Innovative Applications of VR/AR

Bin CHEN

2017.3.25

http://gis4g.pku.edu.cn/course/iavr/

北京大学 PEKING UNIVERSITY

Microsoft

地小空开放实验室

Contents

- Introduction to Our Guests
- Brief History of Virtual Reality
- From VR/AR to MR
- Microsoft's MR Strategy
- Shopping
- Entertainment
- Gaming
- Education

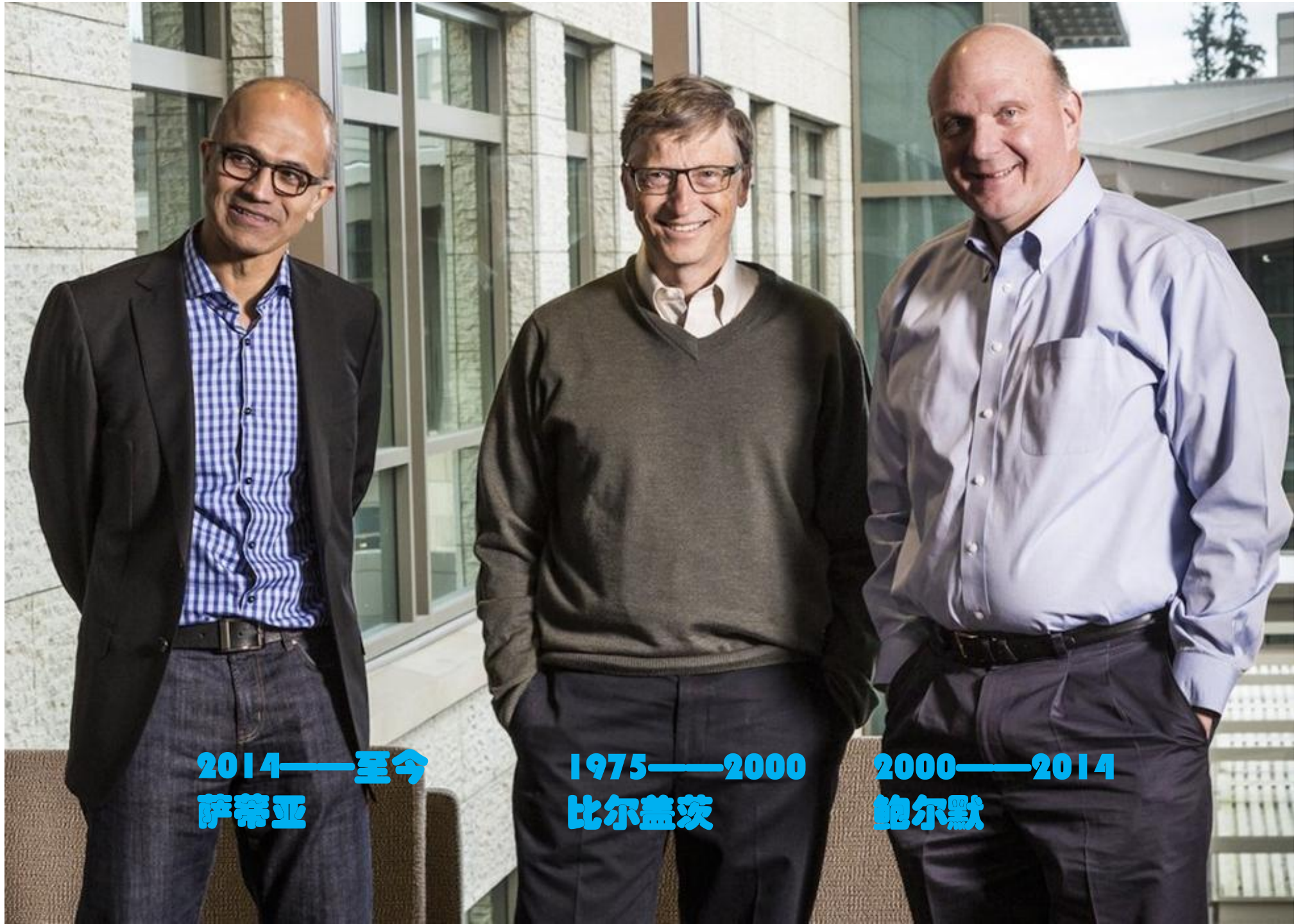
Microsoft

Xinyu Liu
User Experience Evangelist
Responsible for evangelize Microsoft design language,
Mixed Reality platform,
and Windows 10 latest technologies in China.

Microsoft

微软（中国）有限公司

周北星　beizh@Microsoft.com


2014——至今
萨蒂亚
1975——2000
比尔盖茨
2000——2014
鲍尔默

微软的转型

创造个性化计算

商业智能再造

构建智能云

微软有哪些产品和服务？

桌面端

- Windows
- Office

服务器端

- Winserver
- SQL server
- System center
- Sharepoint
- Exchange
- Skype for business

云端

- Azure
- Office 365

Microsoft

Surface

为什么我们需要混合虚拟现实？

从盗梦空间到任意门的无限可能

关于教育
创新无处不在……

Student Innovation Team: GeoKids Open Lab

- Chunhan CHEN
- Yifu WU
- Zixuan ZHANG
- Xu CHEN
- Cong MENG
- Xiaonuan LIN
- From School of Earth & Space Sciences
- and School of International Studies.

地小空开放实验室

Brief History of Virtual Reality

- Recreating a world is eternal dream of human being.
- Existentialism as foundation, Theory, tech and ethics of virtual world developed.
- Computer graphics, multimedia, human-computer interface and brain science lead to virtual world.

1962, Sensorama System

- A fixed, cabinet size, device
- Featured by 3 surrounded screen
- A joint-action chair
- Joystick to control content display

1968, Sutherland System

- Father of Computer Graphics, Ivan Sutherland, designed the first Head Mounted Display(HMD)
- Render 3D wireframe room in glass display
- Head tracking to update 3D view in real-time
- Nickname "sword of Damocles" for hanging poles

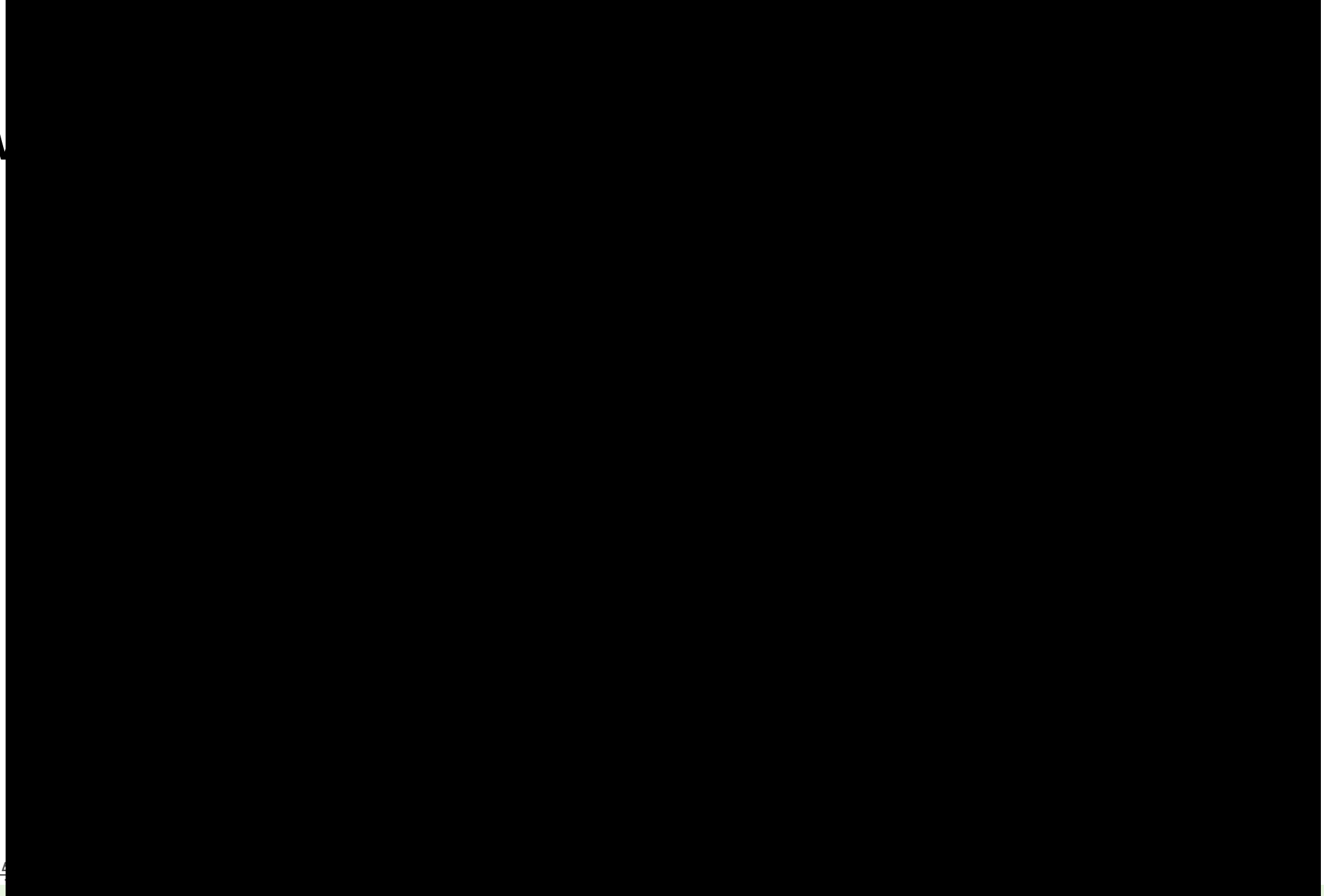
1987, Concept of Virtual Reality(VR) Created

- Father of Virtual Reality, Jaron Lanier, Computer scientist, philosopher and musician
- Presented concept of Virtual Reality: A 3D virtual world generated by computer systems, provides sense simulation of vision, hearing and touch.
- Hololens partner architect

1995, Video Game Host Virtual Boy

- Nintendo's VR Game Host.
- First attempt to VR Gaming.
- Based on red-blue anaglyph 3d technology.
- But thinking too far ahead.
- Only survived 6 months in market.

Virtual Boy Games



2012, Google Glass: Augmented Reality Device

- Based on Android mobile OS
- Overlay reality and information UI
- Control by voice and gesture to handle camera, surfing and email
- Using GPS and Camera to recognize reality scene.
- First AR device for consumer market
- Paused after 3 year's testing

2012, Oculus Rift

- First VR-HMD from Kickstarter
- Got $16M venture capital
- In 2014 by Facebook to $ 2 billion acquisition
- Require PC to play, supported by many VR games.
- Listed in 2016, consumer version CV1 released

2014, PlayStation VR

- Playstation4 VR set from SONY
- A bit outdated in several minor aspects
- Supported by huge amount game hosts
- Enclosed game eco-system
- Stronger user purchasing power

2015, HTC Vive

- Launched by HTC and Valve
- Best results in display and positioning technologies among VR-HMD
- Slightly complex in hardware installation
- High space requirements
- Listed in 2016

2015, Microsoft Hololens, Mixed Reality Device

Next, we welcome Ms. Liu to introduce Microsoft's MR strategy.

Understanding “X”R Concept

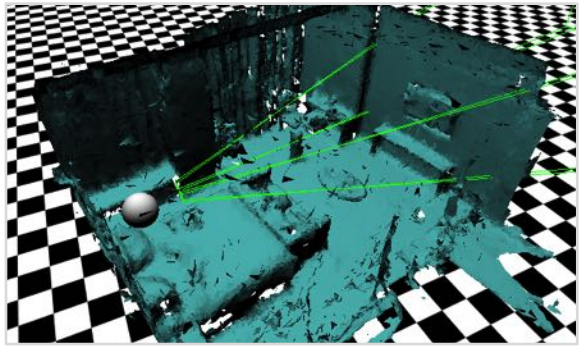
Technology	Device	Concept	Motion	SLAM - 即时定位与地图构建 Simultaneous Localization and Mapping
虚拟现实 (VR) VirtualReality	• Oculus • HTC Vive • Playstation VR • Gear VR	Digital environments that shut out the real world.	Limit	No
增强现实 (AR) AugmentedReality	• Google Glass	2D Digital content on top of your real world.	Free	No
混合现实 (MR) MixedReality	• HoloLens	3D Digital content interacts with your real world	Free	Yes

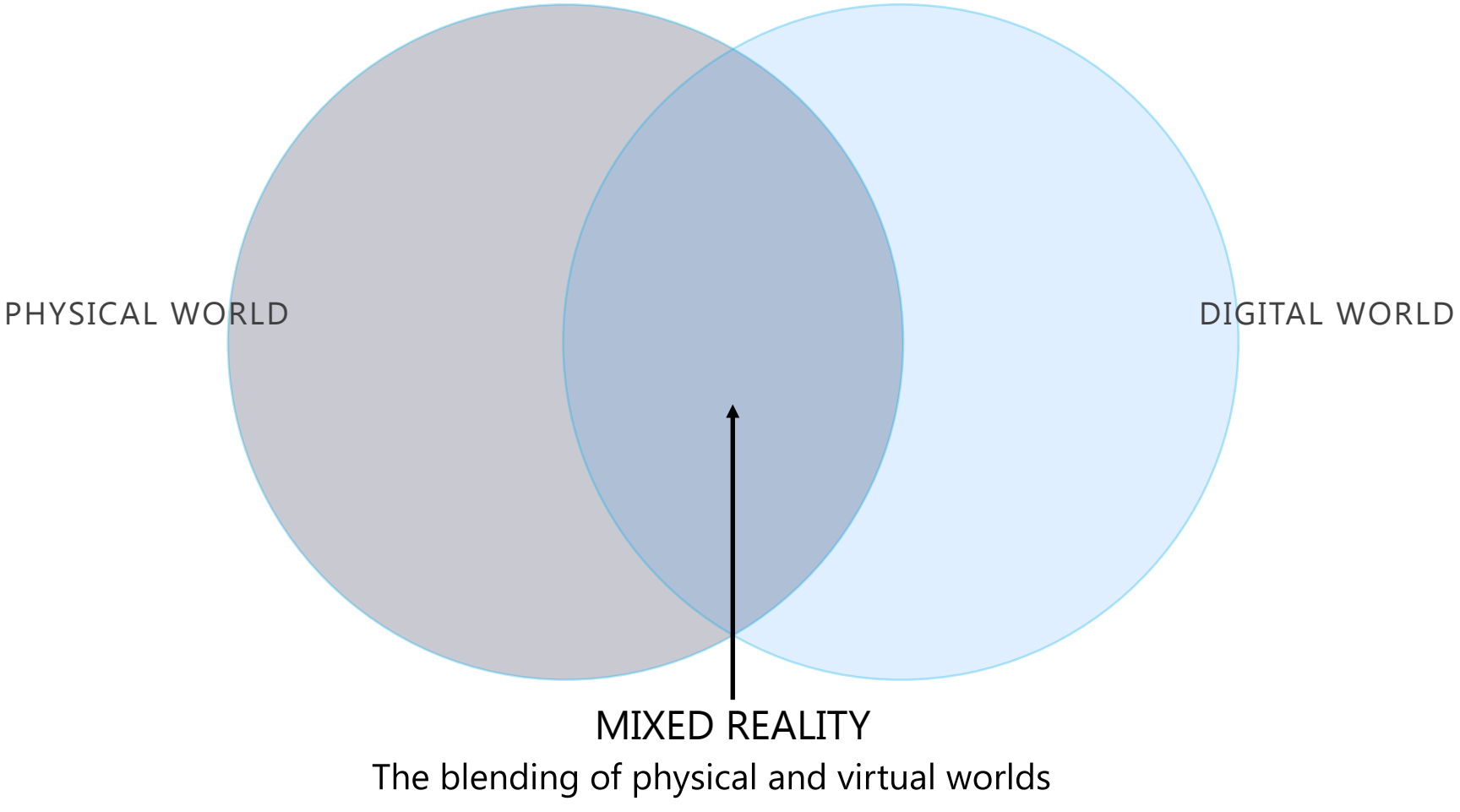
HoloLens – New AR Experience

The first fully self-contained, head-mounted holographic computer with Holographic Processing Unit, Advanced sensors, See-through Lenses & Spatial Sound.

Mixed Reality Platform – New VR Experience

Windows Holographic is a mixed reality platform built around the API of Windows 10.




PHYSICAL WORLD
DIGITAL WORLD
MIXED REALITY
The blending of physical and virtual worlds

AUGMENTED REALITY
Where digital information, objects or people are layered on top of physical reality to enhance understanding or awareness.

AUGMENTED VIRTUALITY*
Where physical environments, objects and/or people are digitally replicated and integrated into the virtual world for interoperability.

Understanding “X”R Concept

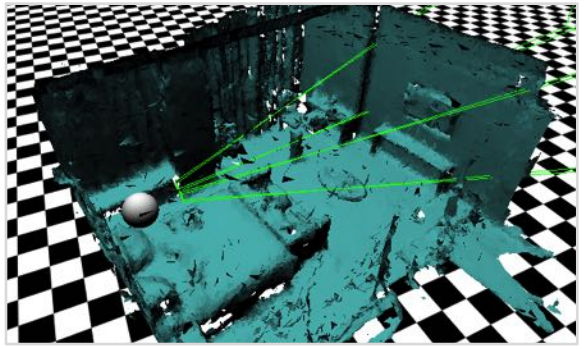
Technology	Device	Concept	Motion	SLAM - 即时定位与地图构建 Simultaneous Localization and Mapping
虚拟现实 (VR) VirtualReality	• Oculus • HTC Vive • Playstation VR • Gear VR	Digital environments that shut out the real world.	Limit	No
增强现实 (AR) AugmentedReality	• Google Glass	2D Digital content on top of your real world.	Free	No
混合现实 (MR) MixedReality	• HoloLens	3D Digital content interacts with your real world	Free	Yes

HoloLens – New AR Experience

The first fully self-contained, head-mounted holographic computer with Holographic Processing Unit, Advanced sensors, See-through Lenses & Spatial Sound.

Mixed Reality Platform – New VR Experience

Windows Holographic is a mixed reality platform built around the API of Windows 10.



Device Hardware

Self-contained computer

Containing more computing power than the average laptop, Microsoft HoloLens doesn’t need external wires, markers, or cameras, nor a connection to a phone or PC, so you can move freely and untethered.

Advanced sensors

Microsoft HoloLens has advanced sensors to capture information about what you're doing and the environment you’re in.

Transparent lenses

See-through holographic lenses use an advanced optical projection system, so you can see holograms in your world.

Holographic Processing Unit

The HPU is custom silicon that processes a large amount of data per second from the sensors, enabling Microsoft HoloLens to understand gestures, where you look, and map the world around you, all in real time.

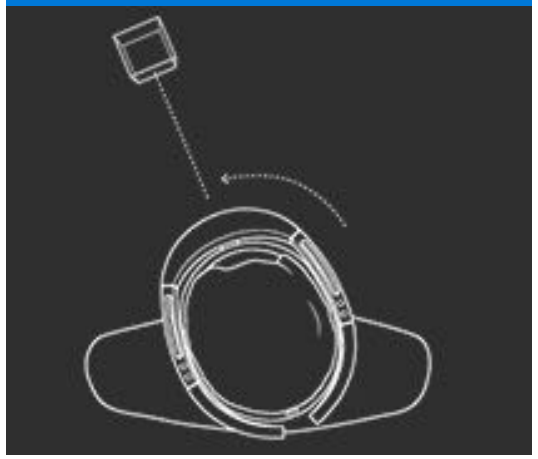
Spatial sound

Microsoft HoloLens synthesizes sound so that you can hear holograms from anywhere in the room. It’s immersive, yet won’t block out the real world.

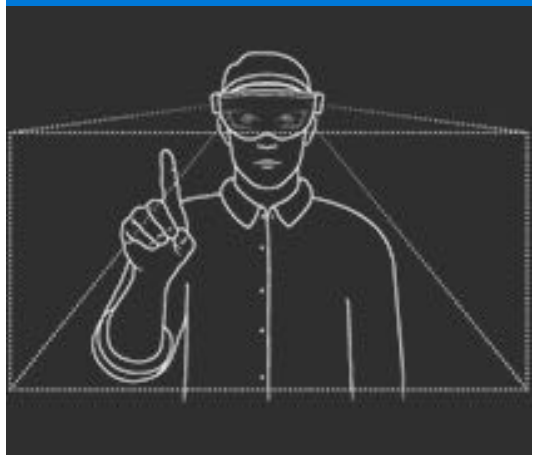
Interaction & Scenarios

New way to interact.

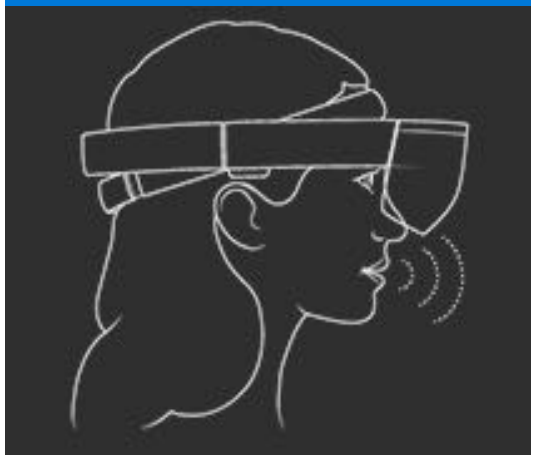
Gaze



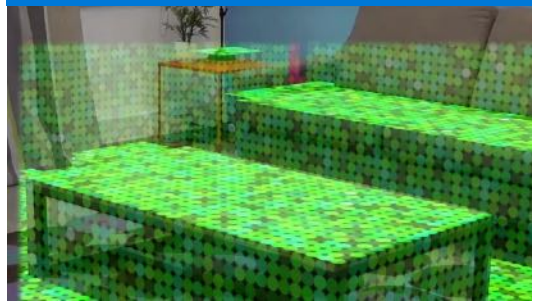
Gesture



Voice commands

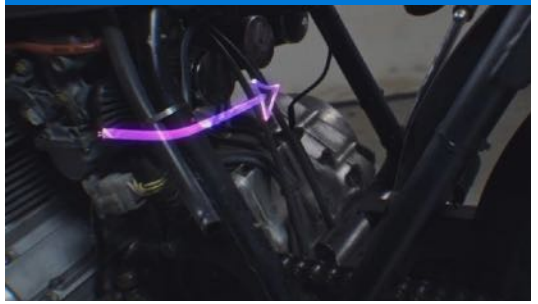


Spatial mapping



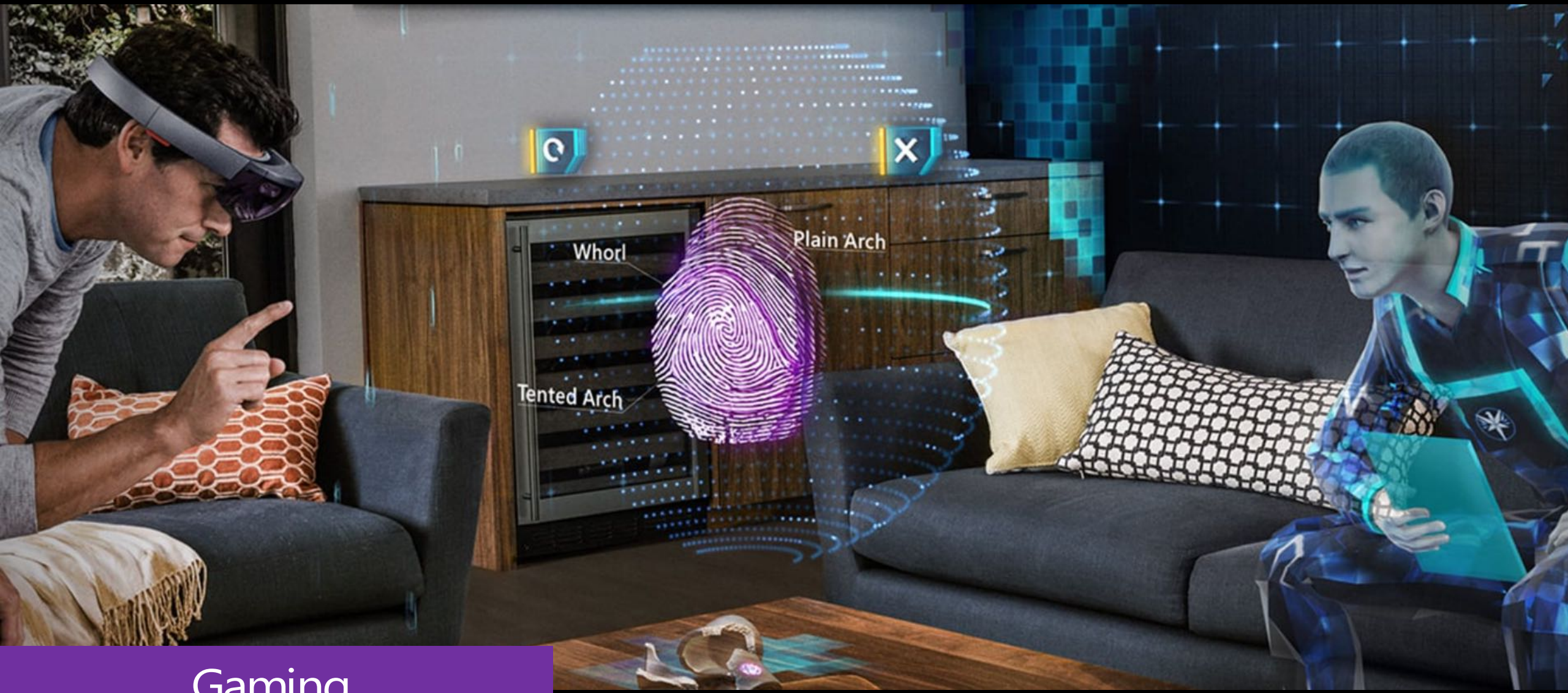
Spatial sound

World coordinates

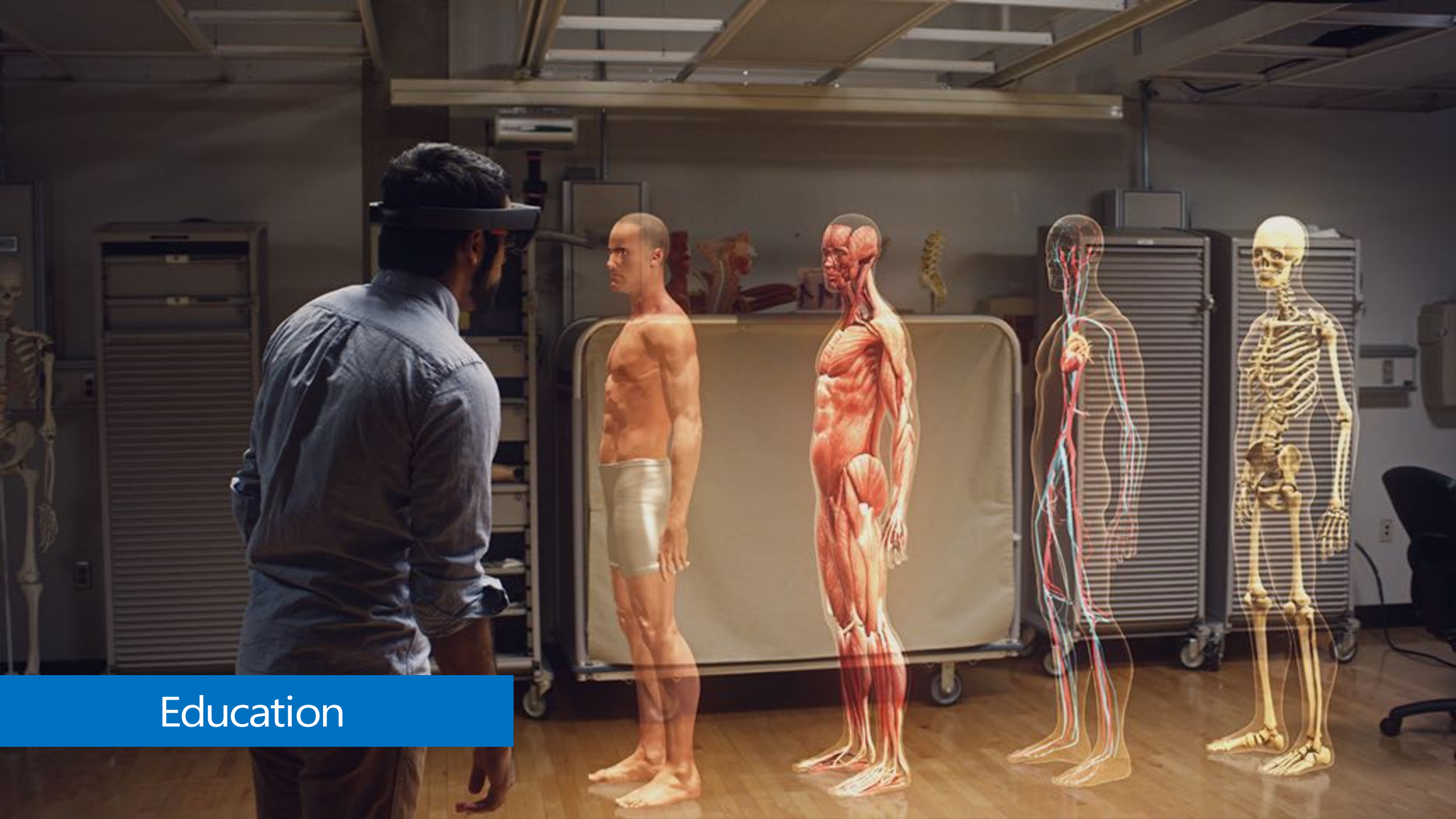


Shopping

Entertainment



Gaming



Education

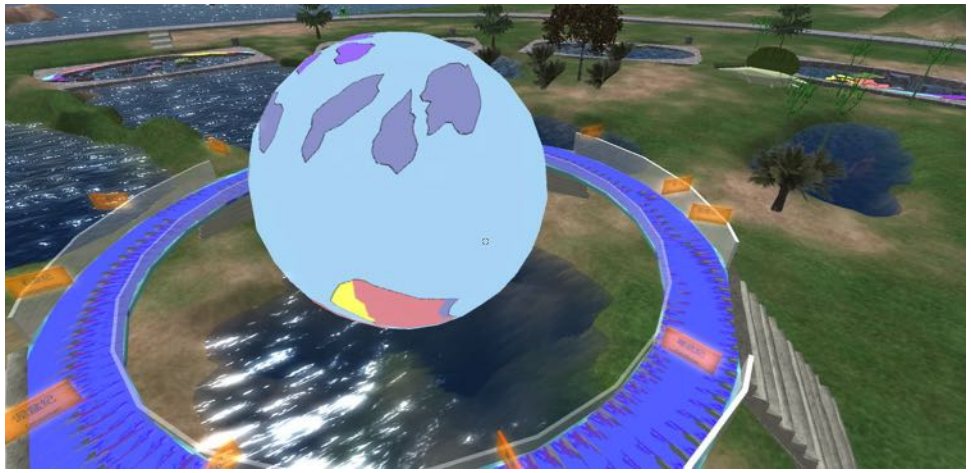
Our Practice and Exploration in VR/AR Education

LABIGO
MODULAR SCIENCE EXPERIMENT GAME SYSTEM

地小空开放实验室

Next, we welcome GeoKids Open Lab team to introduce their work.

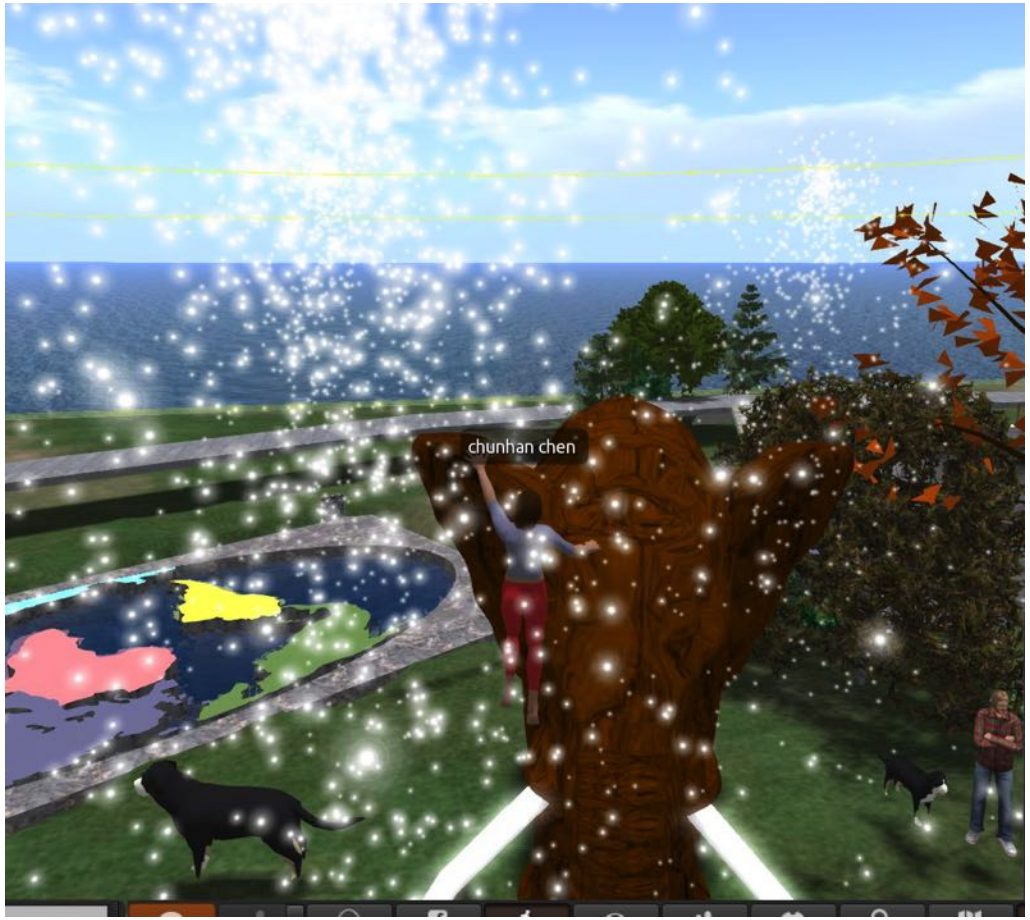
Virtual Reality Continental Drift Geology Museum



- Based on SecondLife technologies.
- The rotating Earth in the center simulates different shapes of continents through geological time scale.
- Visitors are able to saunter in the hall and press the suspending button to shift to corresponding period.
- Static continents of different periods in the surrounding area.

Virtual Reality Continental Drift Geology Museum

- Typical paleo species
- Interactive paleoclimates



Virtual Geology Field Practice System

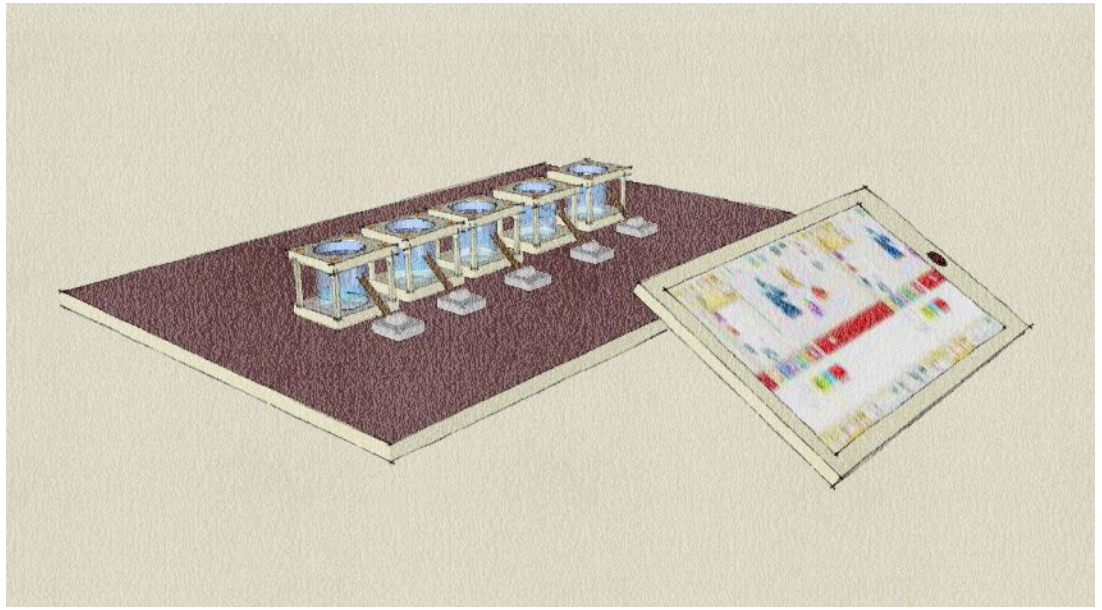
三维虚拟地质实习系统

北京虎峪自然风景区

Image Landsat
Data SIO, NOAA, U.S. Navy, NGA, GEBCO

Our Exploration in K-12 Education: LABIGO

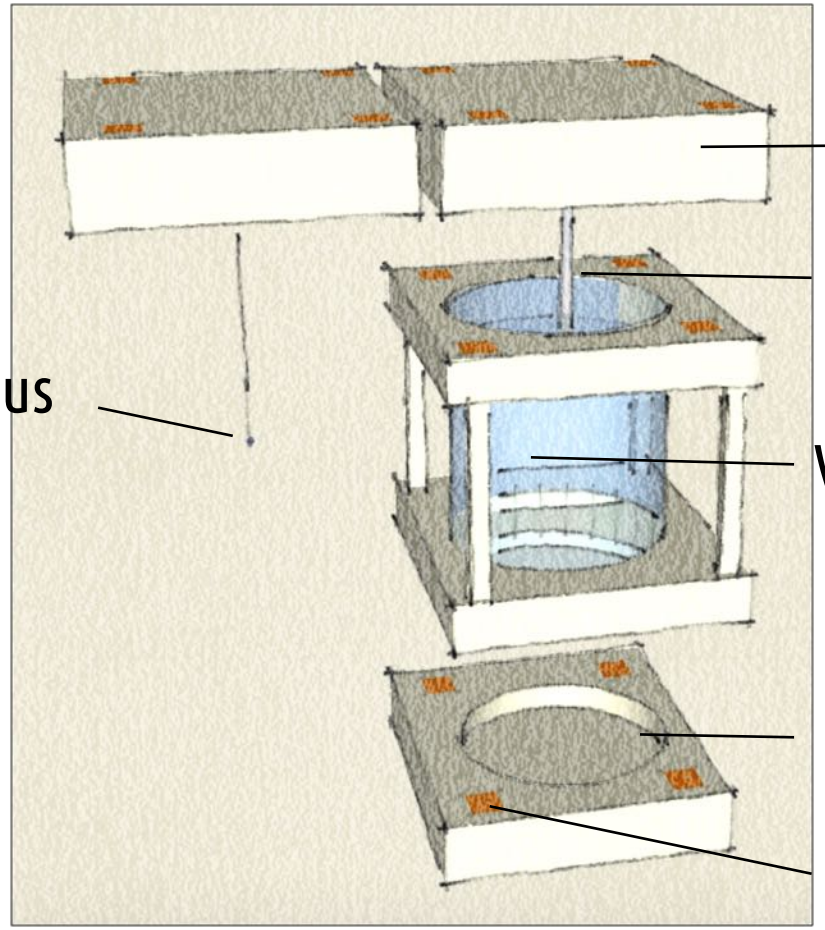
- Modular Science Experiment Game System
- Compatible with LEGO
- Baseplate with Power Supply
- Multiple Science Exp. Modules
- Programming System in Pad or Tablet

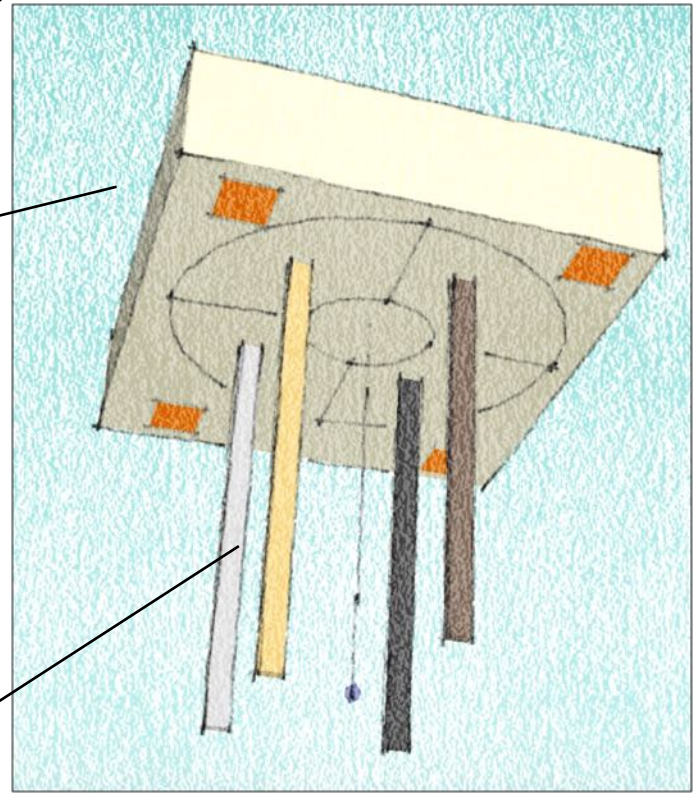


LABIGO

MODULAR SCIENCE EXPERIMENT GAME SYSTEM

CASE 1 Chemistry: The Growing Crystal

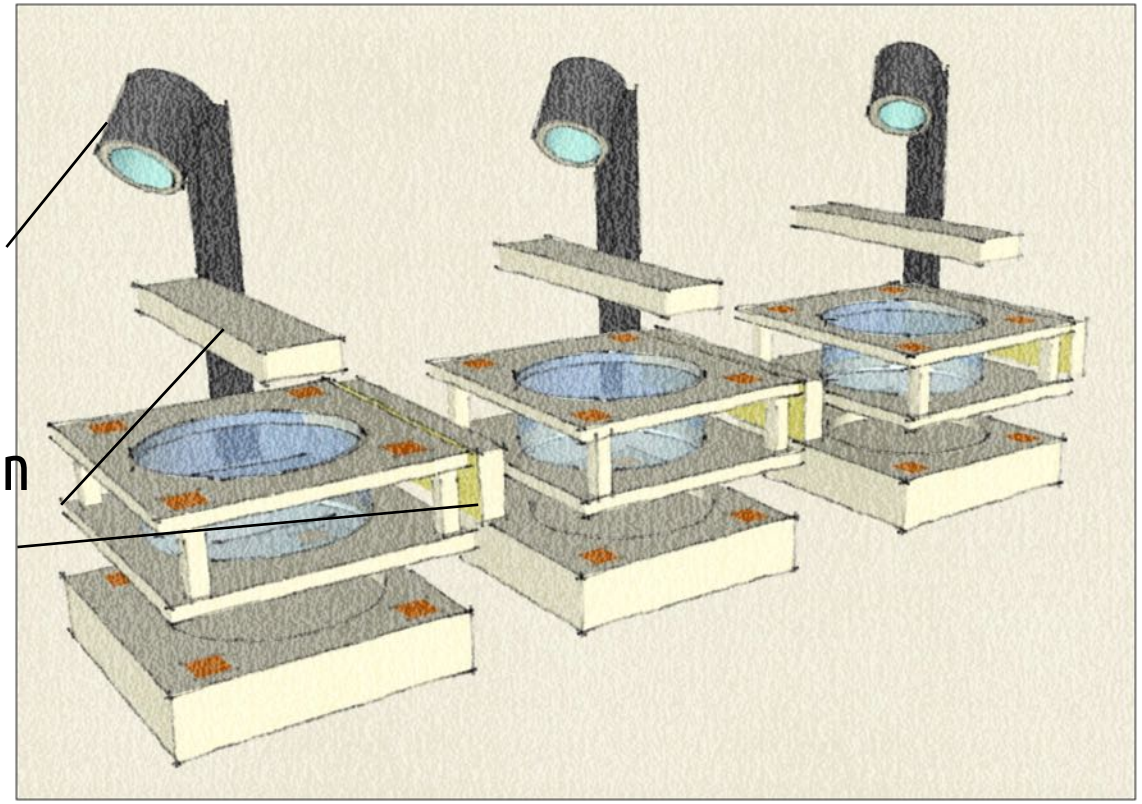




Most modules are **multifunctional** and can be applied in different experiments!

Let's see the next one!

CASE 2 Biology: The Sprouting Beans



A working flow for users

Purchase modules and connect them to the baseplate.

↓

Put wet green mung beans and other necessary materials into the vessel according to instruction.

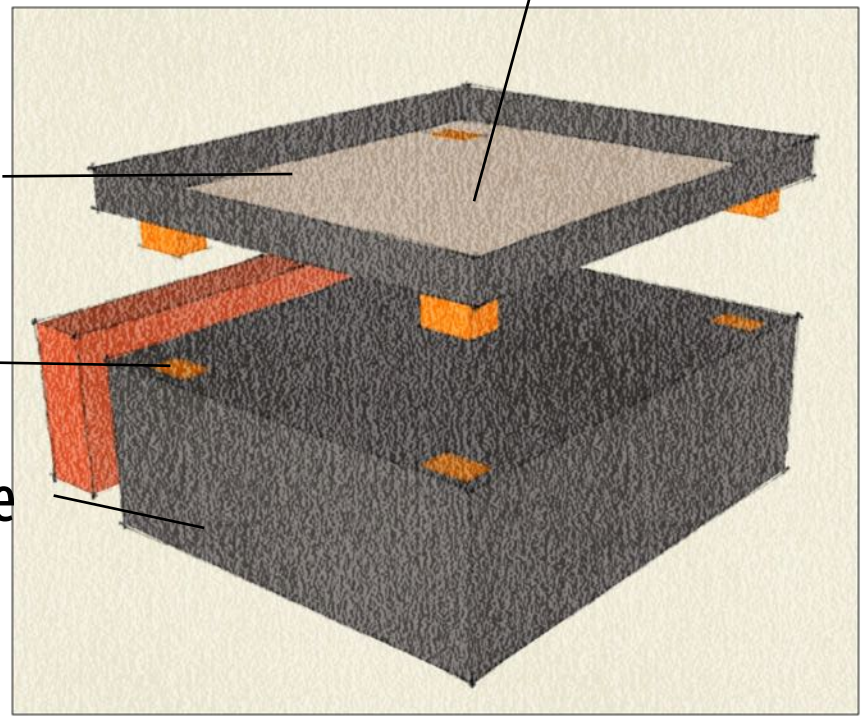
↓

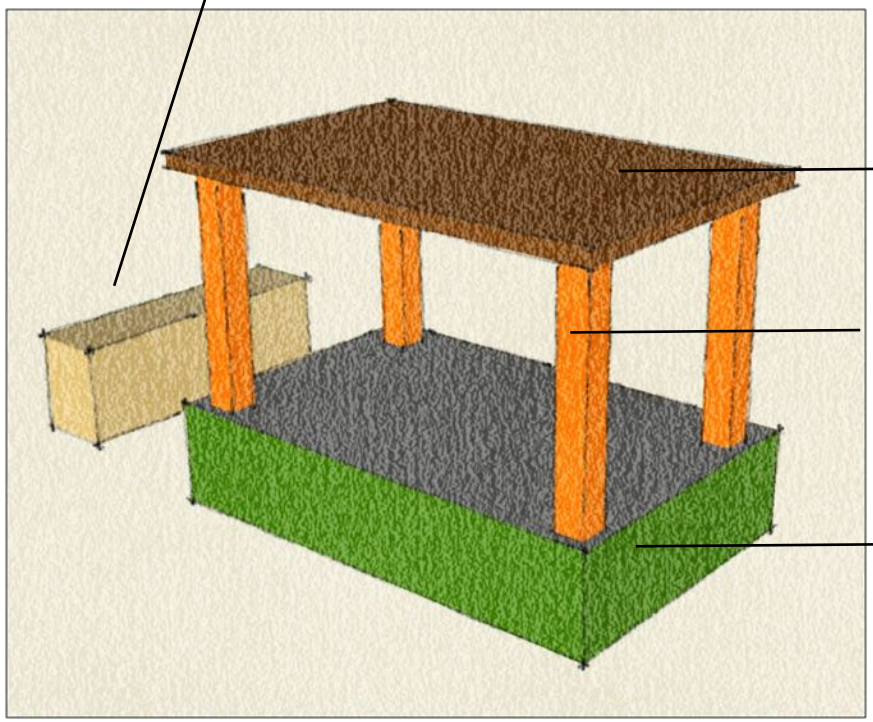
Using the programming system to set different conditions for the three apparatus. (like tempera-ture, illumination intensity, illumination durations etc.)

↓

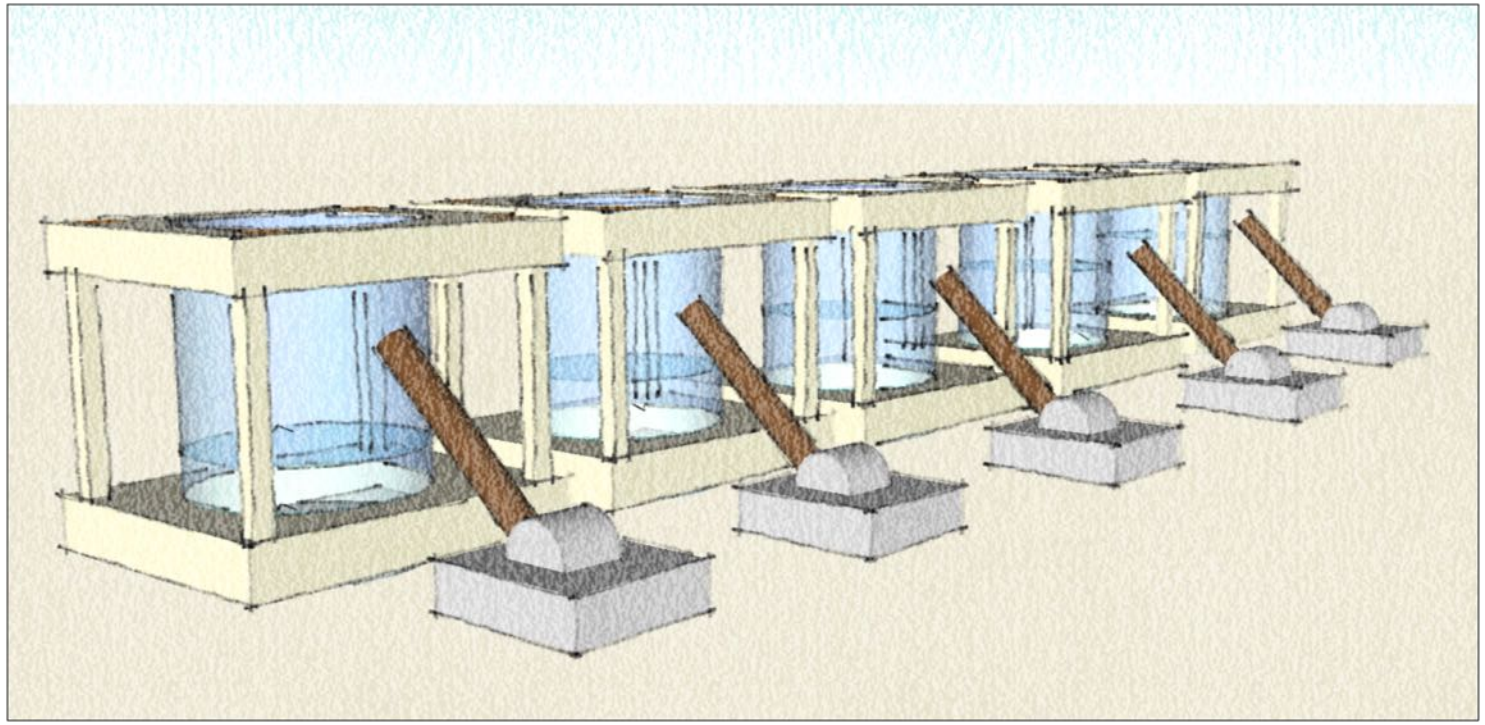
Observing.

CASE 3&4 Physics: The Jumping Seeds & Luminous-Electric Energy Transformation





CASE 5 Music: Water singing a song

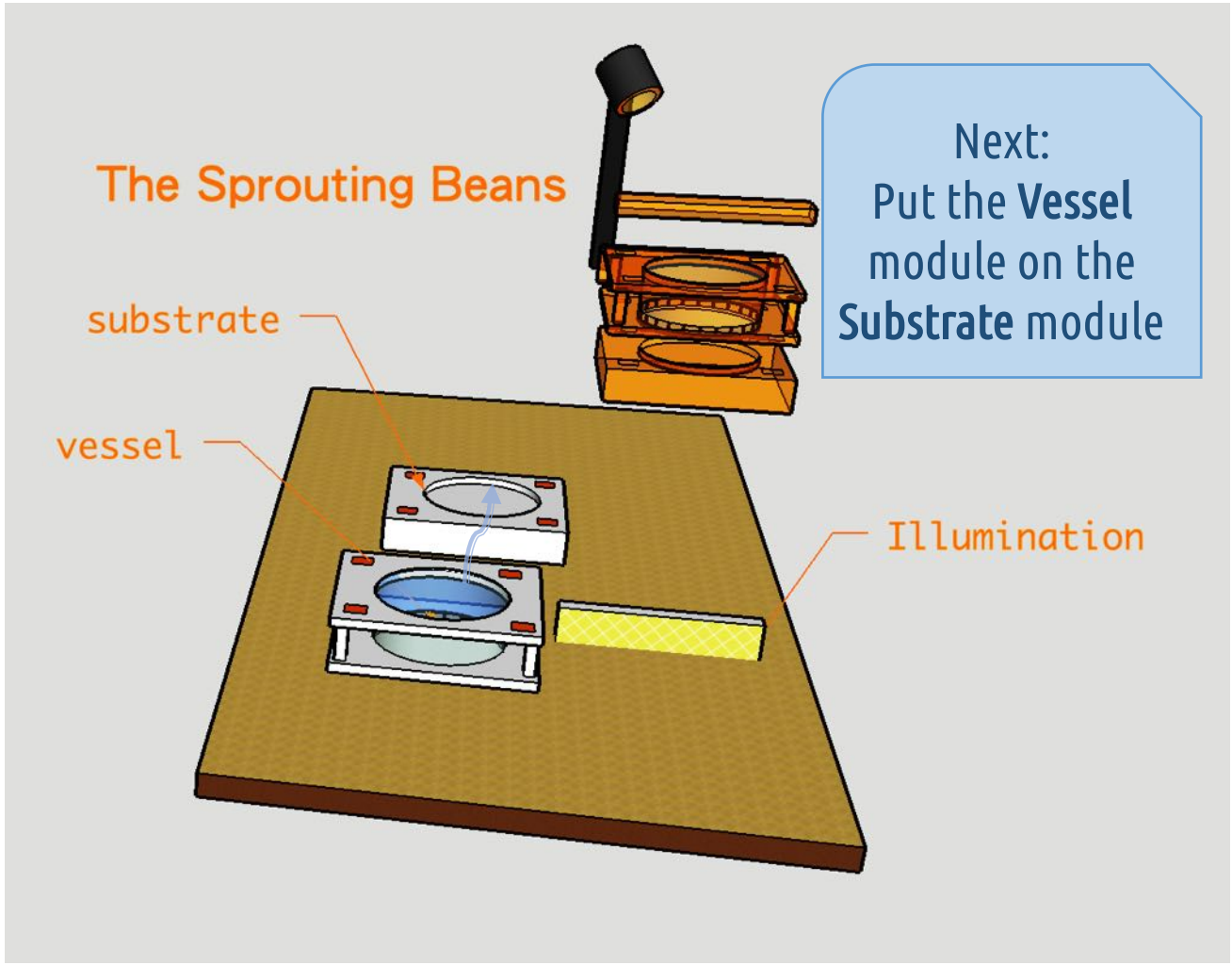


Chemistry, physics, biology, music …
Experiments in various fields could be realized by our product.

Combined with AR/MR Technologies

- Instruction & Auxiliary by AR/MR devices (Microsoft Hololens)
- May work out as an AR application on the platform provided by Hololens.
- Users can get real-time instructions as well as feedback for their operation.

Typical AR/MR Application in Sci. Experiments



- Instructions on how to set up the experiment device, how to operate and how to observe the expecting result.

We may image the future life by virtual reality.

The Further

Question?

Thanks!

Innovative Applications of VR/AR

Bin CHEN

2017.3.25

http://gis4g.pku.edu.cn/course/iavr/

北京大学 PEKING UNIVERSITY

Microsoft

地小空开放实验室