Literature Research

What is AR used for at the moment and what might be future uses?

Student name: Daan Kuhlmann
Company: Greenhouse
Company tutor: Bas Ploeg
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What could be an added value of an AR wearable in comparison to handheld AR?

Smart Glasses or Mobile Devices in AR Field Service
a Comparison Table

Criteria	Smart Glasses	Mobile Devices
Hands free	Yes; no toggle necessary	Limited; must toggle between task and device
Field of view	Limited	Unobstructed
Mobility	Heavy, cumbersome, requires unpacking and packing, sensitive	Light, part of standard equipment kit
Battery life	Short, often not replaceable	Longer lifespan, additional or bigger batteries available
Connectivity requirements	Uninterrupted, high bandwidth	Can manage with lower bandwidth or interrupted coverage
Ability to communicate with customers	Limited	Natural
AR quality	3D	2D
Maturity	Immature, less stable	Mature, in wide use
Price	High cost deployment	Affordable deployment

Source: TechSee Augmented Vision

Augmented Reality glasses are still in its infancy at this moment. Because of this, a lot of technical usability issues impede the total functionality it could have. (Shaham, 2018) When looking further in the future, when these technical limitations could be erased, the added value of AR wearables can outweigh that of mobile AR. The AR wearables must become more powerful, smaller and cheaper to become feasible for a wide range of consumers. (Nguyen, 2017) But the wearables bring some features that can not be achieved by using mobile AR.

The first and foremost added value is that of the capability to use both hands to control the digital environment. With mobile AR, a hand is needed to control through the environment. This leaves only one hand free. When using the wearable, a user can get a more immersive experience, because the wearer can forget he is using technology in the first place.

On top of that, AR wearables like the Magic Leap offer ways to control the environment in different manners, like eye-tracking and voice commands. These, combined with the use of hands and/or hand-gestures, will make up for an intuitive way of controlling the digital environment.

Another added value of an AR wearable is the bigger field of view. Mobile devices can never give the users a bigger view then their flat screen can send out. When for instance, you want to view a big object when decorating a room in AR, the user feels that he is missing something. (Gardonio, 2017) At this moment, the field of view of AR wearables is not that impressive yet, with the Magic Leap having one of only 50 degrees (humans have 220), but there are improvements made. The Hololens 2, that is currently in development, is expected to have a FOV of 70 degrees. (Lang, 2019)

To conclude, the AR wearable is in its infancy now, but when it becomes better it could become a mainstream device. There are a number of added values that can never be achieved by a mobile phone. But before that time, the positives of an AR wearable will not weigh out the negatives, like price, sensitivity and the quality of the AR itself

What is the Magic Leap One and what are its unique selling points?

Because the Magic Leap is the tool being worked with, it is good to understand what the device is capable of before starting to make prototypes.

The Magic Leap One is a head mounted AR wearable, made by American start-up company Magic Leap. Magic Leap was found in 2010 and raised 1.4 billion dollars from investors. In 2018 the Magic Leap was made available in a selection of states within the United States of America. At the moment, the Magic Leap is the newest of the big 3 of AR wearables. (HoloLens, Meta 2, Magic Leap)

How does it work?

The Magic Leaps has the Lightpack (a minicomputer) attached to it via a cable. This Lightpack provides the power and processes data needed for the application of digital images.

The headset itself is where the sensors for tracking the environment and headset orientation are located. It also has a magnet that tracks the exact position of the controller (figure 1).

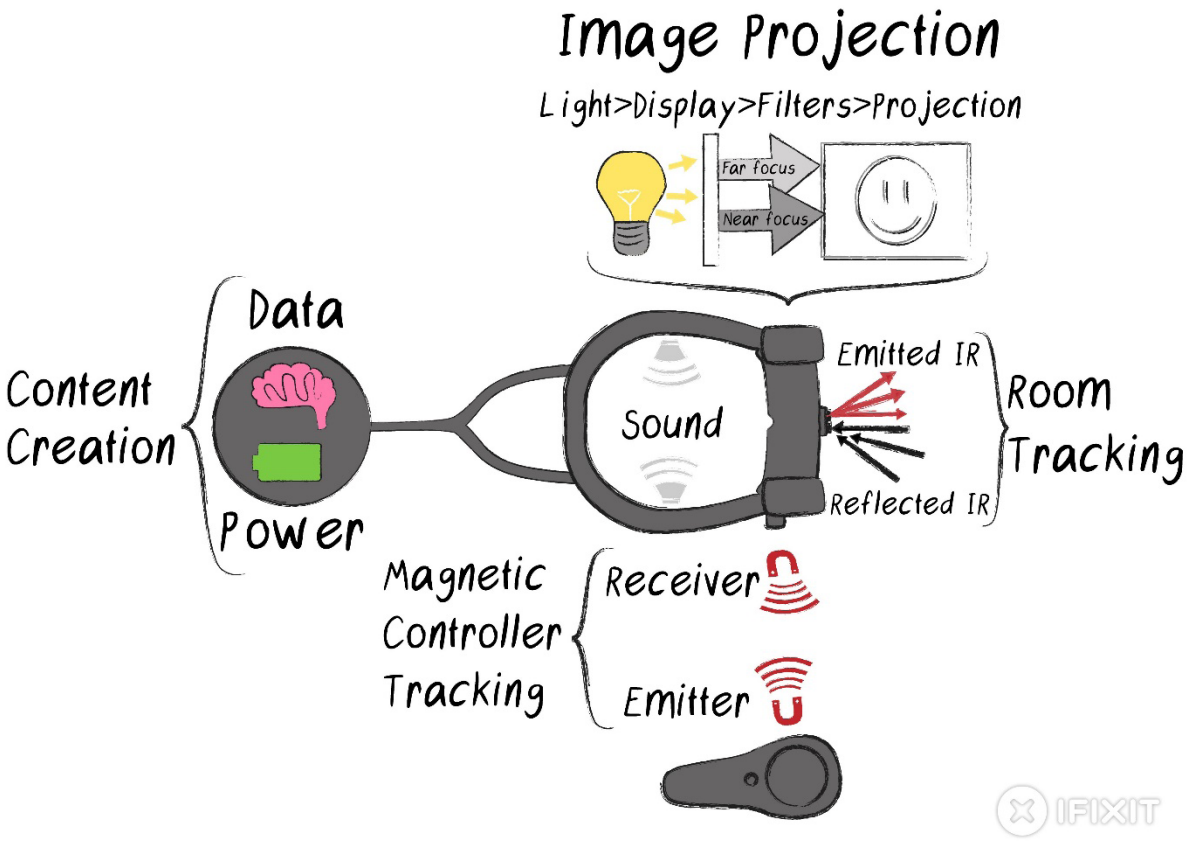

Figure 1: A visualization of how the Magic Leap works (IFixit, 2018).

Field of view

The Magic Leap has the biggest Field of view to date. A field of view is the observable area in which digital objects can be seen. The FOV of the Magic Leap is considerably bigger than one of its predecessors, the HoloLens. But with a FOV of 50 degrees, the Magic Leap still does not come close to the FOV of a human's natural FOV, which is around 220 degrees. Because of this, only the part right in front of the wearer is animated (figure 2).

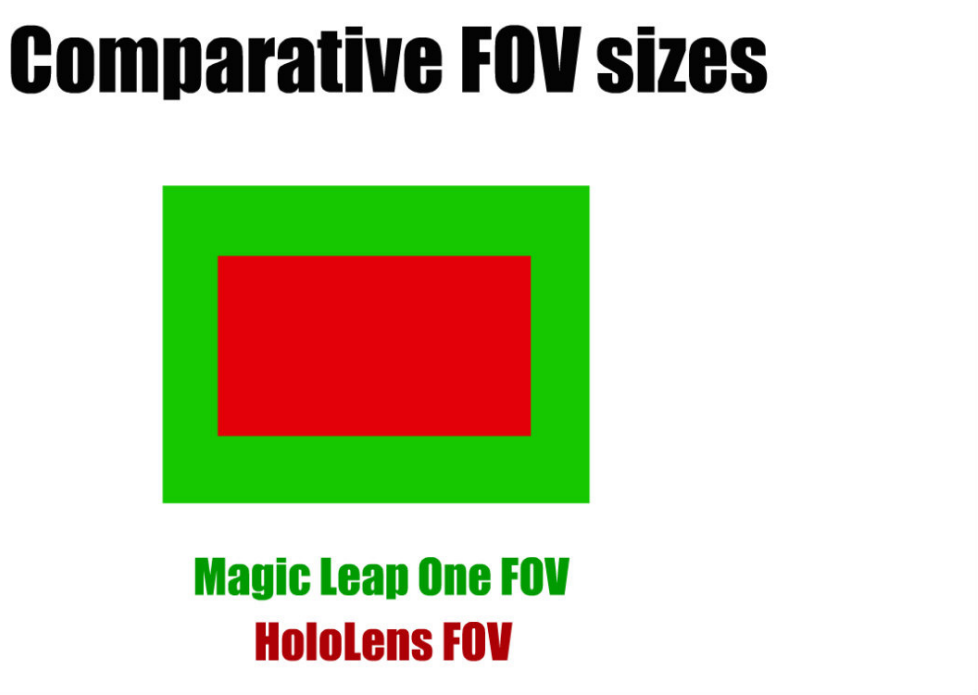

Figure 2: The Magic Leap FOV compared to HoloLens FOV (Road to VR, 2018).

Controller

The Magic Leap uses a controller (figure 3). This controller has 3 buttons and a touchpad. One of the pros of using this controller is that the Magic Leap can track the controller, even when it is out of the field of view, by using magnets in the glasses and controller. The controller is used to for going through menus and for manipulating objects. The controller can also give the user haptic feedback, by vibrating when an interaction happens. This can greatly increase the effectiveness of the application, while haptic feedback is of a great importance.

Figure 3: The Magic Leap One controller (TechCrunch, 2018)

“Wireless”

The Magic Leap has an on-board computer, that is strapped to your belt. It has the strongest hardware of any portable AR wearable to date. The processing speed is comparable to that of the newest mobile phones.

Specifications

CPU	NVIDIA® Parker SOC; 2 Denver 2.0 64-bit cores + 4 ARM Cortex A57 64-bit cores (2 A57’s and 1 Denver accessible to applications)
GPU	NVIDIA Pascal™, 256 CUDA cores; Graphic APIs: OpenGL 4.5, Vulkan, OpenGL ES 3.3+
RAM	8 GB
Storage Capacity	128 GB (actual available storage capacity 95GB)
Power	Built-in rechargeable lithium-ion battery. Up to 3 hours continuous use. Battery life can vary based on use cases. Power level will be sustained when connected to an AC outlet. 45-watt USB-C Power Delivery (PD) charger
Connectivity	Bluetooth 4.2, WiFi 802.11ac/b/g/n, USB-C

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