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VIRTUAL REALITY

NOW IN THE REAL WORLD

A special supplement produced by
AUGGMED and Crisis Response Journal

Special Edition: Virtual Reality

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Welcome to this Virtual Reality (VR) special edition of Crisis Response Journal. Together with AUGGMED, the Serious Game Platform for single and team based immersive virtual and mixed reality (MR) training, we wanted this special edition to provide a small window into the diverse and growing use that VR has in areas of professional life.

These are areas where the safety, security and well-being of individuals, communities and society are the outcome of the game. And where the lives of real people is the currency. A very different environment from the consumer games in which VR grew up is now the norm.

Almost every day the news has items about another global brand developing its products or services with built in or added functionality that uses VR, AR or MR.

Rumours abound in the media of Apple's intent to launch its first iPhone with built in AR in the summer of 2017. Accompanying this is Apple's vision of the future, in which smartphones will no longer be the digital be-all and end-all. Instead they will be relegated to a piece of hardware hidden from view, housing the computing power required to produce what is appearing before your eyes. In their place will be technology loosely called 'spatial computing': holograms, emails, photos, calendar reminders, YouTube videos projected onto your field of vision by smart, (AR) glasses.

Facebook announced in April 2017: "You finally managed to get everyone together in one place. Friends you haven't seen for ages, scattered around the world, smile and talk to each other across a table – a virtual table, in a virtual world, seen through a virtual reality headset."

This is the future of socialising, according to Facebook.

The pace at which this consumer-led development is taking shape and feeding the uptake in the professional world is increasing dramatically. When coupled with the digital transformation agenda that many governments around the world are adopting to improve the efficiency and effectiveness of their organisations providing services to citizens, this can only produce an environment of exponential increase in the development and uptake of VR, AR and eventually MR in areas that traditionally, were the sole domain of classroom-based or full-scale live exercises. Developments set to replace or complement the current training needs and methods of our first responders and professional organisations upon which we rely for our safety and security, both day-to-day, as well as in times of crisis.

AUGGMED and CRJ hope this special VR edition provides an interesting read and valuable foretaste of how and where virtual reality is now coming to the real world. And how its application and use as a serious game for serious professionals can provide the essential support they need to keep us – and the communities in which we live – safer, more secure and more resilient against the many complex and varied threats to which we increasingly face.

The articles in this special edition are drawn from just one issue of *CRJ* (12:3, published May 2017). But this is just the start – the breadth and variety of developments in the VR, AR and MR field for professionals in emergency response are simply too vast to be thoroughly encapsulated within the pages of this supplement.

So this is merely a taster of things to come – there will be much, much more. Keep your eyes on the AUGGMED website, and sign up to CRJ's newsletter for details of what we will be doing in the future to keep you abreast of what is going on in this continually evolving and exciting field.

- **Laurence Marzell, AUGGMED**
- **Emily Hough, *Crisis Response Journal***

VR: Virtual reality. An artificial environment that can be interacted with in a way that feels real. For now, you have to wear special (and expensive) kit to experience it.

AR Augmented reality. A real environment whose elements are overlaid with sounds, videos, images and more. The Pokémon Go game uses AR.

MR Mixed reality. The furthest from fruition and the hardest to grasp. The merging of real and virtual worlds to produce new environments in which physical and digital objects interact.

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Virtual reality for first responders

Lawrence Marzell presents an immersive virtual and mixed reality platform that trains personnel to respond to physical threats and cyber-attacks on critical infrastructure and crowded places

In July 2015, IEEE, the world's largest technical professional organisation dedicated to advancing technology for the benefit of humanity, published an article on the use of virtual reality (VR) for the training of first responders. The article, drawing upon a study from the University of Virginia, stated that firefighters, bomb disposal officers, and others responding to emergencies need hands-on training that is safe and inexpensive and that VR simulators could be the answer to this.

Technological advances in this field are likely to reduce training costs, while simulated scenarios can provide a safe environment for first responders and security personnel to practise in.

With terrorism, natural disasters and, on occasion, man-made accidents continuing to be a major threat to life and infrastructure across Europe and beyond, it is becoming increasingly difficult for first responders to predict, prepare for and respond to attacks or disasters. Training has, in the past, used traditional live scenarios through full-scale exercises. However, such exercises are costly, time consuming and limited in the types of scenario that they are able to replicate. VR and mixed reality (MR) training could significantly reduce the major cost and time resources of these traditional methods, while at the same time increasing the frequency and availability of training opportunities.

In early 2015, as part of its Horizon 2020 programme, the European Commission awarded AUtomated serious Game scenario Generator for MixED reality training (Auggmed) project funding of approximately €5.5 ($5.84) million to develop its serious gaming platform for first responder training. Now, less than a year before the end of the project, Auggmed is well on the path to showing how VR and MR training of first responders can be applied at a practical level.

In March of this year, Auggmed successfully conducted a pilot of its prototype virtual-reality training system at a Barcelona rail station.

This pilot, the second of three, supports the development of a serious games platform to train police, security personnel, first responders and counterterrorism units in different VR scenarios within real infrastructure environments using MR techniques. Auggmed's first pilot in May 2016 involved firearms officers from a UK police force responding to a scenario of a mixed physical and cyber-based attack at an international airport.

The 2015 study by the University of Virginia (see references) highlighted that designing a VR system requires an enormous amount of detail and data, which makes it difficult to translate into simple user interfaces. The researchers noted that the virtual systems seen today may look like programs that can be applied to training, but they are created by visual artists and hence do not provide the specific details first responders need. As a result, the researchers concluded that the game development platform Unity would be ideal to create a training VR system,

Author

LAURENCE MARZELL leads the Serco participation in the Auggmed project; www.auggmed-project.eu

Auggmed Project – Horizon2020

Under the co-ordination of BMT Group Ltd, Auggmed is a consortium of 14 project partners from six EU countries. Partners include: Serco; University of Greenwich; Piraeus Port Authority; Ferrocarrils de la Generalitat de Catalunya; University of Birmingham; Geomobile; Sistema D'Emergencies Mediques; Police and Crime Commissioner for West Yorkshire; Sheffield Hallam University; Israteam; Konstantinos Kardaras (Integration Power); Ministry of Citizens Protection; and Unversidad Politécnica de Madrid www.auggmed-project.eu

because it is adaptable and enables user-controlled changes. This is why Unity was chosen as the games development platform on which the Auggmed system is based.

It is linked up with the state-of-the-art evacuation and circulation simulation software tool Exodus, which models crowd behaviour based on the best available data. This novel approach and integration increase the perceived realism and hence the system's immersiveness.

The developed system allows end users to assume a variety of roles within the simulation and to interact with the simulated crowd. In addition, Auggmed implements mathematical models that describe the effects of fire hazards and explosions on people and infrastructure. The fire modelling is carried out using the Smartfire CFD simulation software.

Both the Exodus and Smartfire simulation models are cutting-edge engineering simulation tools used in the design and certification of buildings around the world.

Numerous statistics based on physical and medical research have been compiled, describing potential effects on the human body, as well as the structural elements of buildings. Also included were the number of casualties, severely wounded, moderate and lightly wounded, as well as potential traumatic stress disorder of victims. Thus the scenarios played out are not based on an artist's impression of reality, but use the best available data and models, bringing training as close to reality as possible. These developments solve some of the main drawbacks exhibited by traditional live exercises, such as safety and expense.

Learning objectives

The Auggmed prototype allows trainers to set learning objectives for individual trainees and/or teams of trainees from a single or multiple organisations. They can define scenarios, monitor the progress of the training session, alter scenario parameters during the training session, provide real time feedback and assess the trainee's performance.

This multimodal VR and MR platform will be able to be used anywhere, via a variety of devices and technologies from smartphones and tablets to high-end PCs with multiple monitors and head mounted displays.

Bespoke scenarios will be possible, automatically generated to suit the needs of the individual, and accessible by a trainee at a time and place of their choosing. This will allow training to take place as often as required, in scenarios involving arbitrary population sizes, with users interacting with this crowd and trainers able to initiate a remote, unplanned session to test the readiness levels of individual team members.

In Barcelona, the second Auggmed pilot evaluated its effectiveness as a training tool in two (simulated) emergency incidents within a virtual representation of a Barcelona rail station at peak times, involving (real) station personnel from the rail company FGC, and paramedics from the Sistema de Emergencias Médicas (SEM).

The first scenario was aimed at station personnel and focused on determining whether a piece of luggage found in the station was a suspicious object, based on all available information at that point in time. The second was designed for paramedics performing initial triage on the victims of a bomb explosion in the station. In addition, the participating teams had the opportunity to test the haptic vest that has been developed as an additional augmented reality device in the project. This vest simulates various sensations such as heat and touch, which allows wearers to 'feel' the heat from a (virtual) fire or to experience various forms of contact with virtual objects (for example being shot).

The objective for station personnel was to maintain normal commuter services, following appropriate protocols, then to decide whether or not to evacuate the station and close down the rail network. For the SEM paramedics, the objective was – as in real-life – to perform initial triage on the injured and to maintain communication among the team. All scenarios were used to assess the suitability of the Auggmed platform as a training tool and to receive feedback from the users.

A further pilot is planned for Greece in early 2018, based on mixed, rather than virtual reality.

At the end of the project, Auggmed will have demonstrated through its prototype how improved training tools and techniques to further equip security and emergency personnel to respond to physical threats and cyber attacks on Europe's critical infrastructure and crowded places has become a reality and is ready to be commercially and operationally exploited. CRJ

The Auggmed prototype allows end users to assume a variety of roles within the simulation and to interact with the simulated crowd. The scenarios are not based on an artist's impression of reality, but on the best available data and models, bringing training as close to reality as possible

Auggmed

Reference

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