Augmented Reality Hardware – Displays

Display techniques in Augmented Reality

There are two main techniques for showing visuals in AR depending on the region of the display mediums.

Handheld augmented reality

Handheld augmented reality is a common method used in smartphones and tablets to show AR content. It only needs basic hardware for the AR system. Touch screen interaction is one of the common interaction methods used in handheld AR, but this method is not as easy as it looks. Recent research indicates that the Freeze Interaction technique shows its efficacy in handheld touch screen AR interaction. The freeze interaction technique enables users to freeze the augmented view and then interact with the virtual content while the camera image is stationary. However, it has a drawback, such as when users freeze their view, it sometimes freezes the whole computer scene. This situation will be problematic when users will have to handle the current, up-to-date real-world situation. To overcome this problem of the Freeze Interaction technique, developers have enforced a new freeze technique called 'Freeze-Object' for more detailed interaction. The handheld augmented reality gained popularity after the release of gaming applications like Pokémon Go and Ingress.

Headset based augmented reality

The headset based augmented reality brings an entirely new set of challenges both in terms of typography and typefaces. In many situations, the text evidence acts as a supplement to the main point of focus. For instance: while driving and checking location-based information, the road is the main focus.

The amount of time to process the information is very limited, and legibility is a significant factor that can improve the reading experience.

The headsets are intersected into two categories with a mechanism to display the text, directly affecting the user's comprehension capabilities.

1. **Video see-through (VST)**

Video see-through is a very reasonable method to deliver AR happenings. In VST, after the camera captures a digital video image of the real world, it is transferred to the graphics processor in real-time. Then the graphics processor assembles the video image feed with computer-generated images (virtual content) and shows it on the main screen. The brightness and contrast of both real-world and virtual components for a seamless experience can be controlled by the developer before its display on the main screen.

However, there are few drawbacks, such as the low resolution of reality as screens don't match the human eye resolution, a limited field of view (which is possible to increase but is expensive) and eye parallax (eye-offset) due to the camera's position which is usually at a distance from the viewer's exact eye location. The VSTs can use smartphones like in Samsung Gear VR, where the

phone is used as a display placed a few inches away from users eyes which is different from experiencing AR in handheld smartphones.

2. **Optical see-through**

Optical see-through displays function using optical elements (as half-silvered mirrors) that are half-transmissive and half reflective to combine real-world and virtual elements. This mirror enables an adequate amount of light from the real world to pass through, making it possible to see the surroundings directly. To generate a perception of the combined world, the computer-generated images are launched on the mirror via a display component which is placed overhead or on the side. OSTs hold the capability of demonstrating the images in real resolution, which are free from parallax. These are very convenient to administer since the user can even use them properly after the power fails. Hence, making them an excellent choice for military and medical purposes.

Advantages of Augmented Reality in Display techniques

- The basic advantage of augmented reality is that it can be used flexibly by anyone including mentally and physically disabled individuals.
- Augmented Reality obscures the difference between the virtual and real-world, hence boosting its usage and effectiveness in the application region.
- It possesses a highly indulging nature that results in gaining a large audience in a shorter period.
- The faults and facts of any situation can be easily specified by using the computing power of AR, thus saving a lot of money.
- Augmented Reality can also be used in the health industry. It can help during diagnosis in determining the accuracy digitally.