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AUGMENTED **REALITY**

Introduction

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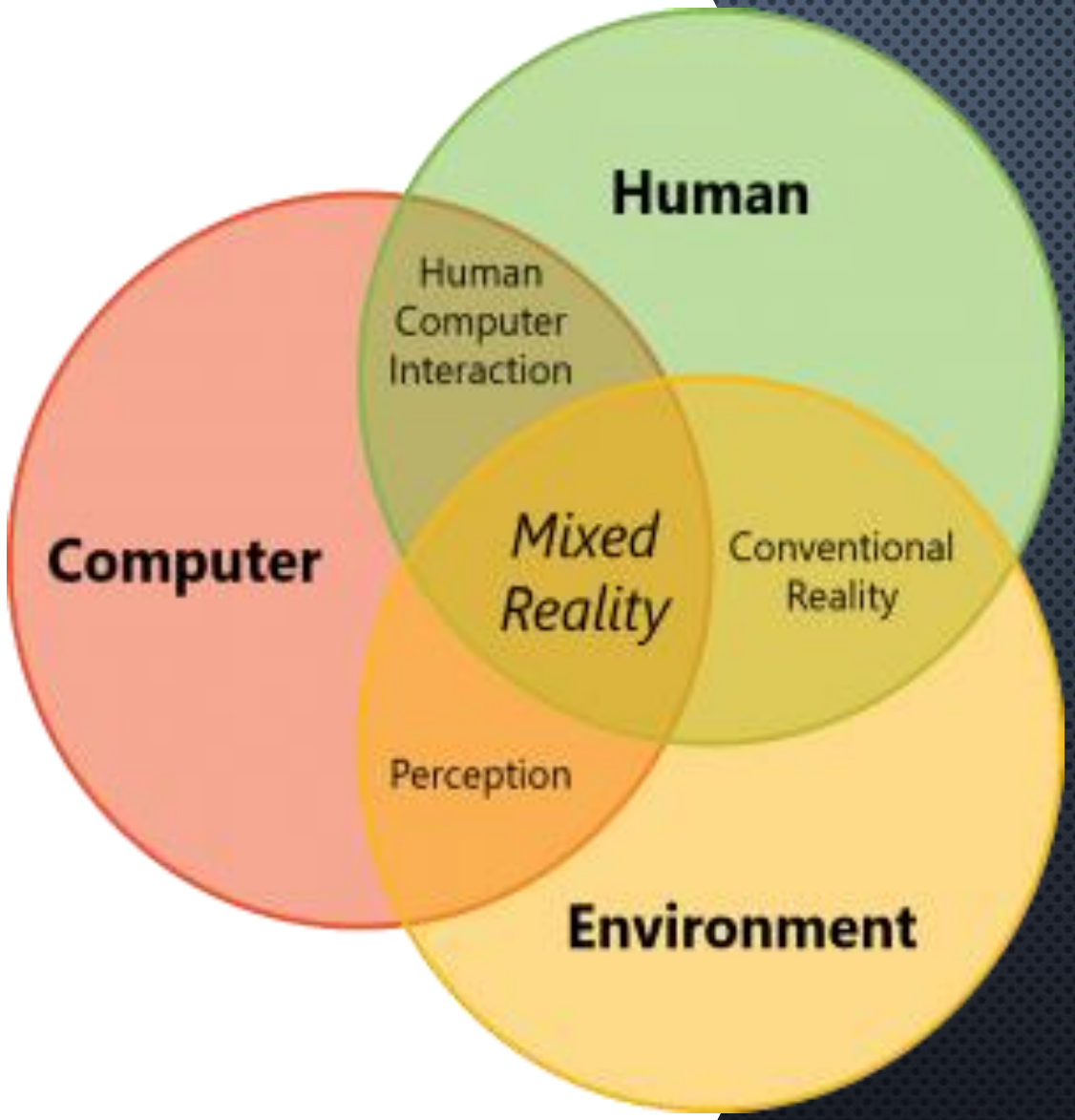
1. Interaction among Human-Computer-Environment
2. Define AR-AV-VR
3. AR in our lives
4. 2-AR devices
5. 2 Software's
6. PLP – Mirror Box
7. HoloLarms


Human
Human Computer Interaction
Computer
Mixed Reality
Conventional Reality
Perception
Environment

HOW MANY SENSORS DO HUMANS HAVE?

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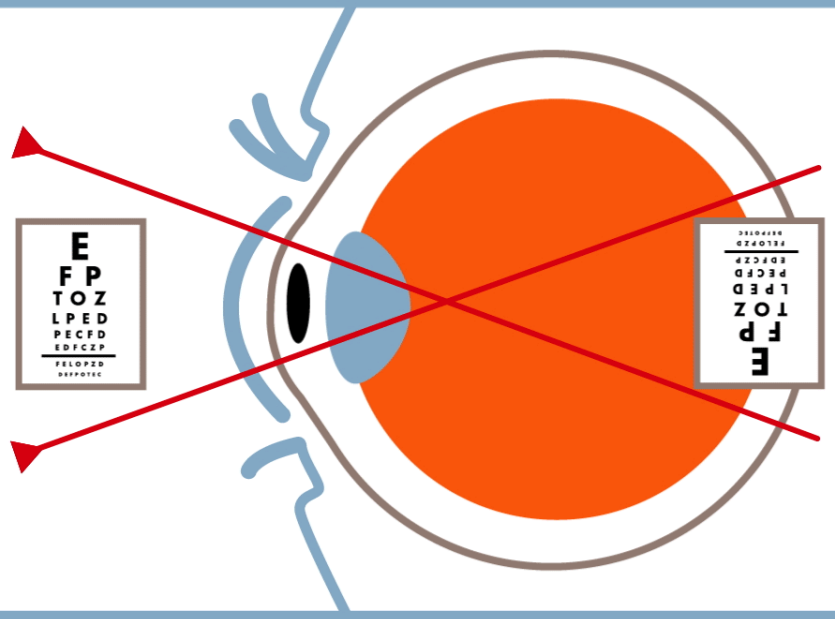
HOW YOUR EYE WORKS



STEP 1

LIGHT ENTERS YOUR EYE through your cornea.

STEP 2

YOUR IRIS DILATES, changing the size of your pupil. The size depends on how much light your pupil needs to let in.

STEP 3

THEN YOUR LENS SENDS THE LIGHT to the back of your eye, but the image is flipped upside down.

STEP 4

YOUR RETINA SENDS THE IMAGE as an electrical signal to your brain, and your brain flips it right-side up.

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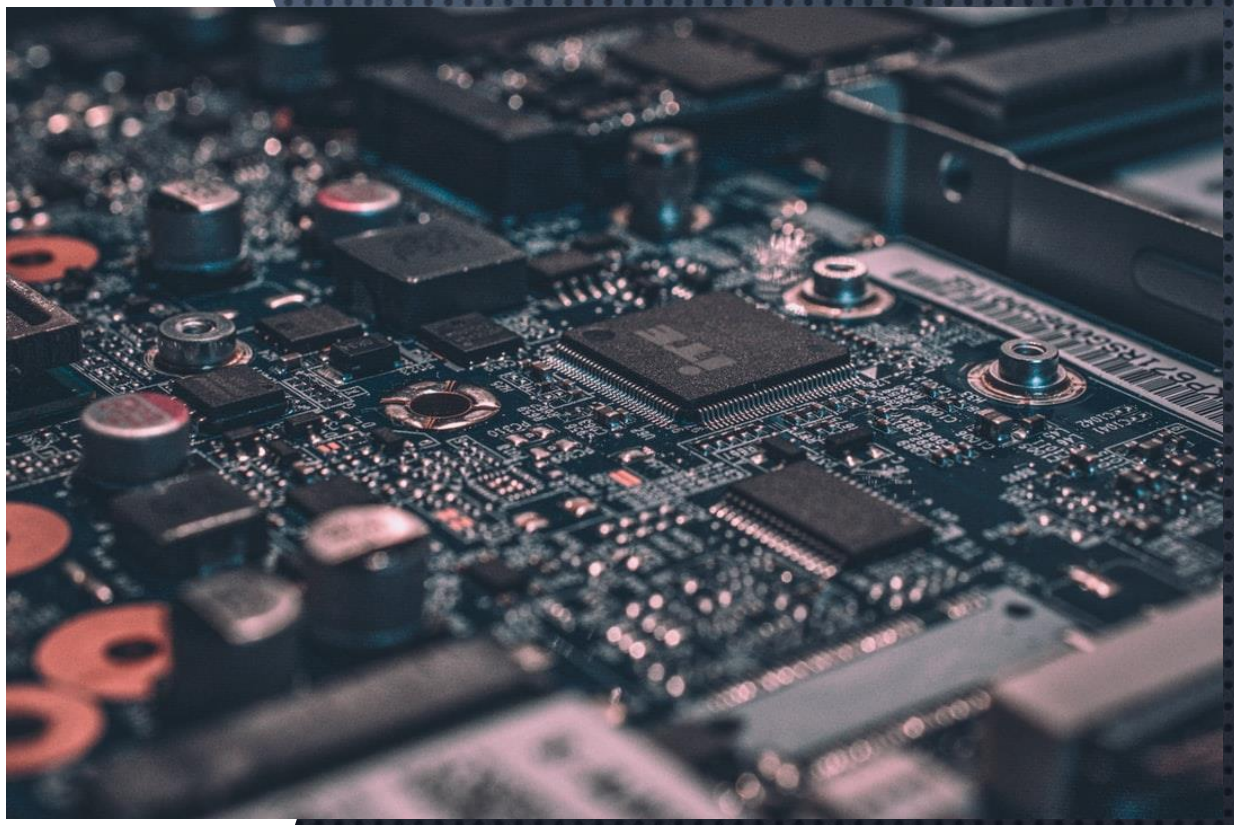
SENSOR:

A DEVICE WHICH GATHERS INFORMATION FROM THE SURROUNDINGS AND SEND THEM TO THE COMPUTER



SENSORS EQUALITY

Sense	Human sensor	Robot sensor
Sight	Eyes	Cameras
Hearing	Ears	Microphones
Touch	Skin	Tactile sensors
Balance	Eyes, inner ear, feet	Gyroscope, accelerometer, tilt switch
Additional abilities	Requires gear (night vision goggles, sonar)	Night vision camera, ultrasound

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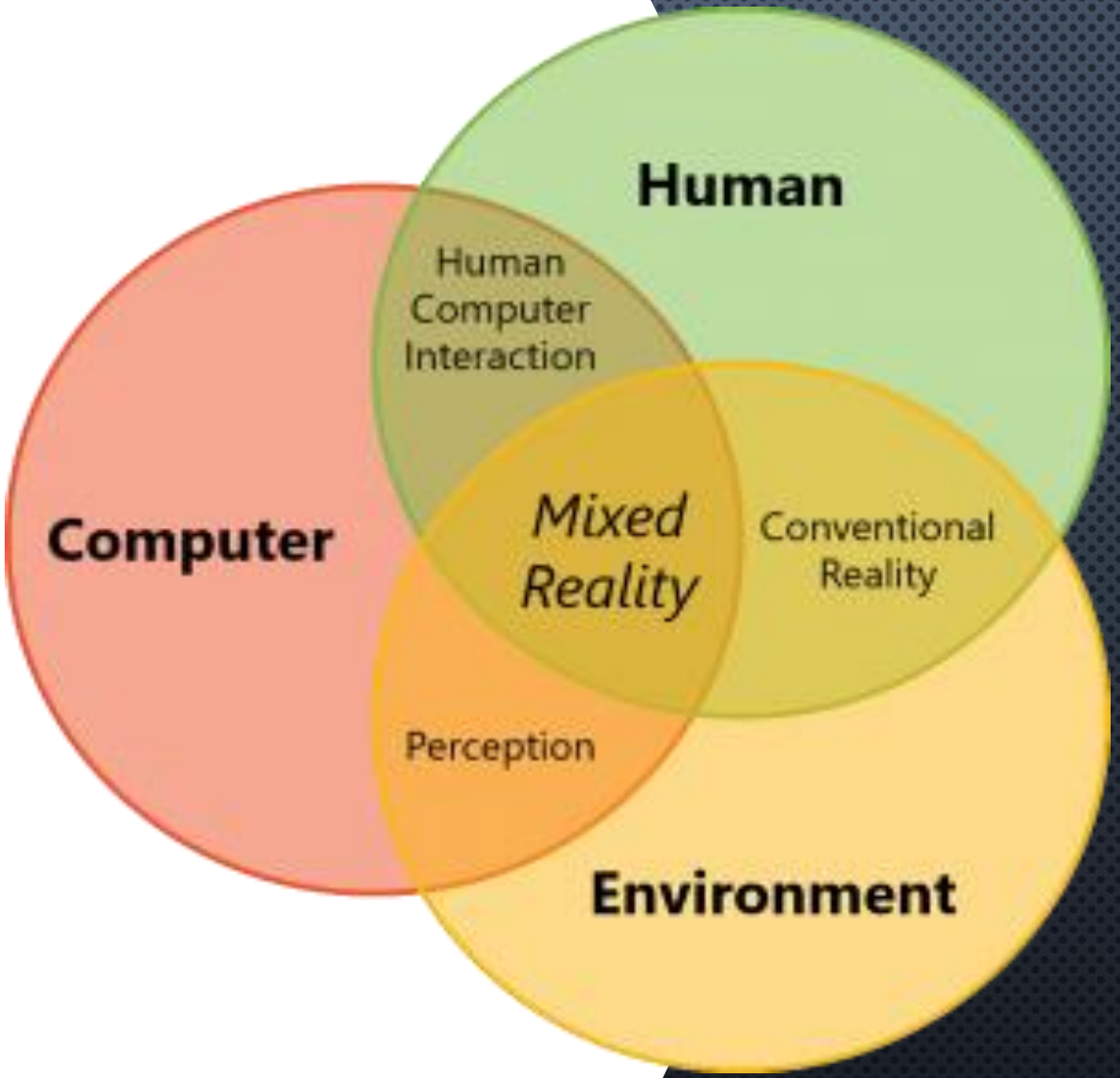
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AS YEARS PASSING BY, THE DIFFERENCES ARE MORE INTENSE...

REALITY–VIRTUALITY CONTINUUM

MIXED REALITY

HRI	AR	AV	VR
REAL ENVIRONMENT	AUGMENTED REALITY	AUGMENTED VIRTUALITY	VIRTUAL ENVIRONMENT

ADAPTED FROM MILGRAM, TAKEMURA, UTSUMI AND KISHINO (1995)

Definitions

Virtual Reality (VR) is the use of computer technology to create a simulated environment. Unlike traditional user interfaces, VR places the user inside an experience. Instead of viewing a screen in front of them, users are immersed and able to interact with 3D worlds. By simulating as many senses as possible, such as vision, hearing, touch, even smell, the computer is transformed into a gatekeeper to this artificial world. The only limits to near-real **VR** experiences are the availability of content and cheap **computing power**.

> Immersive : **VR** is the presentation of an artificial environment that replaces users' real-world surroundings convincingly enough that they are able to suspend disbelief and fully engage with the created environment. Immersiveness is an important element of **VR** applications, such as **VR** gaming and **VR** therapy.

Virtual Reality (VR) and **Augmented Reality** are two sides of the same coin.
You could think of **Augmented Reality** as **VR** with one foot in the real world: **AR** simulates artificial objects in the real environment.

Mixed reality not only overlays, but also anchors virtual objects to real-world objects,
allowing the user to interact with combined **VR** objects.

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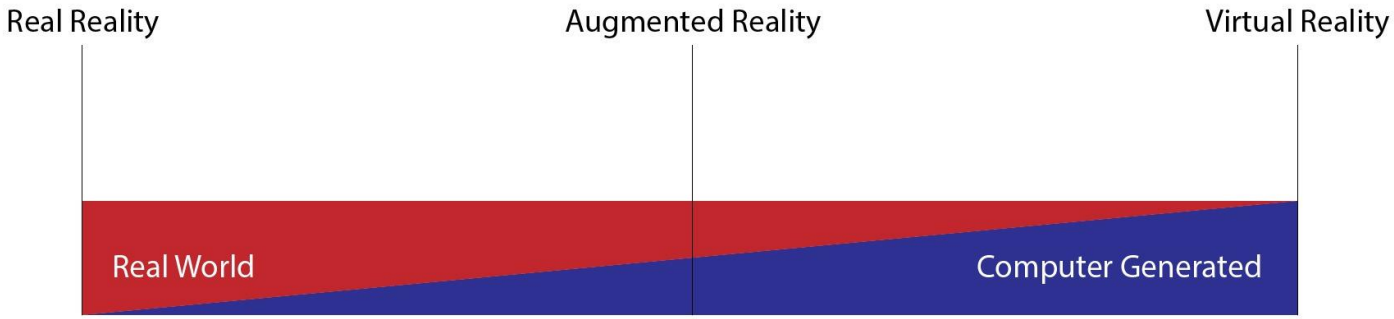
Immersive Computing Spectrum



Source: Google.com

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LET'S MAKE A STEP BEHIND AND THINK…

WHAT INTEREST HAVE ALL WE IN COMMON?

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LET'S MAKE A STEP BEHIND AND THINK…

- WHAT INTEREST HAVE ALL WE IN COMMON?
  - SHARING
  - COMMUNICATION
  - COLLABORATION

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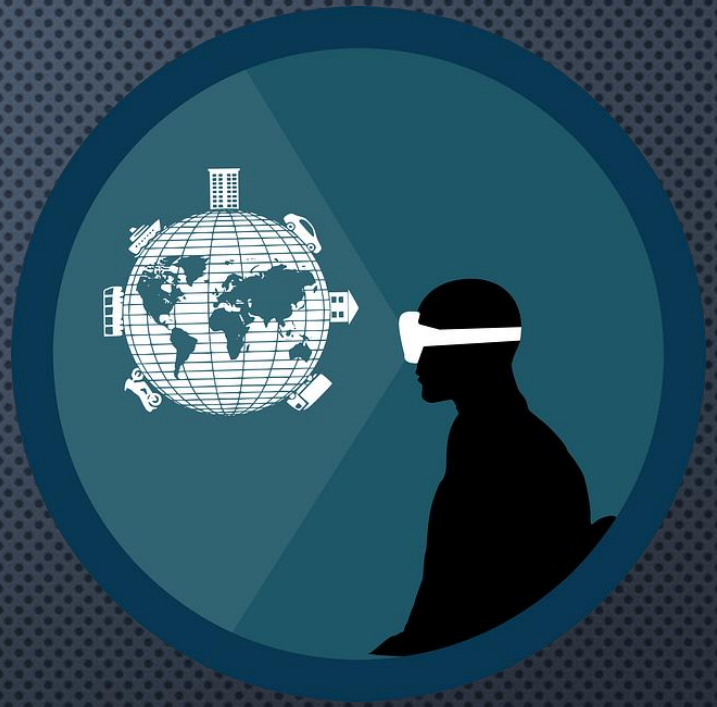
THE QUESTION IS …



CAN AUGMENTED REALITY HELP US
TO DO THEM BETTER, IF SO, HOW?

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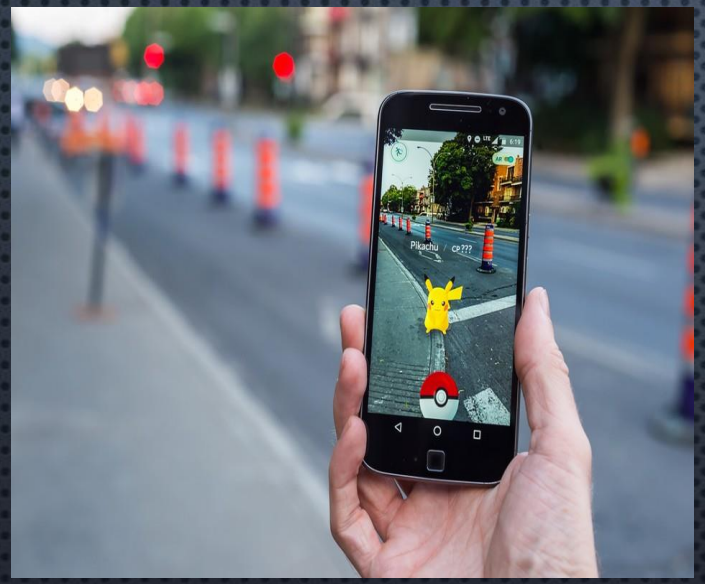
LETS FIND HOW AR CAN MAKE OUR REALITY BETTER…



Entertainment

There are numerous games leveraging AR technology.

The most famous one is Pokemon, which is a location-based augmented reality game.

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Education

Education

USING AR IN THE CLASSROOM CAN TURN AN ORDINARY CLASS INTO AN ENGAGING EXPERIENCE.

IT PROVIDES VIRTUAL EXAMPLES AND ADDS GAMING ELEMENTS TO SUPPORT TEXTBOOK MATERIALS.

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Education

Driving

AR is related to the safety of driving, for example, enhancing the dashboard and windshield of vehicles.

- **BMW : BMW MOTORRAD**

INSTEAD OF A HELMET, THE DRIVER WEARS AN AUGMENT REALITY HEADSET THAT DISPLAYS VEHICLE INFORMATION AS A UI AND EVEN HAS ROAD PREDICTION TECHNOLOGY AND WARNING ALERT SYSTEMS.

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Healthcare

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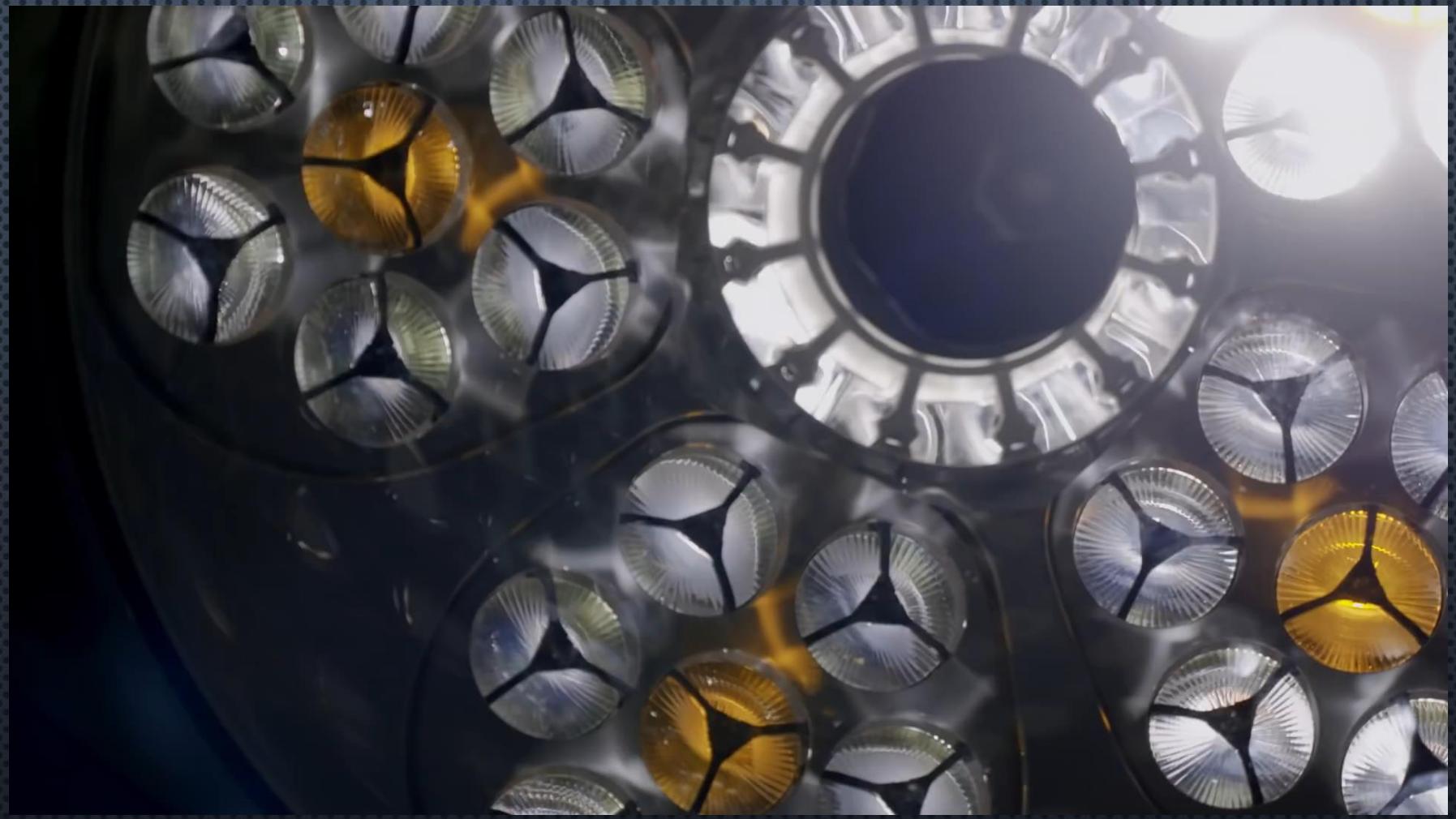
Healthcare



HOWEVER THERE ARE MANY OPEN QUESTIONS …

- How to organize this information?
- Who should edit it?
- How to make it easily accessible?

As well as many ethical questions but the biggest challenge is :

How we transition from the real world all the knowledge captured in text to a world wide everything is capturing visually in 3D.

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THE KEY CHALLENGE

- THE HEAVY COMPUTATION DEMANDS

- THE ABILITY OF RECOGNIZING A LARGE NUMBER OF OBJECTS, WHICH USUALLY REQUIRES THE STORAGE OF LARGE DATA SETS

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MICROSOFT HOLOLENS

What is it?

is a virtual reality (VR) headset with transparent lenses for an augmented reality experience.

Allows users to experience 3D holographic images as though they are a part of their environment

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Three key elements to give as input:

1. Gaze –What you're looking at, and how you target it

2. Gesture – An "air-tap" gesture that HoloLens will recognize, and which allows you to drive selection

3. Voice

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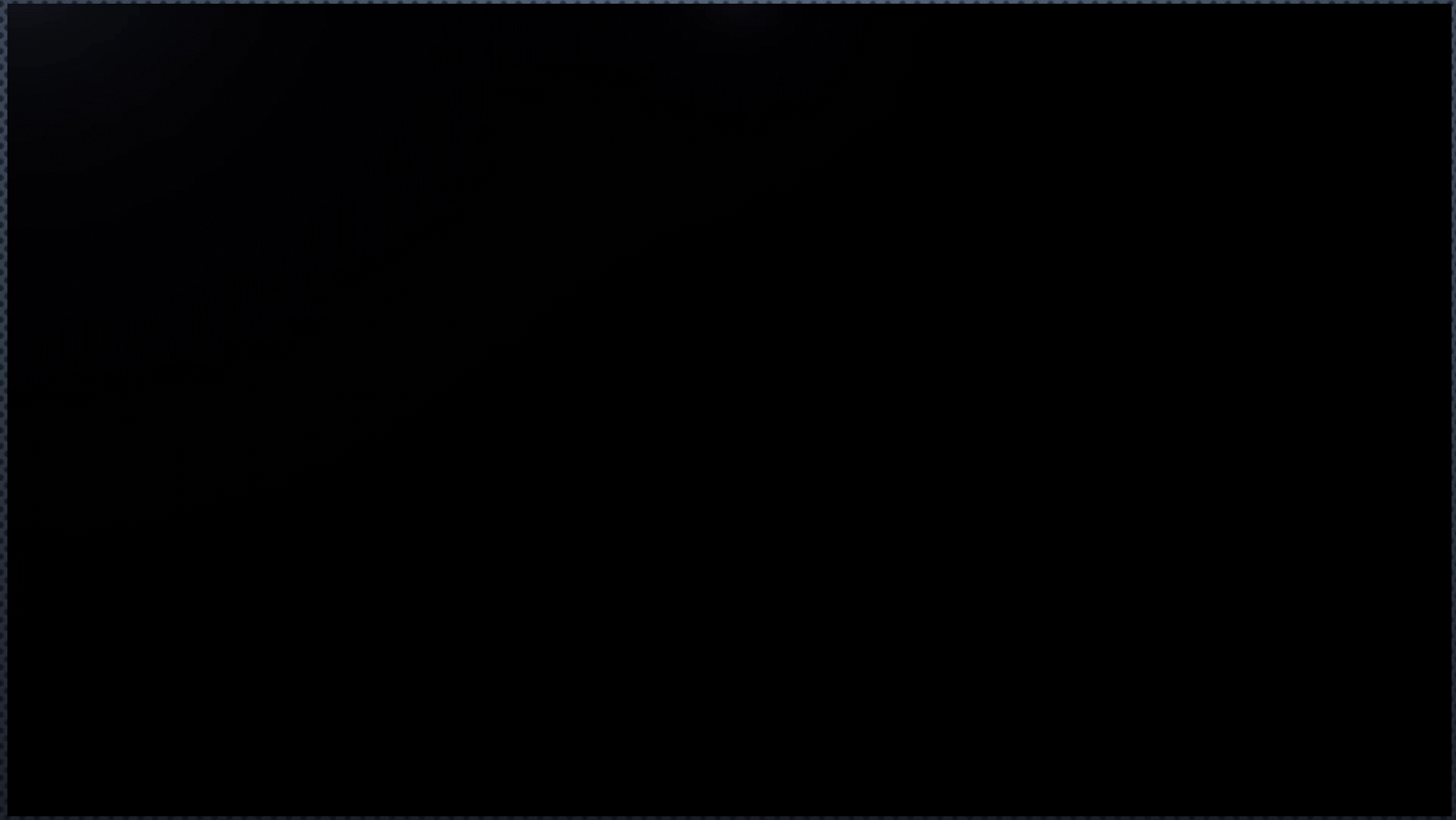
MICROSOFT HOLOLENS



MAGIC LEAP

The headset, called Lightwear, is connected to and powered by the Lightpack, a battery-powered processing system that hooks into your belt or pocket.

Allows hand-tracking or you can use the 6DoF controller.

HOW IT WORKS?

- LIKE A PROJECTOR AT A THEATRE. **VIRTUAL LIGHT** IS MIXED WITH THE REGULAR LIGHT COMING INTO YOUR EYE.

- THE **DEVICE READS WHERE YOU ARE LOOKING**, AND KEEPS THAT FIELD CONSISTENT AS YOU MOVE AROUND VIRTUAL OBJECTS. IN A SENSE, THE OBJECTS "STICK" TO THE REAL WORLD.

- USING BOTH THE **VISUAL FIELD AND SOUNDS**, MAGIC LEAP ONE CREATES WHAT THEY CALL A VOLUMENTRIC VIEW – ESSENTIALLY A SPACE LIKE AN AQUARIUM YOU MOVE WITHIN TO INTERACT WITH BOTH REAL AND VIRTUAL OBJECTS.

THE NEXT ERA OF COMPUTING

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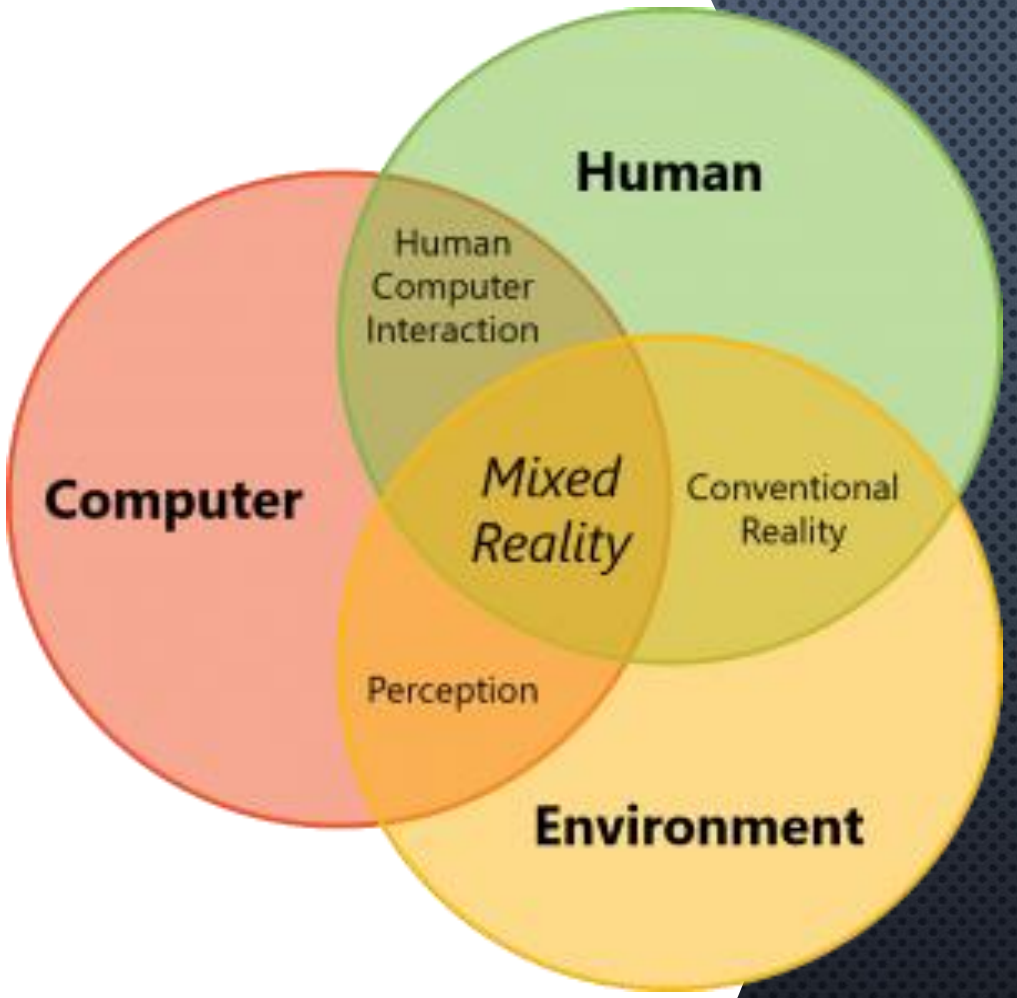
- MAGIC LEAP IS MORE OF A CHORE TO PUT ON THAN HOLOLENS, BUT IT'S SLIGHTLY MORE COMFORTABLE TO ACTUALLY WEAR- HOLOLENS IT'S A BIT WEIRD IN HOW IT FITS ON YOUR HEAD
- MAGIC LEAP ARE BETTER ON THEIR ITS FIELD OF VIEW , THEY ARE LIMITED TO A RECTANGULAR ZONE IN FRONT OF YOU – BUT IT'S NOT NEARLY AS LIMITED AS HOLOLENS
- MAGIC LEAP REQUIRES THAT YOU CARRY AROUND THE TINY COMPUTER, CALLED A LIGHT PACK, THAT POWERS THE EXPERIENCE. MICROSOFT'S HEADSET IS A SINGLE, STANDALONE UNIT, SO THERE'S NO PURSE COMPUTER.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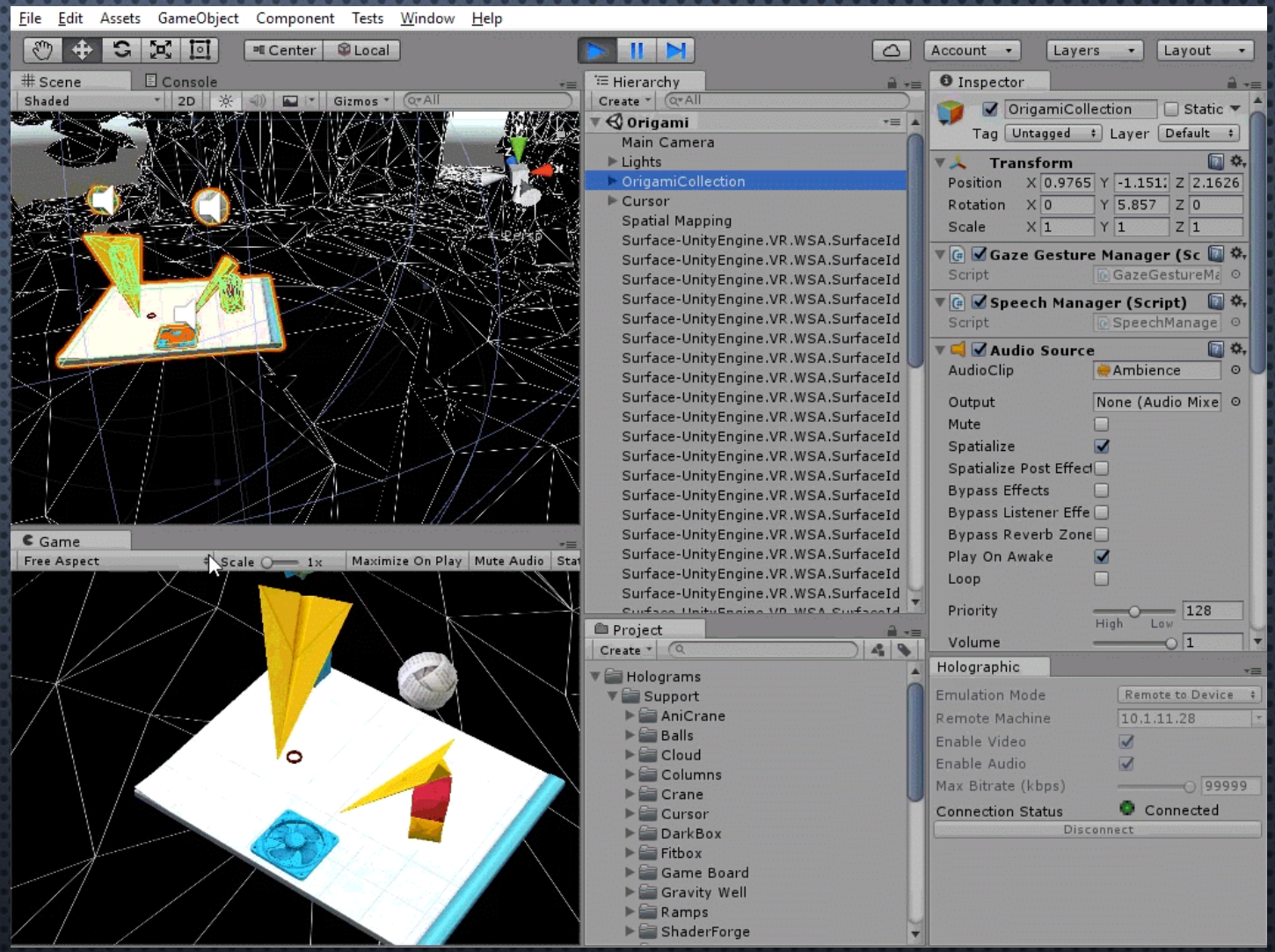
WHERE?

- A CROSS-PLATFORM GAME ENGINE DEVELOPED BY UNITY TECHNOLOGIE

- THE ENGINE CAN BE USED TO CREATE THREE-DIMENSIONAL, TWO-DIMENSIONAL, VIRTUAL REALITY, AND AUGMENTED REALITY GAMES, AS WELL AS SIMULATIONS AND OTHER EXPERIENCES



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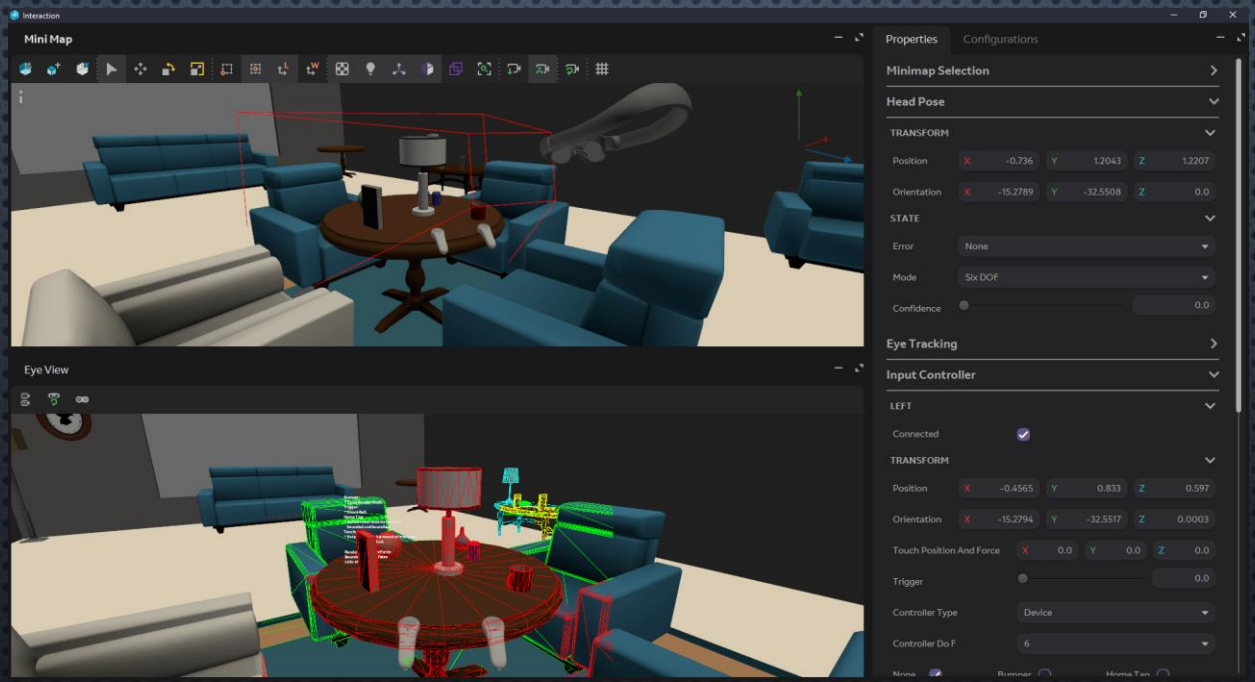
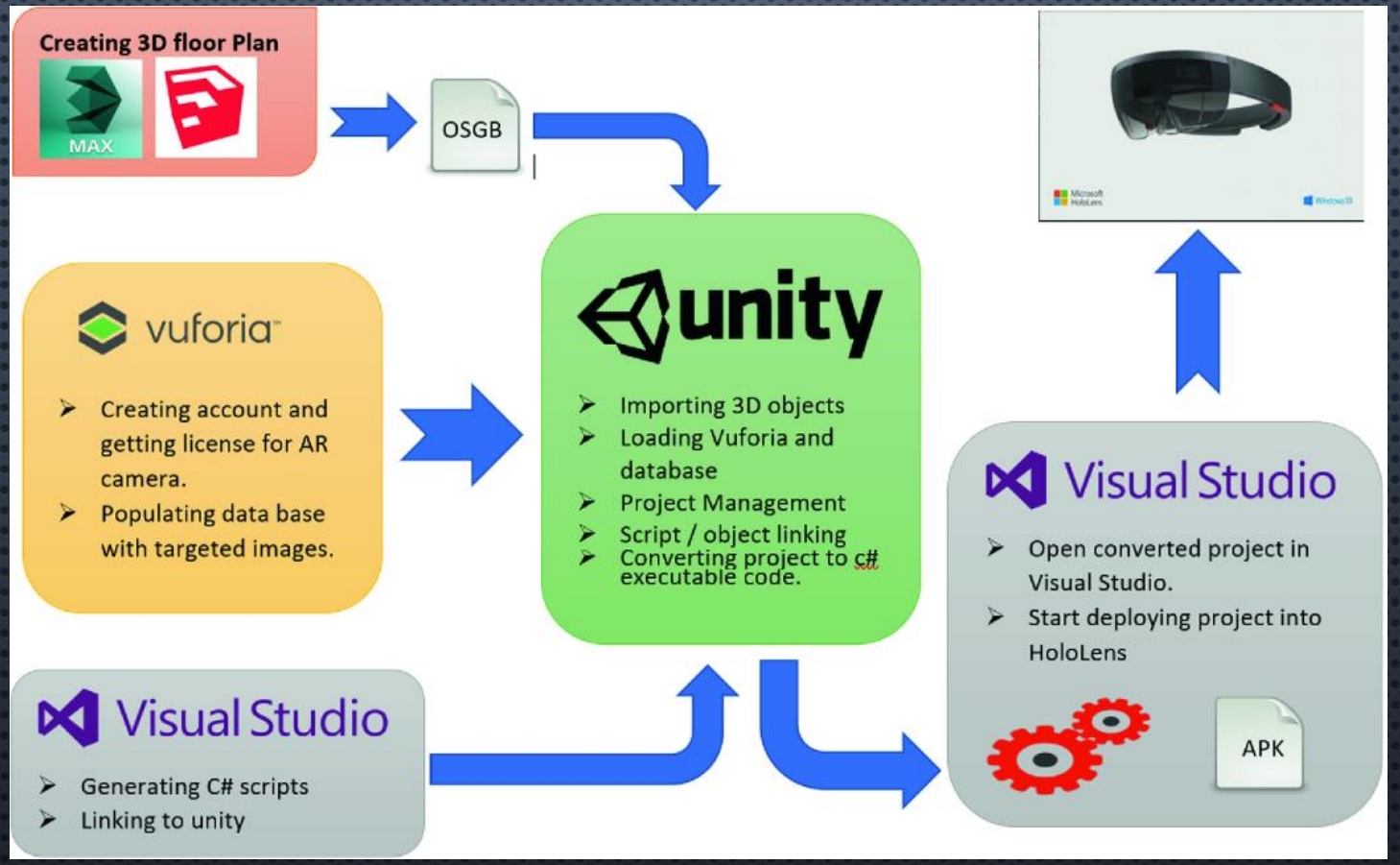
WHERE?

Magic Leap Remote

- Enables developers to run and test their apps <u>without</u> a Magic Leap One device.
- Magic Leap Remote can recognize different simulated input data such as Hand poses or actions with the Control.




Creating 3D floor Plan
MAX
OSGB
vuforia
Creating account and getting license for AR camera.
Populating data base with targeted images.
unity
Importing 3D objects
Loading Vuforia and database
Project Management
Script / object linking
Converting project to c# executable code.
Visual Studio
Generating C# scripts
Linking to unity
Visual Studio
Open converted project in Visual Studio.
Start deploying project into HoloLens
APK

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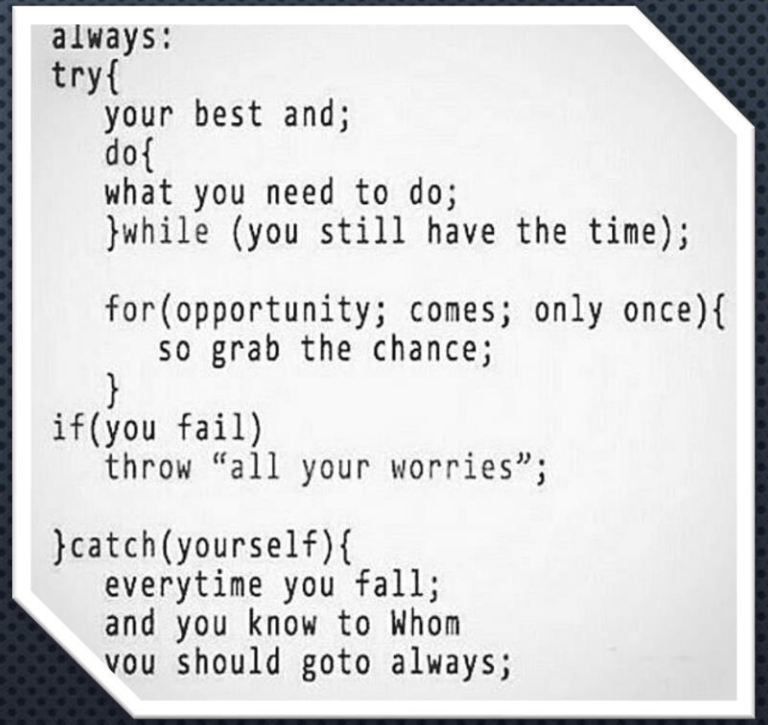
YOU don’t code for the COMPUTER.

YOU code for **HUMANS**.

The COMPUTER is just a communication tool.



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What Is Phantom Limb Pain?

After you have part of your arm or leg **amputated**, there's a chance you could feel pain in the limb that's no longer there. This is known as phantom limb pain.

It's most common in **arms and legs**, but some people will feel it when they have other body parts removed, such as a breast.

For some people, the pain will go away on its own. For others, it can be **long-lasting and severe**.

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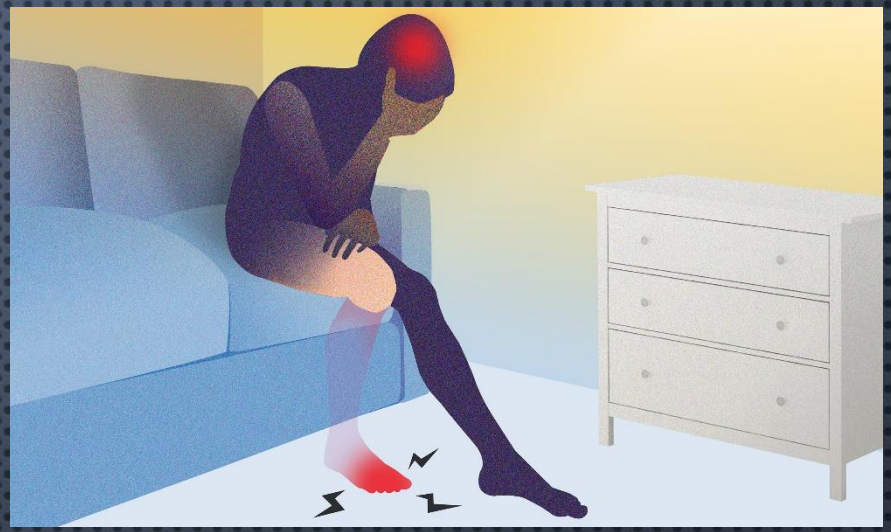
What PLP Feels Like ?



Is not the same for everyone. The pain may feel like it's:

- Burning
- Shooting
- Like "pins and needles"
- Twisting
- Crushing
- Like an electric shock

Aside from pain, you may also sense other feelings from a body part that's no longer there:

- Movement
- Temperature
- Pressure
- Vibration
- Itch

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PHENOMENA OF PLP

(PAIN MEMORIES)

sending message

NERVES IN NEUROSIGNATURE

BRAIN PROCESS THE SIGNAL

RECREATE THE NON-EXISTING LIMB

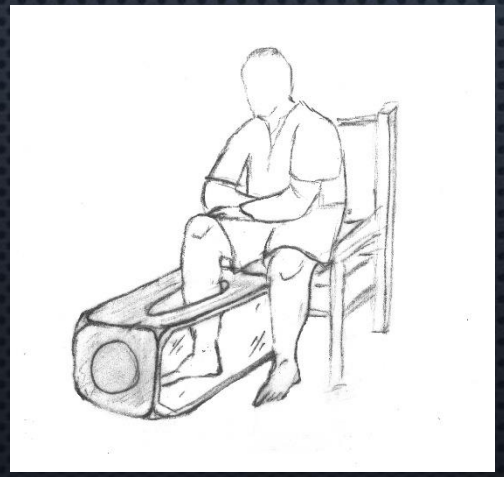
Medicine Can Help

Non-drug Therapies: Mirror box therapy!

Picture a box with no lid. It has two holes -- one for your remaining limb and one for the stump -- and a mirror in the center.

When you put your limb and stump inside, you **see** the reflection of the intact arm or leg in the mirror.

It tricks your brain into thinking you have both limbs as you do therapy exercises. Research shows this can help relieve pain in a missing limb.



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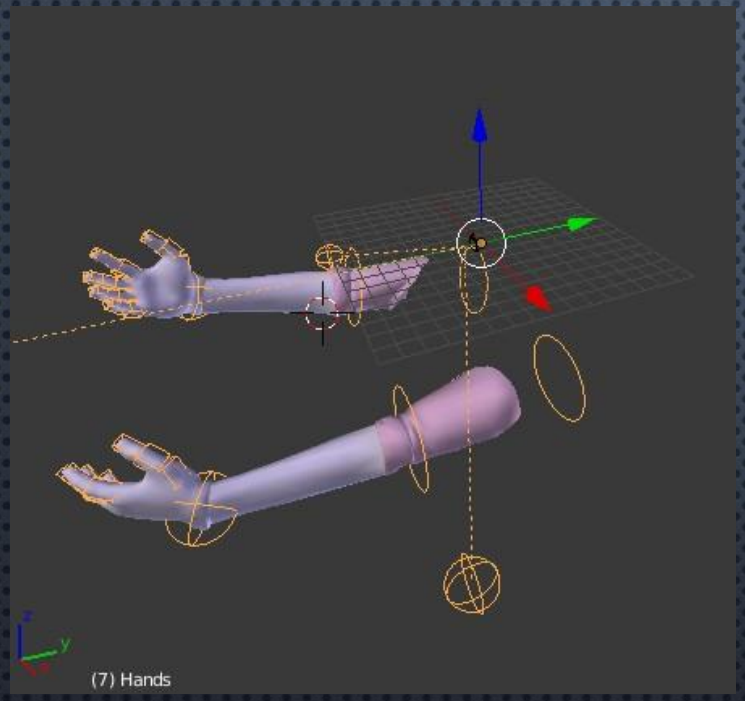
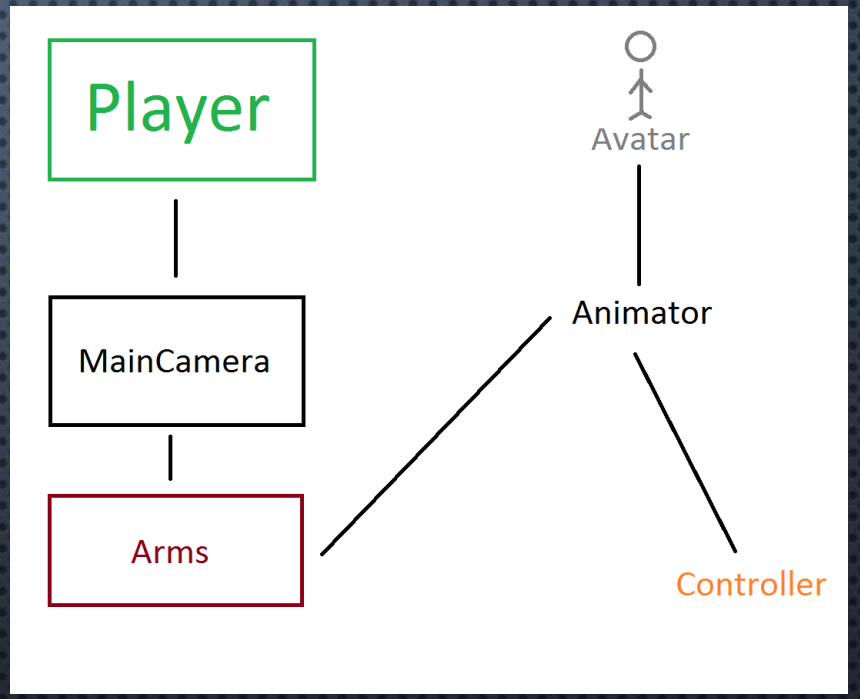
HoloLarms





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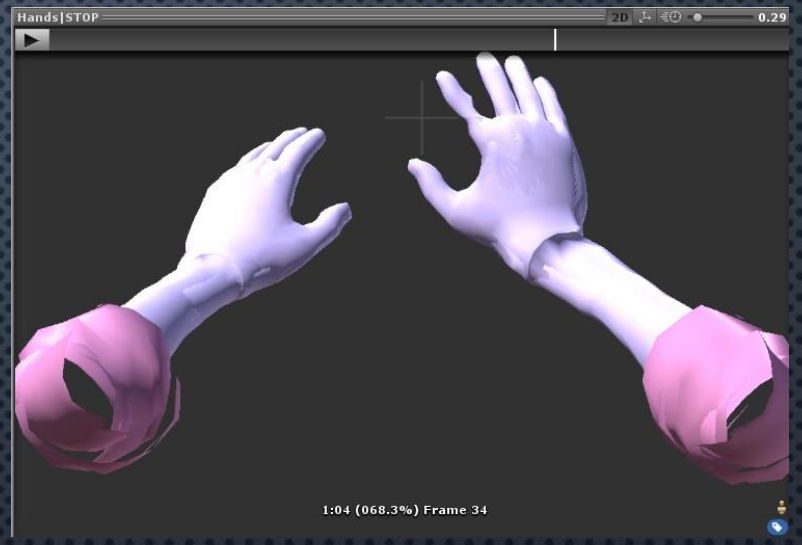
HoloLarms

perfect

what



stop

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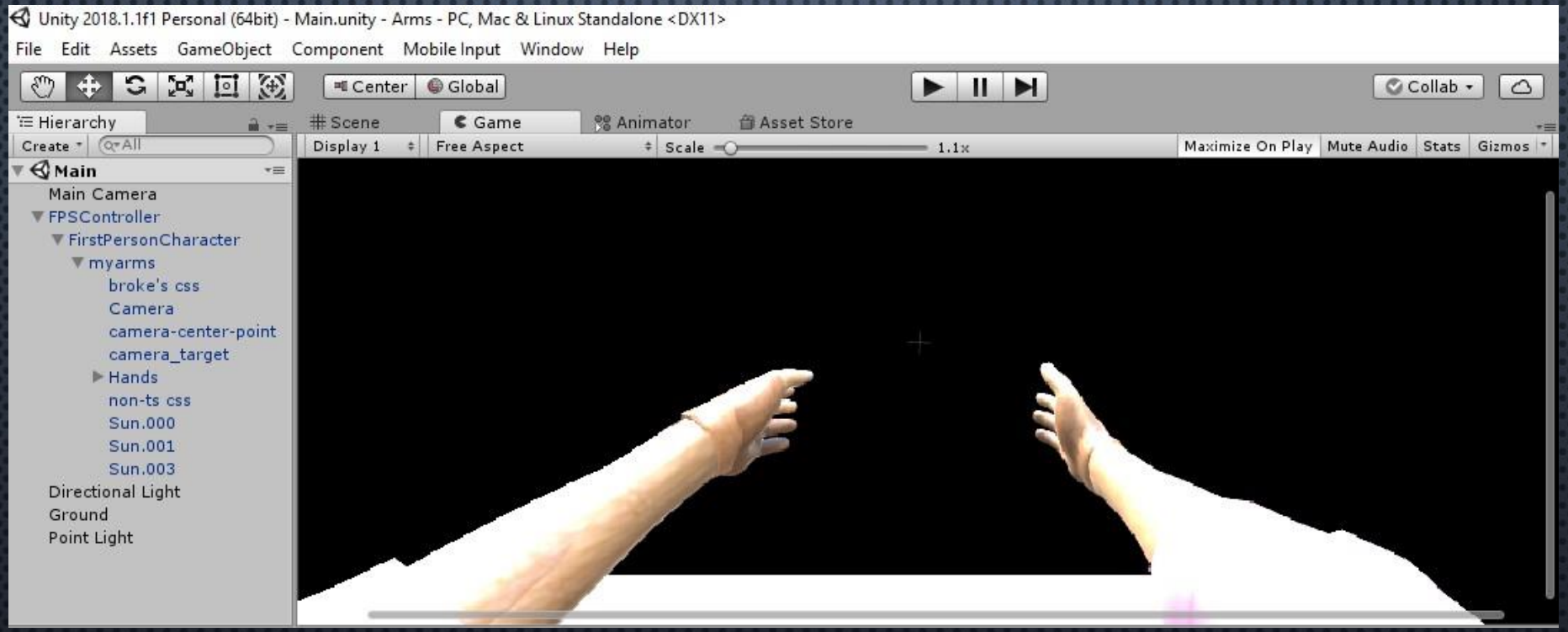
HoloLarms



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