from a 360-degree, enclosed perspective and to move around that virtual world. Thanks to faster, more powerful processors, better graphics cards, and higher resolution cameras, more and more applications are emerging: from VR games that reproduce reality more faithfully than ever, through to training simulators and product configurators for new cars, barriers to creativity are disappearing fast.

Augmented Reality differs from Virtual Reality in one particular, decisive respect: whereas VR users experience complete immersion in a virtual world, irrespective of where they are actually located, AR users actually need to be at a particular location to augment their experience of reality, enriching it with useful information according to their location. Typical applications, therefore, include smartphone travel guides that show details about tourist sights live on the phone screen. Games, such as Pokémon Go, or head-up displays of modern vehicles, augment their users’ reality and are among some of the most common AR applications.

Another difference between Virtual Reality and Augmented Reality relates to the hardware that is required: whereas VR glasses or a Cardboard headset are required for VR applications, a modern smartphone or tablet is all that is needed to use AR applications. The Microsoft Hololens takes

Augmented Reality and Virtual Reality in manufacturing and industry

Augmented Reality (AR) and Virtual Reality (VR) are currently in the process of creating permanent change to industrial development, production, and operational processes: from design development in the automotive sector, through to virtual representations of aircraft engines and investigating the effects of clashes during mechanical engineering, AR and VR offer seemingly limitless possibilities. The advantages are obvious: processes can be made more efficient, designs optimised well in advance of development, and complex machines can be maintained more intelligently.
things a step further again: this is a cordless pair of glasses which work autonomously and allow users to interact with virtually generated, overlaid objects.

Specific applications for industry

From the automotive industry through to aviation and mechanical engineering, VR and AR technologies are opening up completely new options for the industrial enterprises. The automotive industry uses these new technologies primarily in the engineering, production, service and maintenance fields. The use of AR enables designers and engineers to create and optimise visual representations of shapes, designs and colours long before the first prototypes are ever built. During the production phase, augmented reality helps workers to optimise manual manufacturing and assembly processes. Overlays that are accurate down to the last millimetre allow the next stages in the production process to be overlaid visually, effectively reducing the number of defects. Moreover, entire production facilities and manufacturing plants can be simulated and optimised by using augmented reality: by accurately overlaying machines that don’t even exist yet on top of real environments, the movement of materials in the production process can be simulated and optimised.

The service and maintenance field also draws heavily on the benefits of this technology: mechanical and electronic technicians learn on a virtual vehicle how to dismantle an engine to fit a new timing belt, for example. This capability not only has a great deal of economic potential: it also makes complex work a great deal safer.
The breakneck pace of development is also making its mark on the aviation industry, where aircraft mechanics can use virtual exploded view drawings to understand at a glance which components fulfil particular technical functions. This methodology is highly effective for both aircraft manufacturing and aircraft maintenance, leading to a significant reduction in training times.

A prime example of the successful integration of Augmented Reality is offered by Testia, a subsidiary of Airbus, which developed the Smart Augmented Reality Tool (SART) for the aircraft structure manufacturer, Spirit AeroSystems. The SART system allows Spirit's inspection team, as part of the overall quality control structure, to create a digital model of the actual component and, as such, reliably identify any components that do not meet their specifications. More specifically, this solution is what is known as Mixed Augmented Reality (MAR), with digital models being combined with real images to detect deviations. The investment quickly paid off for Spirit: the inspection of the A380 fuselage reduced the inspection time for system mounting brackets from three weeks to three days.

As well as aircraft manufacturers, passengers are also taking advantage of the options for experiencing virtual and augmented reality: a glimpse into the future of aviation shows potential options for the future of aircraft cabin layouts.
VR glasses allow realistic depictions of flight lessons in a helicopter, for example - © Patrick Holland-Moritz

Manufacturing engineering is another sector where the possibilities afforded by VR and AR are attracting a great deal of enthusiasm. As part of CAM, computer-aided manufacturing, it is possible to undertake a virtual visualisation of the manufacturing process, carrying out an accurate analysis of potential clashes long before they can occur. This means that engineers can check whether the cutter or the drill, for example, clashes with other assemblies or fixtures during the machining process.

As with the automotive and aviation industries, augmented and virtual realities are in particularly widespread use for maintaining machinery. The applications range from overlaying the amount of torque required when checking screw fitments, through to displaying the entire service schedule in a digital format.

The use of VR and AR applications is no longer limited to just a few sectors: the high-tech industry has now grasped the potential benefits of the technology. From space travel through to railways and medical technologies, virtual and augmented reality help to make processes more sustainable, faster, more cost-efficient, and easier to create. AR and VR applications also have an important
contribution to make towards improving workplace health and safety and environmental protection and, as impressive as current technology is, it is just as clear that development is very far from being complete.

AR and VR – a glimpse into the future

Experts are confident that, as faster processors, better software and even more powerful cameras are developed, the scope for using applications that support virtual and expanded reality will increase significantly when compared with today. While many video gamers already consider the technology to be standard, industrial development for the technology is just getting started and, with a new generation of AR and VR glasses, entirely new applications will be created with potential benefits for several industries at once. It is even conceivable that augmented reality will no longer be transmitted via glasses in future, but by contact lenses or an implant to the optic nerve instead.

ARTS is at the cutting edge of developing innovative VR and AR applications for industry. From aerospace through to mechanical engineering, the automotive industry, and even bionics – we are always searching for highly motivated experts who, like us, are keen to promote the development of the industry and turn visionary ideals and ideas into reality. With our expertise and experience, we give our customers a virtual head start in the competition for the latest, most innovative technologies.
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