Introduction to Augmented Reality and its Future in Education and Learning

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VIRTUAL AND AUGMENTED REALITY
Virtual Reality

- Head mounted display, gloves
- Separation from the real world

https://www.youtube.com/watch?v=Ykf4gDEzIC8
Augmented Reality

- Combines Real and Virtual Images
- Interactive in real-time
- Registered in 3D

https://www.youtube.com/watch?v=Qm2gnnyyvEg
Strong vs. weak AR

• Weak AR
  • Imprecise tracking
  • No knowledge of environment
  • Limited interactivity
  • Handheld AR

• Strong AR
  • Very accurate tracking
  • Seamless integration into real world
  • Natural interaction
  • Head mounted AR
Augmented vs. virtual reality

<table>
<thead>
<tr>
<th></th>
<th>Virtual Reality</th>
<th>Augmented Reality</th>
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<tbody>
<tr>
<td><strong>Scene Generation</strong></td>
<td>Requires realistic images</td>
<td>Minimal rendering okay</td>
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<tr>
<td><strong>Display Device</strong></td>
<td>Fully immersive, wide field of view</td>
<td>Non-immersive, small field of view</td>
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<tr>
<td><strong>Tracking</strong></td>
<td>Low to medium accuracy is okay</td>
<td>The highest accuracy possible</td>
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HISTORY OF AR
Early head-mounted display (HMD) patents

McCollum’s Stereo TV HMD (1943)  
Heilig’s Multisensory HMD (1960)
Sutherland’s first see-through HMD system (1968)

https://www.youtube.com/watch?v=NtwZXGpxag
US Air Force SuperCockpit Program (1970-80’s)
First industrial use – Boeing wire harness assembly (early 1990’s)
Further development of the field

- 1990’s: Collaboration, outdoor, interaction
- 1990’s: Augmented sports broadcasts
- 1995 - … : Tools and applications (interaction, usability, theory)
- 2005 - …: Commercial Applications (games, medical, industry)
- March 2007: MIT Technology Review, one of 10 most exciting technologies
- December 2007: Economist, AR like reality, only better
- 2013: Google Glass
- 2014: Epson Moverio BT-200
- 2016: Microsoft Hololens
View through Microsoft Hololens

https://www.youtube.com/watch?v=RddvMLwT__g
History summary

- Augmented Reality has a long history going back to the 1960’s
- Interest in AR has exploded over the last few years
- AR is being commercialized quickly
- AR is growing in a number of areas
  - Mobile AR
  - Web based AR
  - Marketing experiences
  - Gaming
  - Learning
SAMPLE AR APPLICATIONS
Typical AR Experiences

• Web based AR
  • Flash, HTML 5 based AR
  • Marketing, education

• Outdoor Mobile AR
  • GPS, compass tracking
  • Viewing Points of Interest in real world

• Handheld AR
  • Vision based tracking
  • Marketing, gaming

• Location Based Experiences
  • HMD, fixed screens
  • Museums, point of sale, advertising
AR books

https://www.youtube.com/watch?v=tRtLs6n_9Vw

https://www.youtube.com/watch?v=X4UGOd9gHrg
Medical AR applications


Remote support


Holoportation

AUGMENTED REALITY FOR FUTURE EDUCATION AND LEARNING
Vision for teaching and education with augmented reality

• Use AR to support remote presence in labs

• Use AR to review designs in real environments

• Use AR to train skills and procedures

• Use AR to analyse large data sets

• Use AR to augment and extend standard teaching material
MICROSOFT HoloLens Demo