ARVR and Digital Evidences

What is Augmented Reality (AR)?
As per the definition of Augmented reality (AR) on wikipedia, it is an interactive experience of a real-world environment where the objects that reside in the real world are enhanced by computer-generated perceptual information, sometimes across multiple sensory modalities, including visual, auditory, haptic, somatosensory and olfactory. AR can be defined as a system that fulfills three basic features: a combination of real and virtual worlds, real-time interaction, and accurate 3D registration of virtual and real objects.

In simple words, Augmented reality (AR) is the real-time use of information in the form of text, graphics, audio, and other virtual enhancements integrated with real-world objects. The primary value of augmented reality is the manner in which components of the digital world blend into a person's perception of the real world, not as a simple display of data, but through the integration of immersive sensations, which are perceived as natural parts of an environment.

It is used to enhance natural environments or situations and offer perceptually enriched experiences. With the help of advanced AR technologies (e.g. adding computer vision, incorporating AR cameras into smartphone applications and object recognition) the information about the surrounding real world of the user becomes interactive and digitally manipulated. Information about the environment and its objects is overlaid on the real world.

What is Virtual Reality (VR)?
Virtual reality (VR) is a simulated experience that can be similar to or completely different from the real world. Applications of virtual reality can include entertainment (i.e. video games) and educational purposes (i.e. medical or military training). Other, distinct types of VR style technology include augmented reality and mixed reality (MR), sometimes referred to as extended reality (XR).

Currently standard virtual reality systems use either virtual reality headsets or multi-projected environments to generate realistic images, sounds and other sensations that simulate a user's physical presence in a virtual environment. A person using virtual reality equipment is able to look around the artificial world,

move around in it, and interact with virtual features or items. The effect is commonly created by VR headsets consisting of a head-mounted display with a small screen in front of the eyes, but can also be created through specially designed rooms with multiple large screens. Virtual reality typically incorporates auditory and video feedback, but may also allow other types of sensory and force feedback through haptic technology.

What is the difference between Augmented Reality and Virtual Reality?
In virtual reality (VR), the users' perception of reality is completely based on virtual information. In augmented reality (AR) the user is provided with additional computer generated information that enhances their perception of reality. For example, in architecture, VR can be used to create a walk-through simulation of the inside of a new building; and AR can be used to show a building's structures and systems superimposed on a real-life view. Another example is through the use of utility applications. Some AR applications, such as Augment, enable users to apply digital objects into real environments, allowing businesses to use augmented reality devices as a way to preview their products in the real world. Similarly, it can also be used to demo what products may look like in an environment for customers, as demonstrated by companies such as Mountain Equipment Co-op or Lowe's who use augmented reality to allow customers to preview what their products might look like at home through the use of 3D models.

Augmented reality (AR) differs from virtual reality (VR) in the sense that in AR part of the surrounding environment is actually 'real' and just adding layers of virtual objects to the real environment. On the other hand, in VR the surrounding environment is completely virtual. A demonstration of how AR layers objects onto the real world can be seen with augmented reality games. WallaMe is an augmented reality game application that allows users to hide messages in real environments, utilizing geolocation technology in order to enable users to hide messages wherever they may wish in the world. Such applications have many uses in the world, including in activism and artistic expression.

Virtual Reality can also be used as a Forensic Tool

Virtual reality (VR) offers unparalleled capabilities to support and facilitate forensic activities. VR is especially well suited for supporting use-cases where spatial information is critical, like accidents and crime scene reconstruction.

The administration of justice and the overall judicial process requires significant preparatory work. In general, this is a time-consuming and expensive process. Processing a crime scene is a long, tedious ordeal that involves purposeful recording and documentation of the conditions at the scene, and the collection of any physical evidence that could provide clues and help determine what happened. The most logical explanations that investigators can recreate, in many cases, can still be very confusing for most people who didn't have the possibility of being at the scene to comprehend easily.

The latest craze of content sharing suits VR as users can cohabit Virtual Environment (VE) and contribute content unique to immersion. When placed in an immersive VR environment, the user's view is completely obstructed from the real world due to the Head Mounted Display (HMD). This means the user cannot see anything around them except the VR environment. This visual obstruction provides an adversary with the opportunity to cause physical harm to an immersed VR user.

A recent study found that depth perception and balance were temporarily deteriorated in children immediately following 20 minutes of VR immersion. Furthermore, VR may affect the psychological wellbeing of users given that they feel completely immersed into an environment. Immersion amplifies the consequences of cyber bullying and sexual harassment, where the misconduct "feels all too real". A legal precedence is yet to be set, however, VR wrongdoing remains in the middle ground between virtual and legitimate physical crimes.

In anticipation of a migration to virtual socialization, we intend to arm cyber forensic researchers and practitioners with the necessary tools and information to expedite investigations.

In the investigation, an analysis of logical system artifacts and network traffic is done. Applications could be selected for testing by searching the Steam and Oculus stores for the keywords like abusive or threatening words, or other related words. Application files could be compared to the baselines to identify traces. Manual examination of social application or other application logs. Exploring httpcache folder for HTTP responses & Timestamps. Finding authorization logs, configurations, Database, storage, RAM analysis, Hardware Forensics of ARVR devices, TCP Protocols, Remote connections, Man In The Middle Attack analysis, weak encryptions, cookies, Steam logs, etc.

Thank You !