

Digital Realities

Technical Information Note 10/2019

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Contents

1. Introduction
2. Augmented Reality
3. Virtual Reality
4. Mixed Reality
5. Support available
6. Hardware
7. Software

This Note is provided for information only.

Its aim is to introduce and promote the use of Digital Realities by landscape practitioners. Given that this is a rapidly changing field suggestions for updates from practitioners and third parties are welcome.

1. Introduction

Digital Realities is the collective term for Augmented Reality (AR), Virtual Reality (VR) and Mixed Reality (MR). These are methods of visualising a digital object or environment in a more natural and intuitive way. They provide the opportunity to overlay data making it easily accessible and relevant.

The term Extended Reality (XR) is also used to refer to all real and virtual combined environments and human-machine interactions generated by computer technology and wearables.

AR, VR and MR offer different solutions, use different hardware and software combinations and are available at various price points. Within each there are different levels of functionality, quality and accuracy. Which option is chosen will depend on the task it is required for. For some an impression only will be enough, for others it will be important to have data and geometry at the highest quality and accuracy.

This note explains each and gives some examples of how they are currently being, or have the potential to be, applied to Landscape Architecture, Landscape Planning and Landscape Management.

This is a fast-moving field of technology and it should be noted that the examples given in this Note will rapidly become out of date. Suggested updates are invited.

2. Augmented Reality

Augmented Reality (AR) is an interactive experience of a real-world environment augmented by digital information overlaid in either a constructive manner, i.e. information added to the real-world environment, or in a destructive manner, i.e. used to mask the real-world environment. The digital information is seamlessly interwoven with the real-world environment in a way whereby it is perceived as an immersive aspect of that real environment.



In a world where we have increasing access to both static and live data, AR is seen as a technology which can overlay that static or live data as we view the world around us, by either looking through a mobile device or a specialist headset. The data could be underground services in a street, or policy areas on a landscape or even the names of the hills in a view in front of us.

The technology also provides the opportunity to overlay a digital layer in our professional work, perhaps digital labelling for the plants in our designs, enhancing wayfinding for site users, or a method of telling the story of the place, e.g. by combining information panels with a digital layer to enhance the user experience.

The opportunity for Landscape Professionals to benefit from and utilise this technology is vast particularly now that the advent of WebAR means that software requirements for viewing are greatly reduced and with the support of technologies such as local wi-fi (e.g. see [Info-Point](#)) which enable data to be provided locally at venues without consuming users' data allowances.

Hardware Requirements

AR is typically experienced through smartphones and tablets with manufacturers now including AR hardware support on their devices as well as 'kits' for software developers to exploit that hardware in their applications. The capability of these mobile devices offers portability for use in the field. This has led to an explosion in AR content and it is fast becoming a mainstream technology with games such as Pokémon Go capturing the imagination of the public and brands such as Ikea and Dulux all producing their own apps for use by their customers. As the technology and content is developing dedicated headsets are now coming to the market for professional users.

Mobile Devices

- Android devices running Android 7.0 or later

- Apple iPhone SE / 6s or later and iPad 5th gen or later and iPad Pro running iOS 12 or later supporting ARKit 2

AR headsets

- Daqri Smart Glasses
- Daqri Worksense
- Magic Leap
- Microsoft HoloLens
- Mira Prism

Software for developing Augmented Reality Content

- ARki
- Revit / ArchiCAD via Umbra or Kubity
- Sketchup with Augment Extension
- Vectorworks via Nomad App
- Zapworks Studio

Software for viewing Augmented Reality content

- ARki
- Augmentecture
- Kubity
- Nomad for Vectorworks
- Sketchup Viewer
- Umbra
- Zappar

Application of Augmented Reality for Landscape Professionals

- Site survey and analysis
- Data Visualisation
- Design visualisation
- Storytelling related to place
- Wayfinding
- Policy mapping
- Landscape Management and Maintenance Information
- Cemetery management

3. Virtual Reality

Virtual Reality (VR) is an interactive experience which takes place in a simulated environment created using visual and audio stimulation but which may also include scent, temperature, wind and other forms of sensory stimulation (Cf. Cineworld 4Dx). The virtual world may be a realistic simulation of the real-world or it can be out of this world, creating an experience that is not possible in ordinary physical reality. The experience can be constrained for example a 360-degree photo / video where the user is entirely immersed in the content but can only look around, or it can offer freedom of movement allowing the user to explore the virtual world they are experiencing.



Hardware Requirements

VR can be delivered on mobile or desktop devices or in a dome. Desktop VR typically delivered through a headset worn by the user and requires significant processing power, particularly graphics processing in order to create a smooth user experience. It is typically restricted in its portability although mobile versions are available albeit the compromise will be the quality of the experience. The headsets listed below range from smart device-based systems to full professional headsets requiring workstation class PCs with top of the range graphics cards.

Mobile VR Headsets

- Google Cardboard
- Google Daydream headset
- Samsung Gear VR by Oculus
- Oculus Go
- Oculus Quest

Desktop VR Headsets

- Microsoft Mixed Reality Headsets
- Oculus Rift
- Vive Cosmos
- Vive VR
- Vive Pro
- Vive Focus

- PiMax 5K Plus
- PiMax 8K
- PiMax 5k or 8k Business Edition

VR Domes

- Igloovision
- Virtualdomes

For high quality simulations and visualisations of Built or natural environments the virtual world is modelled using 3D authoring software and optimised using a gaming engine such as Unreal or Unity. The challenge for Landscape Architects is to get the 3D model from BIM authoring software into the gaming engine. There are workflows for some applications, and some are easier than others, however the software is developing quickly with a view to having bidirectional links between authoring software and the gaming engine.

Where quality is not the driver but rather real time virtual access to our developing models is the requirement, software is beginning to appear which allows this bidirectional link with model, enabling us to place the viewer into the model on our desktops. In some instances, the model can be manipulated, changing colours, textures, time of day, lighting etc. This offers an exciting opportunity for clients and stakeholders to interact more openly in our design process and experience the spaces we are designing.

Software for developing Virtual Reality Content:

- 3D Studio
- ArchiCAD
- CS Artisan
- Keyscape
- Revit
- Sketchup
- Unreal Studio with Datasmith
- Unity 3D
- Vectorworks

Software for viewing Virtual Reality content:

- BIMx
- Enscape
- Fuzor
- IRIS VR
- Lumion
- Revit Live
- Sketchup Viewer for VR
- Twinmotion
- Unreal Studio with Datasmith
- Unity 3D
- Vectorworks Web View

Application of Virtual Reality for Landscape Professionals:

- Site survey and analysis
- Design visualisation
- Immersive Collaboration
- Client and user sign off
- Design testing for inclusiveness
- Immersive modelling
- Storytelling related to place
- Digital Experiences
- Immersive digital twins of protected or inaccessible landscapes
- Communication of global issues to the public, making the issues real

Case Studies:

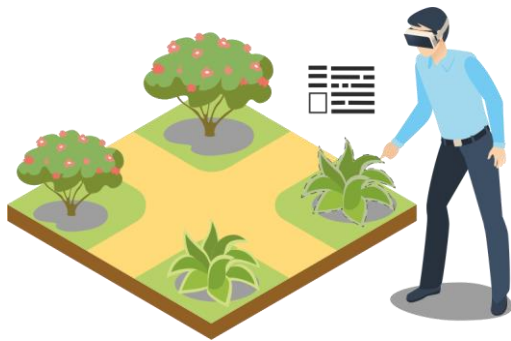
Visualise large datasets – [Helsinki model using Umbra](#)

[The Garden Bridge VR Experience](#) by Arup

Garden Design – ArchiCAD and [Enscape](#) by Simon Bell

4. Mixed Reality

Mixed Reality (MR) is an interactive experience where a real-world environment is merged with a virtual environment. Physical objects and digital objects co-exist and interact in real time. This technology is often considered an amalgamation of AR and VR, however it is more than that, it links the virtual and the physical world, actions in the digital world influence the physical world and vice versa.



Hardware Requirements

MR is typically experienced through specialist headsets which overlay the virtual world with the real-world. To date this has been achieved in two ways. Microsoft's Mixed Reality Headsets appear to be more like VR headsets, however they have cameras which can provide the user with real-world visual data combined with the digital world. However, the more advanced implementation of this technology comes in the form of a headset which mimics glasses or a visor through which the user can see the world around them and onto which the digital world can be projected.

MR Headsets

- Glass
- Magic Leap One
- Microsoft HoloLens and HoloLens 2

Software for developing Mixed Reality Content

- 3D Studio
- ArcGIS
- ArchiCAD
- CS Design
- Keyscape
- Revit
- Sketchup
- Unity with Mixed Reality Toolkit
- Vectorworks

Software for viewing Mixed Reality content

- 3D Viewer
- BIM Holoview (Revit viewer)

- Fuzor AR
- Holo 360
- Sketchup Viewer for HoloLens
- vGIS Utilities

Application of Mixed Reality for Landscape Professionals

- Site survey and analysis
- Storytelling related to place
- Policy mapping
- Landscape Management and Maintenance Information in the field
- Cemetery management
- Training of owners, users and maintenance teams

5. Support available

With new technologies, new skills are required. To support businesses in their digital transformation the government has established Digital Catapult to promote the development and early adoption of advanced digital technology. Digital Catapult is the UK's leading advanced digital technology innovation centre. It drives the early adoption of digital technologies to make UK businesses more competitive and productive to grow the country's economy. One of their key focus areas is to increase applied research, development and innovation in advanced digital technologies for the creative industries.

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Third party support

Digital Realities Technology is a fast-changing sector with many developers and workflows. In the same way that reprographics companies assisted practices with their printing requirements, services are now springing up to assist practices with these technologies. Some examples include [Exitech](#), [Soluis](#) and [Hobbs](#)

6. Hardware

Acer Windows Mixed Reality Headset [Click to go to website](#)

Apple Glasses – Coming in 2020

Daqri Smart Glasses [Click to go to website](#)

Daqri Worksense [Click to go to website](#)

Dell Visor Mixed Reality Headset [Click to go to website](#)

Glass [Click to go to website](#)

Google Cardboard [Click to go to website](#)

Google Daydream headset [Click to go to website](#)

HP Windows Mixed Reality Headset [Click to go to website](#)

Lenovo Explorer [Click to go to website](#)

Magic Leap One [Click to go to website](#)

Microsoft HoloLens 2 [Click to go to website](#)

Microsoft HoloLens [Click to go to website](#)

Mira Prism [Click to go to website](#)

Oculus Go [Click to go to website](#)

Oculus Quest [Click to go to website](#)

Oculus Rift [Click to go to website](#)

Oculus Rift S [Click to go to website](#)

PiMax 5k or 8k Business Edition [Click to go to website](#)

PiMax 5K Plus [Click to go to website](#)

PiMax 8K [Click to go to website](#)

Samsung Gear VR by Oculus [Click to go to website](#)

Samsung HMD Odyssey [Click to go to website](#)

Vive [Click to go to website](#)

Vive Cosmos [Click to go to website](#)

Vive Focus [Click to go to website](#)

Vive Pro [Click to go to website](#)

Vive Pro Eye [Click to go to website](#)

7. Software

The following is a list of software which forms part of the extended realities workflow. The list is not exhaustive and other options exist, particularly in terms of authoring software. The main authoring packages being used for Landscape are listed but generally if authoring software can export in FBX, OBJ, 3DS it should be possible to develop an AR / VR or MR workflow. The descriptions are based on material taken from the vendors' websites and will need checking for updates.

3DS Max [Click to go to website](#)

3ds Max is software for 3D modelling, animation, rendering and visualisation. Create stunning game environments, design visualisations and virtual reality experiences. [Website](#)

3D Viewer [Click to go to website](#)

3D Viewer Beta lets you view 3D models on HoloLens. Open and view supported .fbx files from Microsoft Edge, OneDrive, and other apps.

ArcGIS [Click to go to website](#)

The mapping and analytics platform, ArcGIS provides contextual tools for mapping and spatial reasoning.

ArchiCAD [Click to go to website](#)

ARCHICAD© is the leading Building Information Modelling (BIM) software solution for the architecture and design industry.

ARki [Click to go to website](#)

By augmenting 3d models into real-world environments, ARki provides real-time architectural visualisation at ANY scale, allowing users to explore architectural models on-site, with complete navigational freedom.

Augmentecture [Click to go to website](#)

Augmentecture facilitates the export of models from Revit and Sketchup onto their online platform where models can be hosted and viewed on a free mobile app.

BIM Holoview (Revit viewer) [Click to go to website](#)

BIM Holoview is a tool designed for architects, engineers, construction teams and facility managers to overlay 3D Revit models on real buildings using Microsoft HoloLens. During construction it can be used to visualize BIM models in an actual build environment, plan the sequencing of construction and fit-outs, and identify anomalies between the plans and actual building. In a completed building it gives facility managers 'x-ray vision' through walls, floors and ceilings to see structural elements and locate building services for maintenance.

BIMx [Click to go to website](#)

BIMx features the Hyper-model, a unique technology for integrated 2D and 3D building project navigation. BIMx helps bridge the gap between the design studio and the construction site.

CS Artisan [Click to go to website](#)

CS ArtisanRV enables the landscape professional to fully embrace Building Information Modelling, offering specialist BIM for landscape tools to collaborate with the industry leading Revit® solution.

Enscape [Click to go to website](#)

Real-time rendering & virtual reality with live link from BIM (ArchiCAD / Revit / Rhino / Sketchup) to virtual walkthrough

Fuzor [Click to go to website](#)

Bi-directional synchronization to Revit, ArchiCAD and Rhino. Best of all, Fuzor offers an Integrated Design Environment for AEC professionals to provide seamless workflow. Combine your Revit, Sketchup, FBX and other file types in Fuzor to experience your full model in 2D, 3D and virtual reality. Customize Fuzor to your workflow preference and deliver high quality designs.

Fuzor AR [Click to go to website](#)

Fuzor HoloLens App supports easy to use position locking by both a QR code scanning and using two-points method. Your model can be adjusted accurately with gestures or voice commands and can be presented at a 1:1 scale to a 1:1000 scale for flexible use. To maximize AR usability, parts of the model can be isolated so you can focus the most important components and support annotation for saving your important notes to record any comments you want to make. In addition, this app also integrates build sequence that uses your existing 4D schedule for on-site training purposes.

IRIS VR Prospect [Click to go to website](#)

Prospect will read your 3D files and send them into an immersive, navigable virtual reality environment in one click. No training, no coding and no waiting.

IRIS VR Scope [Click to go to website](#)

Create panoramas in V-Ray, OctaneRender, Lumion, Autodesk A360, Corona Renderer and more. Then, view in virtual reality using your mobile device.

Keyscape [Click to go to website](#)

A single solution that enables you to quickly create and modify small or large landscape projects

Kubity Go [Click to go to website](#)

Kubity Go is the mobile app for Kubity PRO. It displays SketchUp and Revit models seamlessly across all devices and allows for immersive AR/ VR experiences, remote presentations, device-to-device share, and on-the-go access.

Kubity Pro [Click to go to website](#)

With an easy-to-access model library, your 3D is ready to be shared and explored wherever, whenever, and however you want—with whoever you want.

Kubity VR [Click to go to website](#)

Kubity VR is the Virtual Reality companion app for Kubity Go. A simple mobile VR solution that goes where you do. Untether from your desk and explore your SketchUp models and Revit projects on-the-go right from your phone with Google Cardboard, Samsung Gear VR, or our revolutionary glasses-free Magic Window

Kubity VR+ [Click to go to website](#)

Step inside a new world and instantly visualize SketchUp and Revit models on Oculus Go and GearVR. Kubity VR+ is an everyday solution designed to streamline conversations between architects, engineers, designers, contractors, and their clients. 3D communication has never been easier.

Lumion [Click to go to website](#)

Lumion is the world's fastest 3D rendering software for architects. In seconds, you can visualize CAD models in a video or image with real-life environments and striking artistic flair. Lumion supports 360 panoramas which can be viewed in VR.

Nomad for Vectorworks [Click to go to website](#)

The Vectorworks Nomad mobile app allows you to access your Vectorworks documents wherever you are —whenever you need them. View, mark up, share, and sync your Vectorworks files across your devices and with your colleagues from the convenience of your iPhone, iPad, or Android device.

Revit [Click to go to website](#)

Revit® BIM software includes features for architectural design, MEP and structural engineering and construction. Revit supports a multi-discipline, collaborative design process.

Revit Live [Click to go to website](#)

Revit® Live cloud service turns Revit models into an immersive experience, helping architects to understand, explore and share their designs. Revit Live is only available in the Architecture, Engineering & Construction Collection.

Sketchup Pro [Click to go to website](#)

A full-featured desktop modeler built to make anything your imagination can create.

SketchUp Viewer for Mobile [Click to go to website](#)

SketchUp Viewer enables you to store and share 3D models on your iOS or Android mobile device. SketchUp Viewer is a great way to share models with clients or have a portfolio of 3D models on hand when you're on the go.

SketchUp Viewer for Mobile is designed to give you the ability to freely install the app and use it to explore either the demo models or your own models. Further, the app offers AR model viewing capabilities for users with an ARKit (iOS) or ARCore (Android) enabled device.

SketchUp Viewer for HoloLens [Click to go to website](#)

SketchUp Viewer for HoloLens enables you to engage colleagues and clients in experiential design review: a powerful new way to evaluate, coordinate, and communicate in Mixed Reality.

With the application's collaboration functionality, you can host multiuser see-what-we-see viewing sessions. Other co-located users can join you in the same room or via a remote location. With HoloLens, you and your teammates can virtually inhabit a design, helping to facilitate clear and efficient communication about complex spatial issues.

With SketchUp Viewer for HoloLens, you also can interact with your designs as holographic scale models, supplementing or alleviating the need to build physical models of your projects.

SketchUp Viewer for VR [Click to go to website](#)

SketchUp Viewer for VR enables you to engage colleagues and clients in experiential design review: a powerful new way to evaluate, coordinate, and communicate in Mixed Reality.

With the application's collaboration functionality, you can host multiuser see-what-we-see viewing sessions. Other co-located users can join you in the same room or via a remote location. With virtual reality (VR), you and your teammates can virtually inhabit a design, helping to facilitate clear and efficient communication about complex spatial issues.

With SketchUp Viewer, you also can interact with your designs as virtual scale models, supplementing or alleviating the need to build physical models of your projects.

SketchUp Augment Extension [Click to go to website](#)

Augment is the leading augmented reality platform that enables you to simulate your 3D models in augmented reality. Augment's open platform makes it possible to upload, share and visualize 3D models – from buildings, to furniture, to consumer goods, and more – in the real-world and in real time, at scale.

Twinmotion [Click to go to website](#)

Twinmotion 2019 is designed for architecture, construction, urban planning and landscaping professionals. Powered by a robust graphic engine, Twinmotion is the only solution on the market capable of producing high quality images, panoramas, standard or 360° videos in mere seconds, allowing fully immersive 3D VR exploration. A simple interface and pictograms make Twinmotion extremely easy to learn and use, regardless of the size and complexity of your project, your material, your IT knowledge and your modeler.

Umbra [Click to go to website](#)

Umbra is the world's first fully automated platform for optimizing high-resolution 3D content and distributing it to anything from AR and VR on mobile to high-performance game development environments.

Unity 3D [Click to go to website](#)

The world's leading real-time creation platform. Unity is used to create half of the world's games. Our real time platform, powered by tools and services, offer incredible possibilities for game developers, and creators across industries and applications.

Unity with Mixed Reality Toolkit [Click to go to website](#)

MRTK V2 is intended to accelerate development of applications targeting Microsoft HoloLens, Windows Mixed Reality immersive (VR) headsets and OpenVR platform. The project is aimed at reducing barriers to entry to create mixed reality applications and contribute back to the community as we all grow.

Unreal Studio with Datasmith [Click to go to website](#)

Create stunning real-time visuals for architecture, product design, manufacturing, and more. Unreal Studio drastically reduces iteration time through efficient transfer of CAD and 3ds Max data into Unreal Engine.

Vectorworks Landmark [Click to go to website](#)

This all-in-one program will transform your design, presentation, irrigation, and documentation workflows. Unlike other software, Vectorworks has the flexibility to support your entire project from beginning to end, or anywhere in the process — with tools created specifically for you as a landscape professional.

Vectorworks Web View [Click to go to website](#)

Web view enables a fully immersive 3D VR environment to be accessed through any web browser requiring no additional software to run it. Vectorworks 360 Panorama capability also creates a web-based link that anybody can access and requires no additional software to set up.

vGIS Utilities [Click to go to website](#)

View the utilities objects around you to make your field work faster, easier and safer. Using the vGIS system, field personnel can see an augmented view that includes holographic infrastructure objects, improving their environmental assessments and increasing their situational awareness. From delivering real-time, in-field holographic visualizations of underground pipes, valves, cables and other utility objects to visualizing ground penetrating radar scans, vGIS solutions are estimated to prevent 25% of excavation-related accidents resulting from human error, among other benefits.

Zappar [Click to go to website](#)

The Zappar app can be used by Zappar's partners as the connection point for people to access their augmented reality content. ZapWorks users can instantly publish their content which can be viewed in the Zappar app. You just open the app, scan an image with a zapcode on it, and the rest is magic.

Zapworks Studio [Click to go to website](#)

ZapWorks is the most robust AR toolkit for companies who want to push the boundaries of creativity and storytelling. Using the ZapWorks ecosystem, you can rapidly build, publish, analyse and scale immersive AR experiences across the complete customer journey.

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