Augmented Reality: The Basics

Author: Rohith Perumalla

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Citations:

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Summary:

Augmented Reality is the technology that superimposes a computer-generated image on a user's view of the real world, providing a composite view. Augmented is quite different from virtual reality since it does not recreate your environment but actually enhances your environment. There are many pieces of hardware and software that come together to render a mixed reality and can be marker or location based. Augmented Reality has the potential to change the way everything is being done.

Analysis:

Augmented Reality is the idea of live view of a physical environment with elements that have been augmented by computer detected sensory input to generate new elements including (but not limited to) sound, graphics, and video. Augmented Reality works with hardware and software to detect the surrounding then analyzes it to then generate the elements in the user's environment. It is sometimes known as mixed reality since Augmented Reality creates elements and combines it with the user's real environment. Augmented Reality is also often confused with Virtual Reality; however, Virtual Reality unlike Augmented Reality completely recreates the user's surroundings instead of adding things to the user's real environment. Augmented Reality uses a variety of hardware and software and could either be marker-based or location-based.

Augmented Reality often comes in many forms, it comes in headsets, eyewear, and handheld devices. Some forms of Augmented Reality simply just add a graphic on top of the

physical surroundings using just the camera, but more complex and advanced type of Augmented Reality truly add these elements to your reality by using spatial recognition and mapping. To spatially map an area devices use special depth sensing cameras that constantly take scans of an area and compile all the scans to create one complete map of the user's surroundings. These devices also often contain sensors to detect when a user is moving and turning to make sure the augmented reality matches the user's location and position, some of these sensors are motion sensors, accelerometers, GPS, optical sensors, and gyroscopes. Some other hardware that Augmented Reality devices use to create a mixed reality include mics to detect user commands and then have speakers that create an immersive experience. Augmented Reality devices will use all these hardware technologies and bring them together to create an immersive mixed reality.

Augmented Reality hardware is useless without tools to utilize the data gathered by the sensors or to create data to be output by the hardware. Augmented Reality software is wide ranging and are many types with various functions that come together to create the final mixed reality. There is software that is used to create and design the augmented elements like graphics or holograms. Then there is software that is used to spatially map the area and link elements to their positions on the map, and there is also software to ensure the right elements are showing up in the right place when a user is pointed at a certain location. There is also software that compiles all the other software into a user friendly package. A common tool used to create holograms is the Unity engine that is primarily used by Microsoft's HoloLens. For spatial recognition there are many algorithms being developed that are becoming more and more efficient at analyzing input. As for creating user friendly applications, people use Swift when creating iOS products and use Visual Studio and C++ for Windows and other languages and tool for other operating systems. Augmented Reality devices combining hardware and software create mixed realities.

There are 2 types of Augmented Reality: marker based Augmented Reality and location based Augmented Reality. Marker based Augmented Reality works by placing markers that have some physical identifiable significance to the software in the physical environment. Markers can be stickers with a special code or a unique color or could be a physical object like a cube that

the software can distinguish. Marker based Augmented Reality allows the versatility of moving markers around but with that versatility it requires that there are extra markers for extra elements. Another type of Augmented Reality is location based Augmented Reality; location based Augmented Reality can include spatial recognition and mapping or geolocation Augmented Reality. Spatial Augmented Reality requires more hardware but creates a truly immersive experience by allowing elements to act as if they were real objects in the environment. Spatial Augmented Reality creates a map of the real environment and then adds the augmented elements to the map as if they were really part of the room, so when a user is looking at a certain area away from the augmented element the elements would not be visible or would be seen in the user's peripheral. Geolocation Augmented Reality places objects at longitude and latitude points and uses gyroscopes and accelerometers to create a similar experience as spatial mapping. Location based Augmented Reality allows users to have a truly captivating experience. Marker and location based are two of the most popular types of Augmented Reality that work by incorporating hardware and software.

Augmented Reality is being developed into apps and various other devices to blend the digital world with our physical reality. It is being worked on by many companies including tech giants Microsoft, Google, and many others. It is the technology that takes in data about an environment and enhances it by creating new elements and placing it on top of the existing reality. Augmented Reality is the combination of hardware, software, and creativity. Augmented reality essentially uses hardware and software to enhance a user's surrounding, and can be marker or location based Augmented Reality.