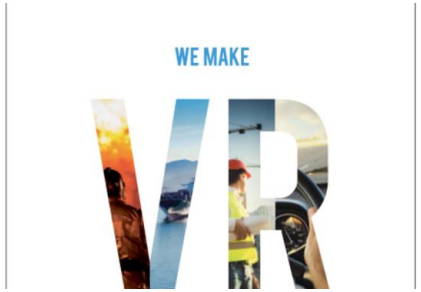
Introduction to Augmented Reality & Virtual Reality

Dr. Kaushal Kumar Bhagat
Advanced Technology Development Centre

2016: The Year of Virtual Reality



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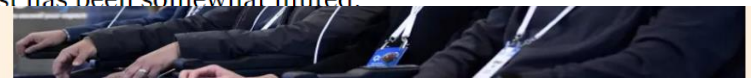
China's Year Of Virtual Reality

Lisa Hanson, CONTRIBUTOR

I cover the PC, console and mobile games industry in Asia. FULL BIO

Opinions expressed by Forbes Contributors are their own.

2016 became "year one" of virtual reality in China, due to the fact that the sector finally truly started to grow. My company Niko Partners estimates China's VR hardware 2016 market size will hit $300 million by the end of this month with mobile VR being the unequivocal leader in terms of hardware unit sales. Virtual reality overall has been embraced in China more than the West and Chinese consumers have shown a willingness to go out and purchase VR devices or experiences, whereas consumer interest in the West has been somewhat muted.



A woman uses a virtual reality device at MK2 VR in Paris on Wednesday. | AFP-JIJI

BUSINESS / TECH

2016 'year zero' of virtual reality revolution, filmmakers say

AFP-JIJI

WHAT'S TRENDING NOW

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- Over 1,000 Japanese firms to turn 100 years old in 2017
- Japanese is affecting the English lexicon in new ways

BLOGS

JAPAN PULSE

Definition of VR

- In 1968, Ivan Sutherland (“father of computer graphics”) created the first VR and AR Head-mounted display system.
- Lanier (1989), for the first time, proposed the term of Virtual Reality and developed the VR technology to be relevant products, promoting the development and application of VR.

Technological and Psychological perspectives

- Technological perspective: VR is a collection of diverse technologies with interactive means. VR integrates a set of multiple media in a three-dimensional environment such as audio, text, video, image, and so on.
- Psychological perspective: VR was defined as a particular type of experience instead of a technology. It is the psychological sense of “being there” in the environment generated by VR.

Main types and Characteristics of VR

Types of Virtual Reality

1. Non-immersive Virtual Reality: Non-immersive virtual reality refers to a virtual experience through a computer where you can control some characters or activities within the software, but the environment is not directly interacting with you.
2. Semi-Immersive Virtual Reality:Semi-immersive virtual experiences provide users with a partially virtual environment. It will still give users the perception of being in a different reality when they focus on the digital image, but also allows users to remain connected to their physical surroundings.
3. Fully Immersive Virtual Reality: A fully immersive virtual technology ensures that you have a realistic experience within the virtual world. It will be as if you are within the physically present in that virtual world and everything is happening to you for real.

Game-oriented and Socially-oriented

- Two different types of VR system: game-oriented VR (e.g., World of Warcraft) and socially-oriented VR (e.g., Second Life)

(Papagiannidis, Bourlakis, and Li, 2008)

- Game-oriented VR has precise rules and regulations, limiting the availability of certain activities exclusively for specific characters
- Socially-oriented counterparts grant their users practically unlimited freedom and options to create their characters and to engage in virtual activities

(Nagy & Koles, 2014)

3I Characteristics of VR

Immersion

Interaction

Imagination

Comparison among three types of VR

	Fully-immersive	Semi-immersive	Non-immersive
Resolution	High	Medium	Low
Sense of immersion	High	Medium	Low
Interaction	Low	Medium	High
Price	Very expensive	Relatively expensive	Low

Types of VR headsets

- Tethered VR headsets (high-end VR headsets, PC VR, desktop VR)
- Standalone VR headsets (all-in-one HMDs)
- Smartphone VR headsets

Tethered VR headsets

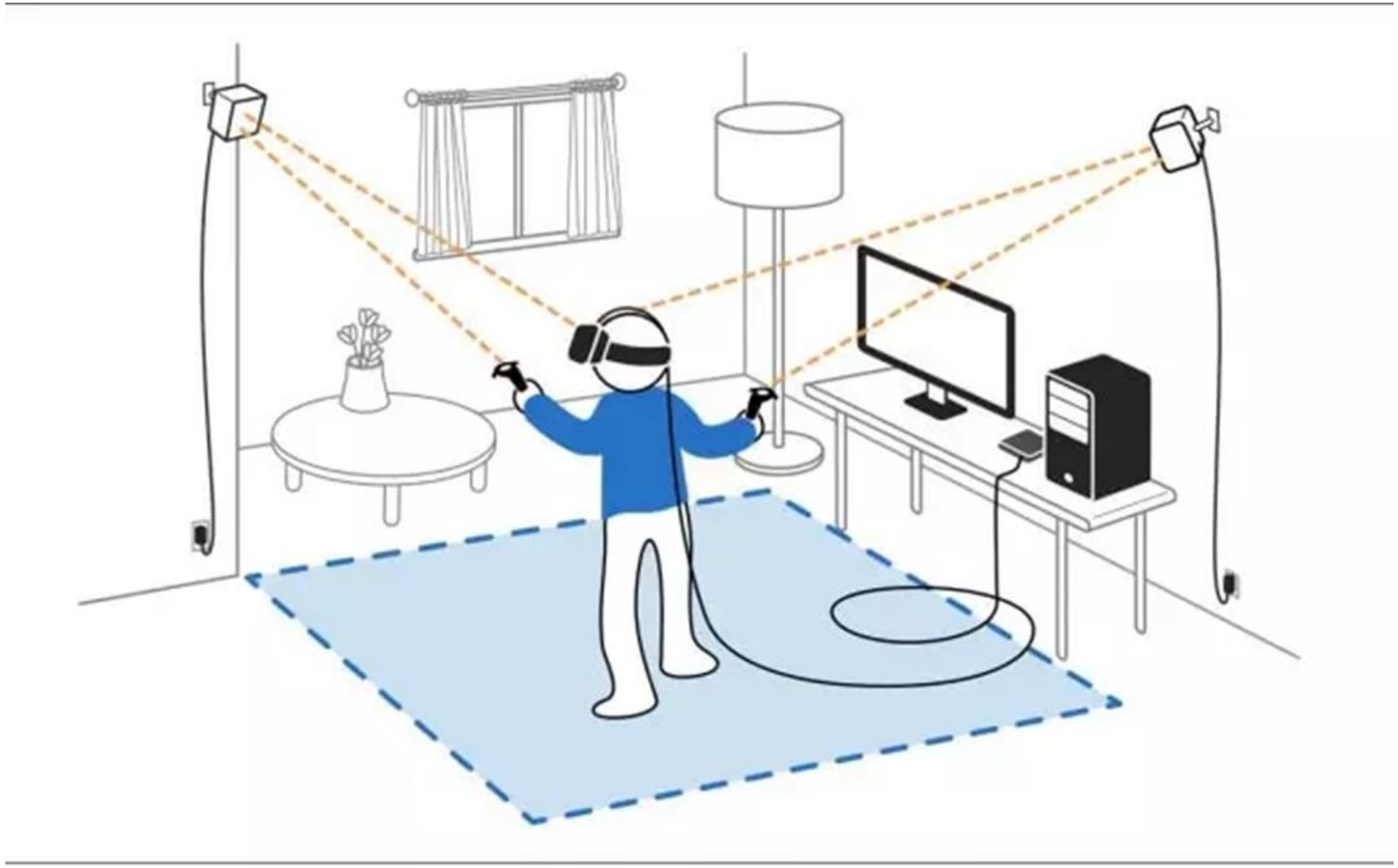


Image: https://www.healthysimulation.com/23591/how-to-set-up-vr-lab/

Standalone VR headsets

Image: https://fortune.com/2015/06/11/oculus-microsoft-partnership/

Smartphone VR headsets

Image: https://www.pngwing.com/en/free-png-ngtla

How does VR works?

Position tracking in VR

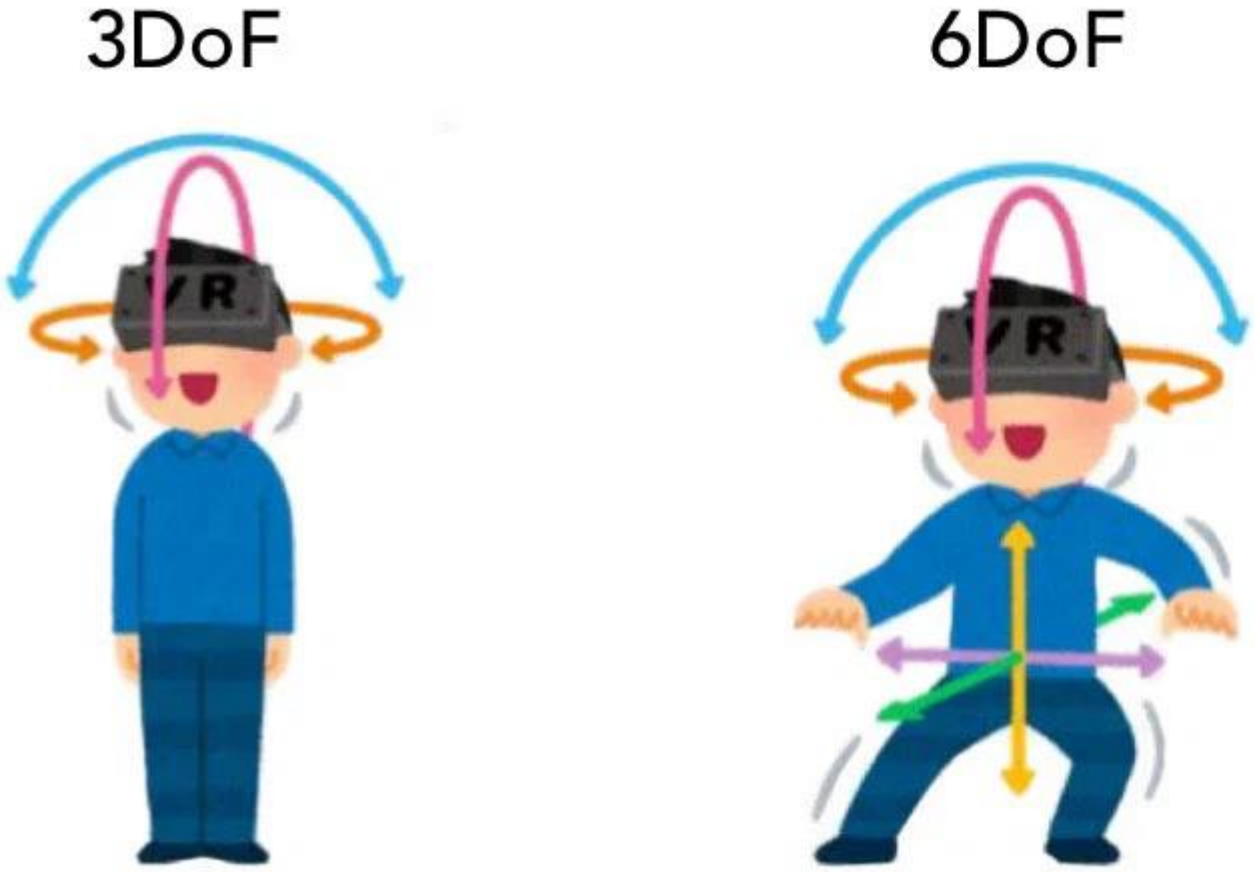


Image: https://venturebeat.com/2019/05/05/how-virtual-reality-positional-tracking-works/

Y AXIS YAW

X AXIS PITCH

Z AXIS ROLL

Y AXIS UP/DOWN

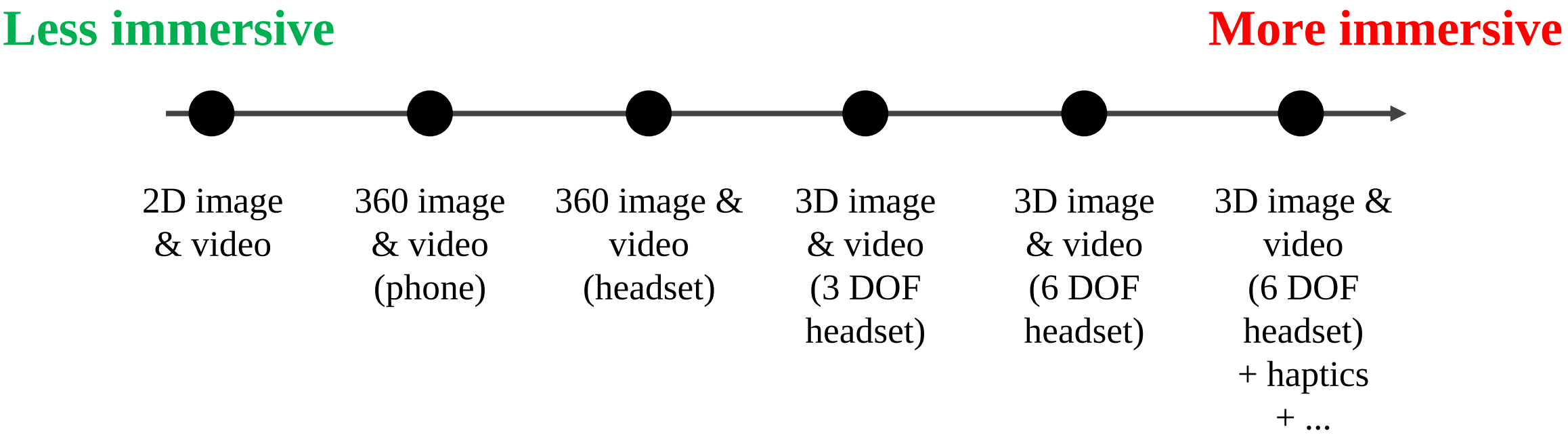
X AXIS LEFT/RIGHT

Z AXIS FRONT/BACK

Types of tracking in VR

- Heading tracking
- Eye tracking
- Motion tracking

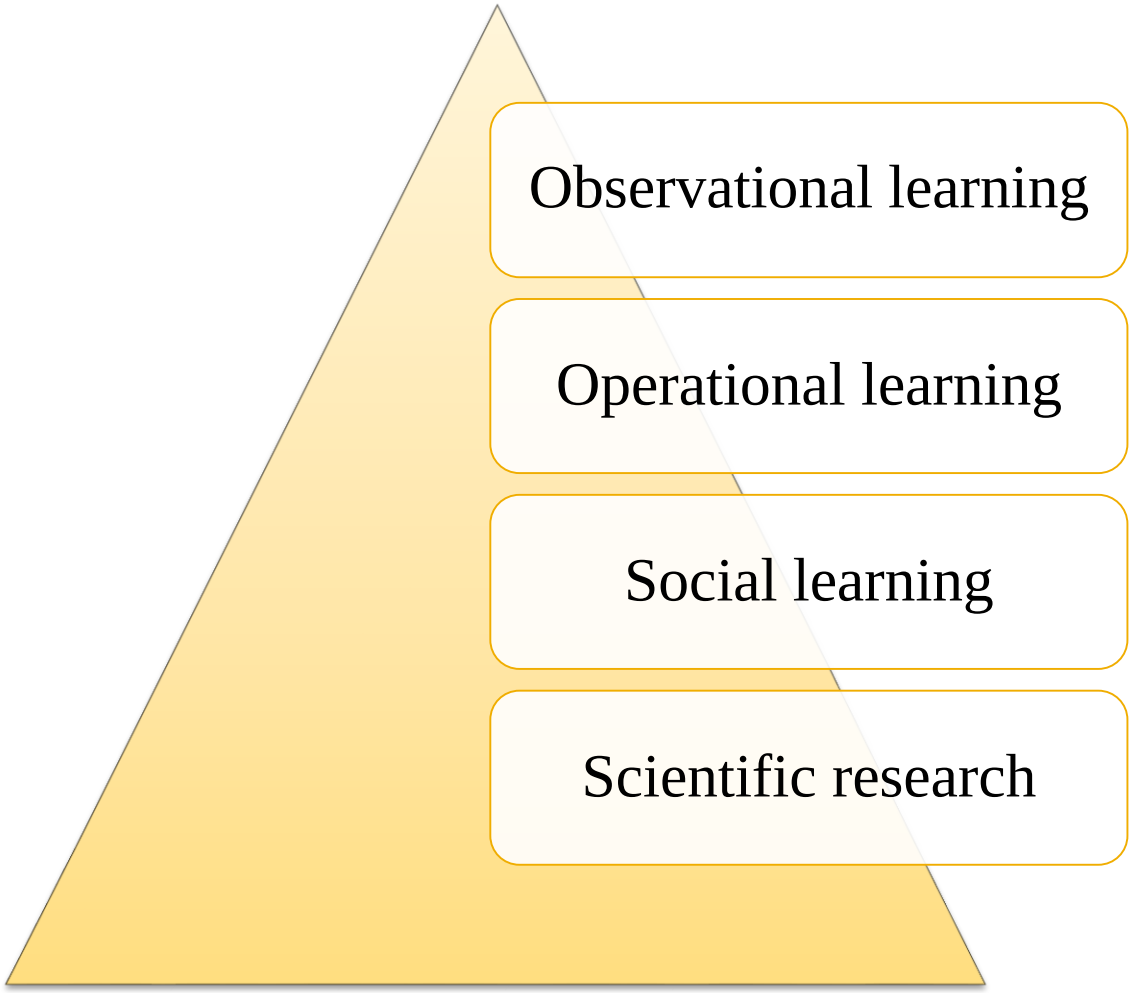
Immersion


Less immersive
More immersive
2D image & video
360 image & video (phone)
360 image & video (headset)
3D image & video (3 DOF headset)
3D image & video (6 DOF headset)
3D image & video (6 DOF headset) + haptics + ...

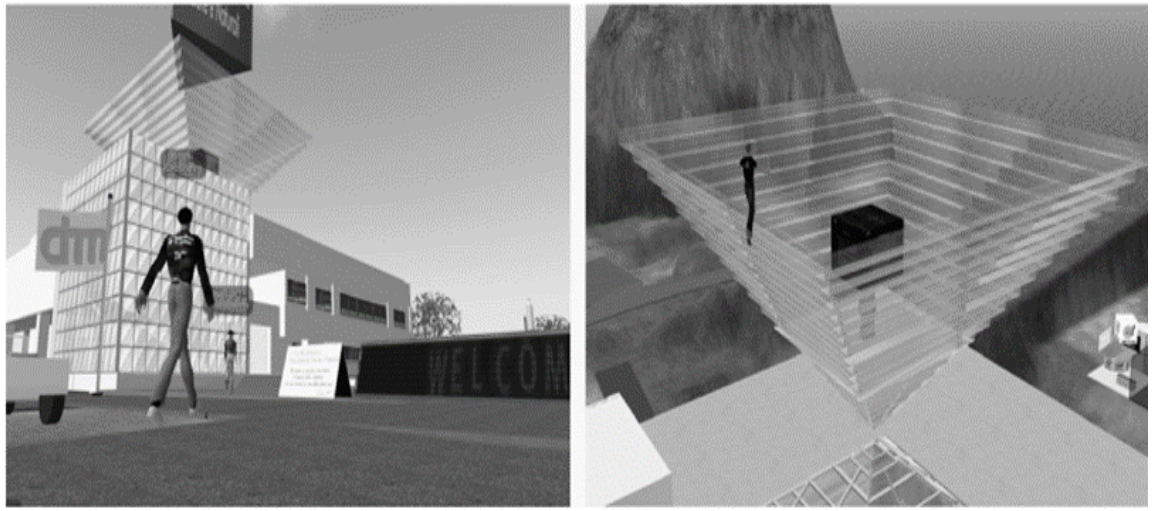
Benefits of Virtual Reality

Visualization is the best way to understand and grasp a difficult concept
VR can help to bring life to a concept helping to understand, remember and apply it

Applications of VR



Observational Learning



Virtual Campus (De Lucia, Francese, Passero, & Tortora, 2009)

Operational Learning

Using the situated learning environment created by VR, learners are allowed to operate the objects with their own hands, to observe and to experience carefully.

Example: “Newton World” developed under NASA’s “Science Space” project

Social Learning

3D virtual environment provides a multi-user virtual environment where the teachers and students are able to conduct social learning activities, highlighting its characteristic of high interaction.

Scientific Research

Challenges of Immersive VR

- Expensive in terms of both time and money
- Time and financial costs are usually not affordable for most schools
- Not Scalable in Nature
- Difficult for most teachers to learn to design VR content

Advantages of AR over VR

- Multimedia and multisensory display
- Portable and Cost-effective
- User friendly (no sense of nausea/motion sickness/cybersickness)

What is 360 VR?

It refers to the VR approach that employs 360 images/videos, allowing users to look around in all directions, and giving them the opportunity to control what they want to see.

(Walshe & Driver, 2019)

Advantages of 360 VR

- 360-degree spherical images or videos reduces the cost and time of developing the VR content
- Production of 360 VR content does not require high-tech capabilities
- Users can design their own VR content
- Easy-to-implement
- Use of real images or videos as learning materials increases increased the authenticity of learning contexts

Devices required for 360 VR

Omnidirectional camera

Multi-directional camera

Note: Panorama pictures clicked on regular smartphones can also be used

VR Headsets / (affordable) Google cardboard headsets

360 VR EDUCATOR

LOGIN REGISTER

User Login

Email

Password

Forgot Password?

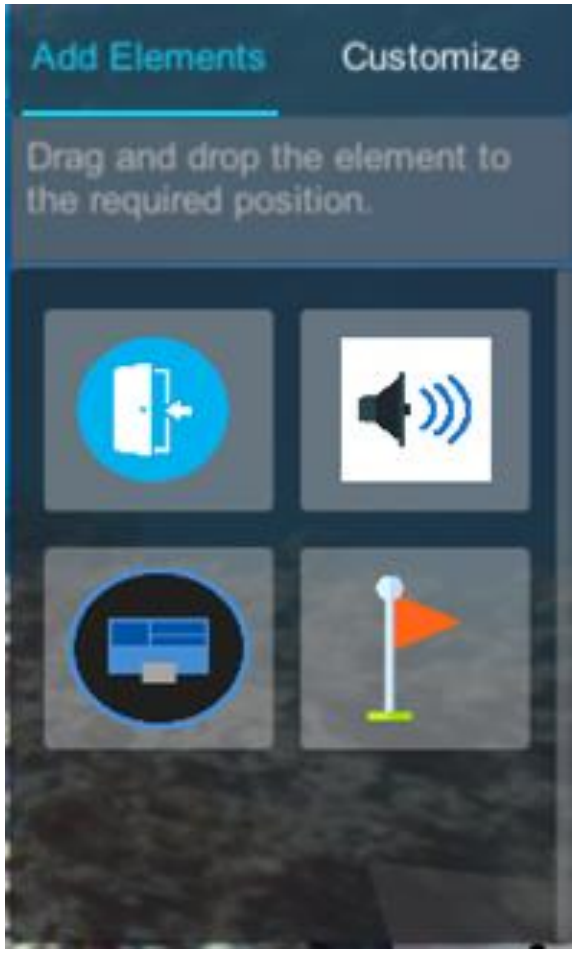
Login

Keep me signed in

Don't have an account? Register

Lesson Creation

- VR lessons can be created and modified using lesson creation tool.
- Lessons consists of chapters.
- Chapters are 360 images/videoes consisting of interactive elements called game elements.
- Currently the app has 4 game elements as follows:
  - Audio element
  - Panel element
  - Portal element
  - Checkpoint element



Create or modify existing lessons

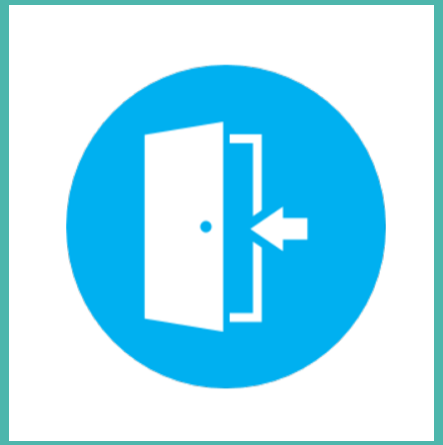
Lesson Creator Tool

Game Elements

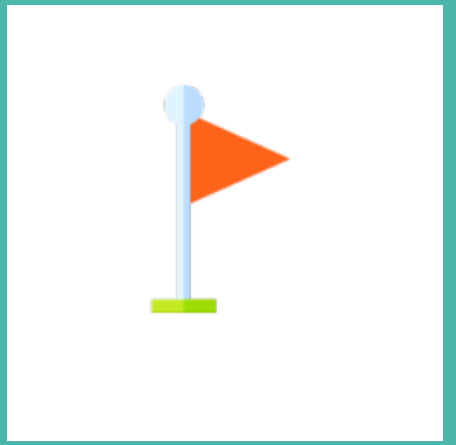
Game elements are interactive elements augmented to 360 images or videos to immersify the user experience. Here are the four game elements which can be created within a VR lesson.

Panel Element

Audio Element



Portal Element



Checkpoint Element

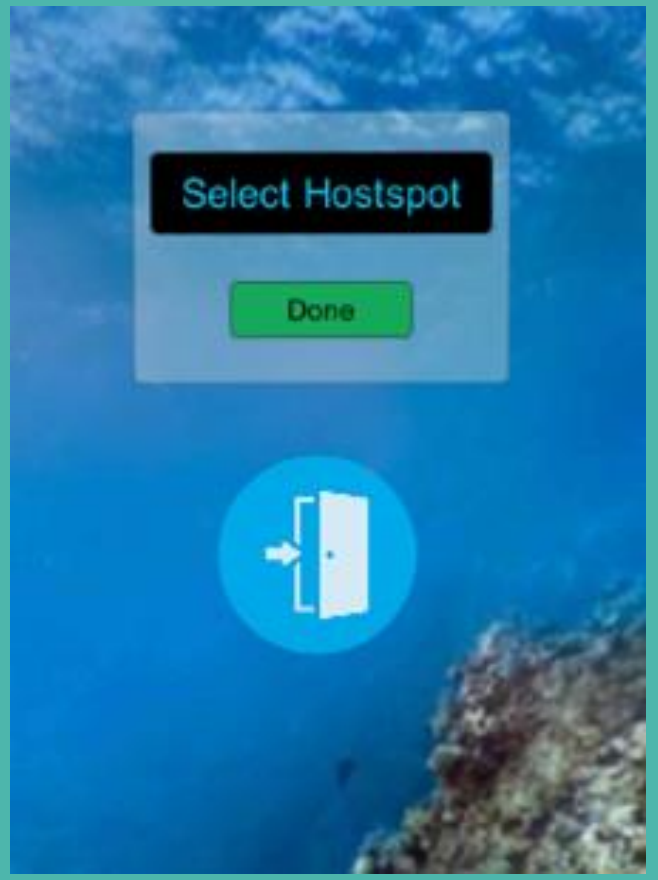
Audio Element

- Narrations can be added to the scene using audio element.
- Users have to provide the link to .mp3 file in the form of a web link (eg: http://xyz.mp3)

Creating an audio element

Portal Element

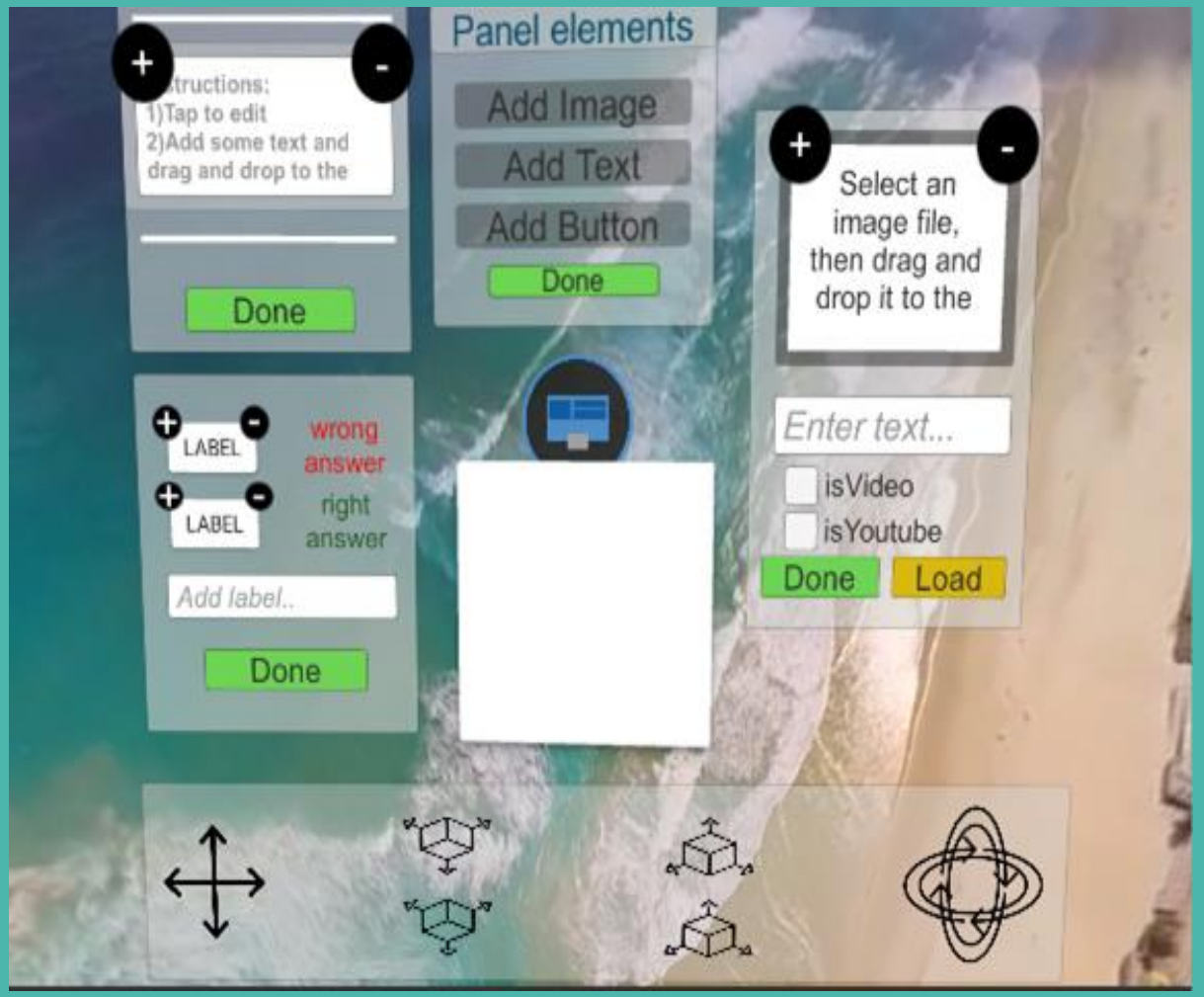
- Portal Elements are used to create links to other chapters in the lesson.
- User can navigate to another chapter by click on the portal button within the chapter.



Creating a portal element

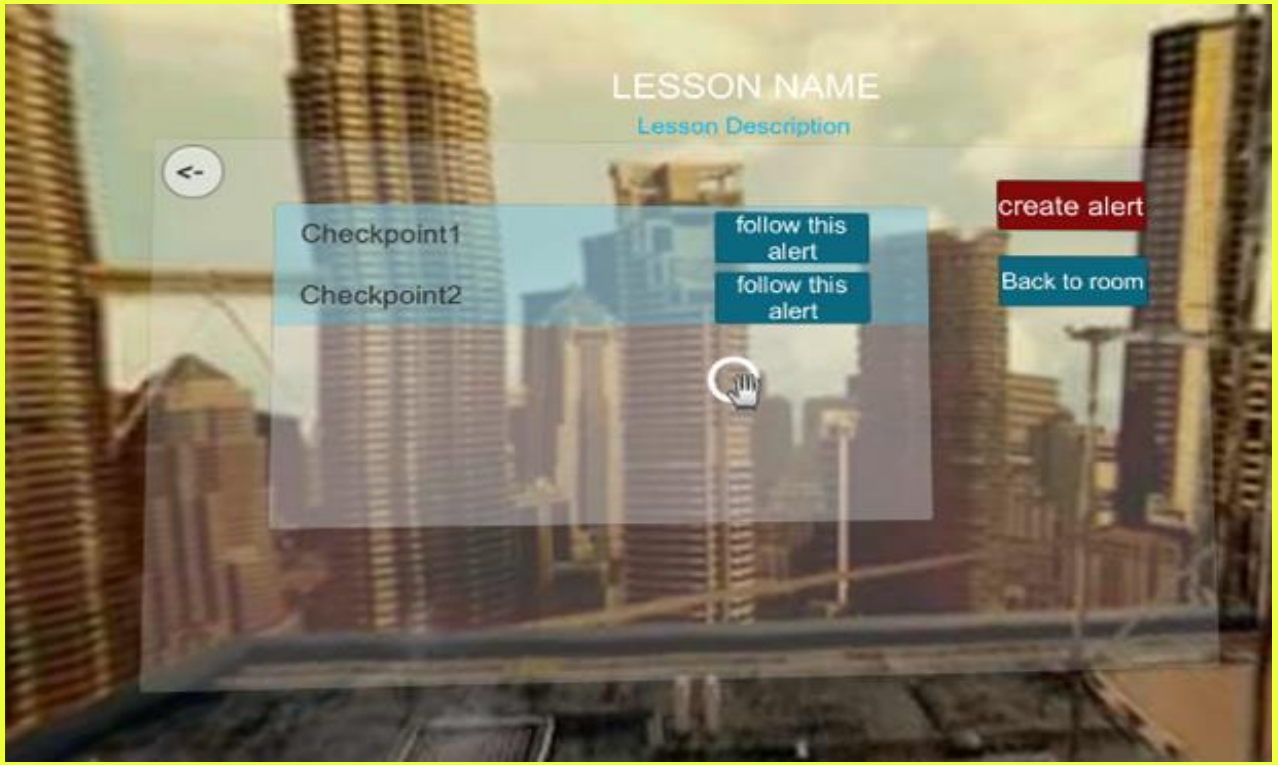
Panel Element

- Panel element is used to add interactive multimedia content to scene like texts, buttons, images, videos, videos from youtube.
- Teachers can annotate the scene or create an interactive quiz using these elements.



Creating panel element

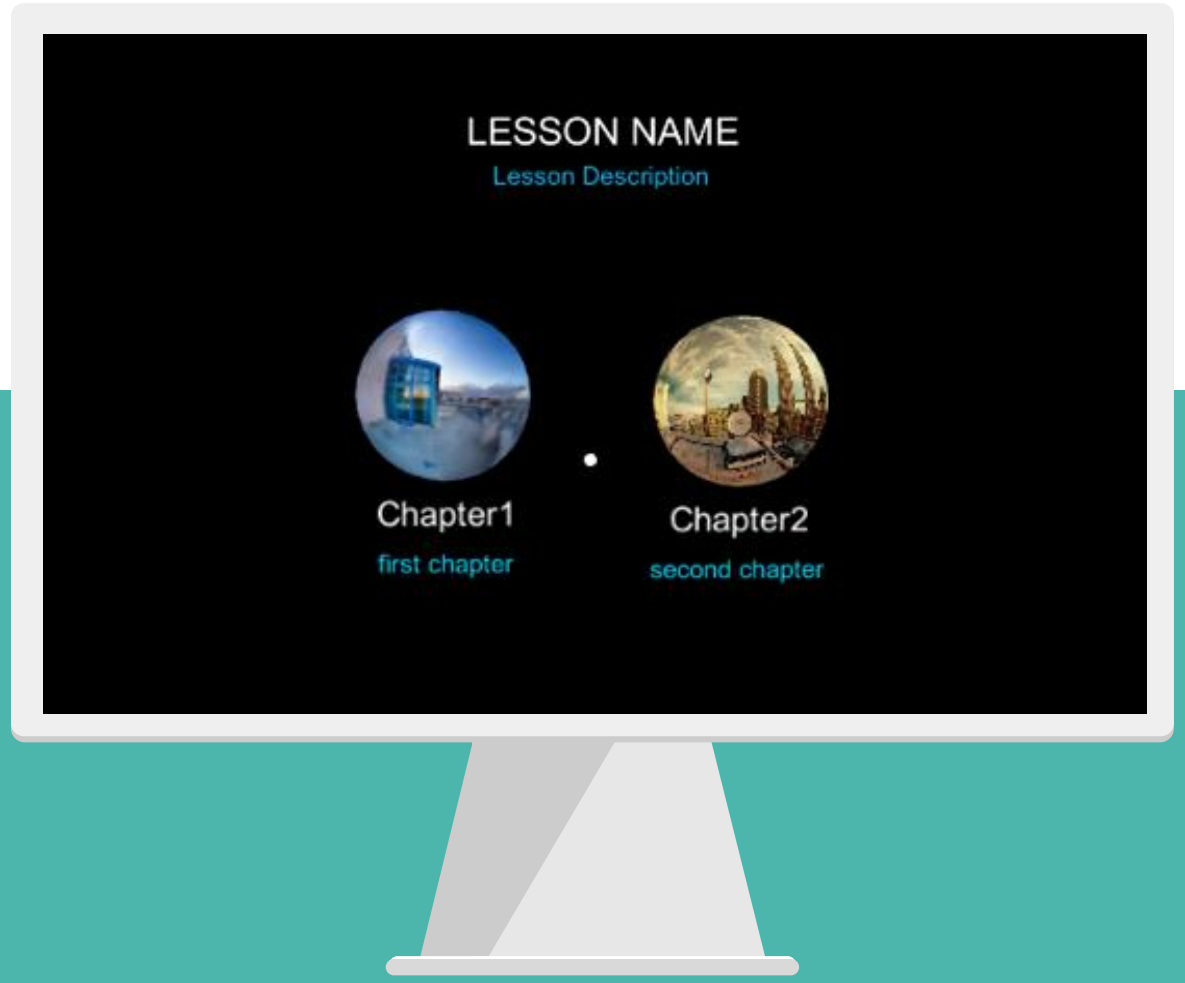
Connect, Interact, and Guide Students

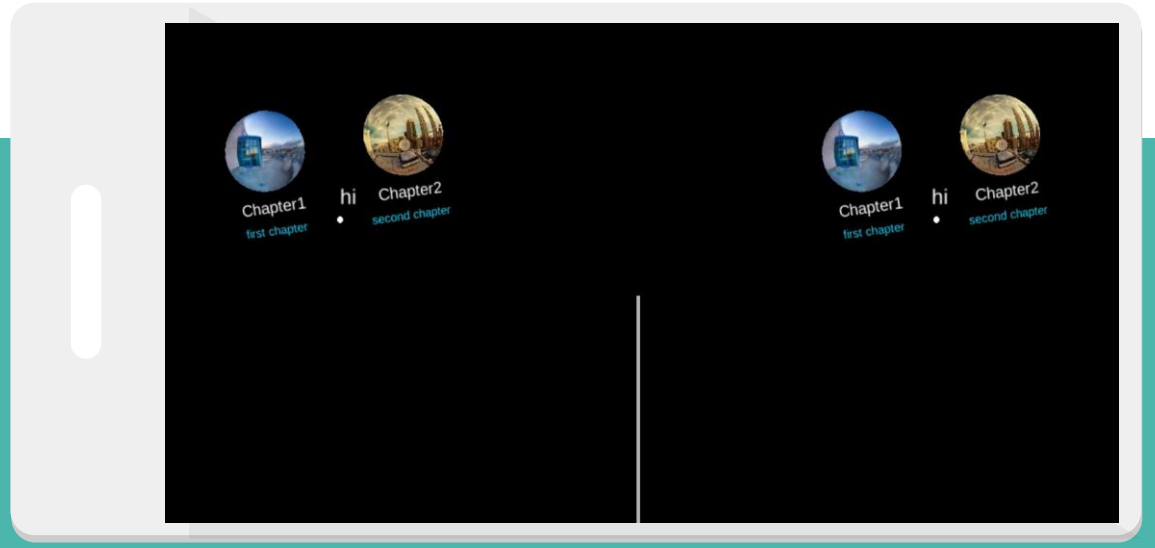


Teachers can create checkpoint element to be viewed in sequential order. Students have to click on “follow the alert” button to be guided towards the checkpoint.

Once the student clicks on “follow the alert”, he/she will be guided towards the checkpoint by a white color arrow as shown in the above figure.

Experience the content on PC and Android





360 VR Educator Vs Google Expeditions

Features	360 VR Educator	Google Expeditions
360 images and videos	Supports both 360 image as well as videos.	Only supports 360 images.
Audio element/ Narration	Is supported	Is supported
Panel Element	Is supported and has special facility to add videos from youtube.	Is supported
Portal Element	Is supported	Not supported

Features	360 VR Educator	Google Expeditions
Checkpoint element	Is supported	Is supported
Connecting/interacting with other users.	A user can guide another user even though they are located far from each other.	Users should be connected to same wifi networks to avail this facility.
AR Tours (Augmented Reality Tours)	Not Supported	Is supported
Support for multiple devices	Currently this app is supported for windows(non-VR) and android(VR) only. Support for WebGL is currently under progress.	Supports many different platforms like Chrome OS, as well as Android and Apple iOS devices.

5 Practical Ways of Using VR

- Enhanced online training simulations
- Immersive gamification in eLearning courses
- Customized learning paths in web-based courses
- Learning assessments with visual feedback
- Advanced learning analytics in online training

Source: https://blog.commlabindia.com/elearning-design/ar-vr-elearning-role