

A Survey of Visual, Mixed, and Augmented Reality Gaming

Bruce H. Thomas, "A survey of visual, mixed, and augmented reality gaming," *Computers in Entertainment (CIE)*, vol.10, no.1, pp.1-33, 2012

Outline

1. Introduction

2. Tools

3. Indoor AR gaming

- a. HMD
- b. Spatially immersive display(SID)
- c. Handheld

4. Outdoor AR gaming

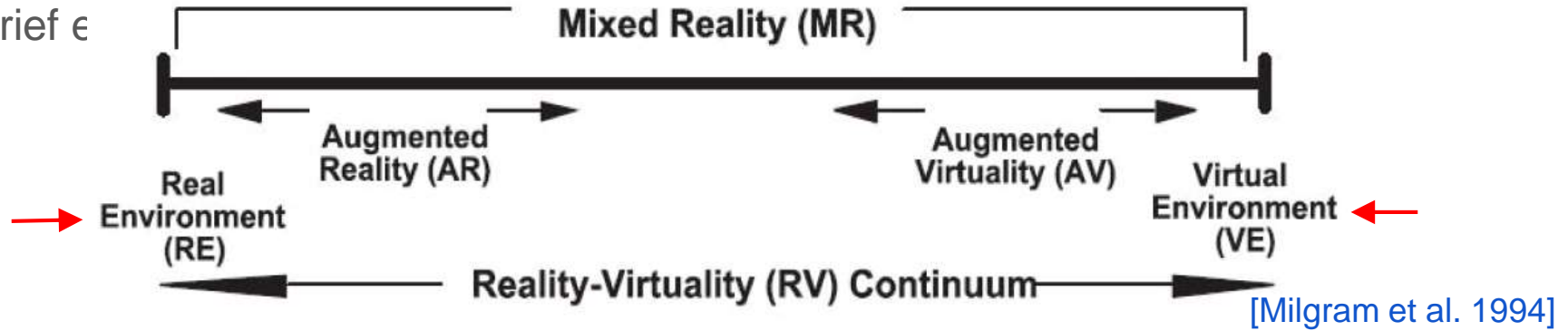
- a. Handheld
- b. HMD

Introduction

A survey of visual, mixed and augmented reality gaming in both the academic and commercial contexts.

Mixed reality (MR) and **augmented reality (AR)** are well-established areas of investigation for entertainment computing.

Brief e



For ease of reading, the term augmented reality will encompass both mixed and

The difference between AR and VR,

1. **AR**: It requires a limited amount of the user's field of view to be rendered with computer-generated graphics.

VR: The entire visual world must be rendered, causing users to feel that they exist in a virtual world.

1. AR's ability to allow users to view physical world provides a better sense of where they are and who is around them.

2. AR gives users the ability to move around, it allows users to understand and experience the game more intuitive.

Structure of AR

AR gaming takes on a number of different forms based on:

1. whether it is played **indoors** or **outdoors**; and
2. the type of display: head-mounted displays(**HMD**); **hand-held displays**; or **projector-based displays**.

According to these properties, There are five form factors:

1. indoor/HMD,
2. indoor/handheld,
3. indoor/projector,
4. outdoor/HMD, and

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Tools

1. There are a number of hardware and software frameworks developed to support AR gaming.

- a. HyperReality framework for building AR and context-aware applications. [Romero and Correia 2003]



- a. HYPERPRESENCE, a framework for developing augmented reality applications and games with robotic elements. [Tavares et al. 2003]



Tools (cont.)



- c. Muddleware, a communication framework for AR multiuser games for handheld devices. [\[Wagner and Schmalstieg 2007\]](#)

- d. D... the rapid design exploration of AR experiences. [\[MacIntyre et al. 2004\]](#)



- d. **ARToolkit**, a most popular AR development library, is an open-source computer tracking library to create AR applications. [\[Kato and Billinghurst 1999\]](#)
ARToolkit's public availability, ease of use, and low cost, allows for lots of technology, such as AR puzzle game, AR tic-tac-toe, AR music game.



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Indoor/HMD

There are many HMD-based AR games, including **AR Mah-Jong**, Jumanji, Othello, AR2Hockey, ARTankwar, BattleBoard, Billinghamurst, MasterMind, MonkeyBridge, BLADESHIPS, **AR singing game**, AR racing game, AR painting game and so on.

First, AR Mah-Jong, a classic Chinese board game, it is played at a table and AR displays all the game pieces. The AR for this game is the combination of virtual game pieces and the real space (p

AR Tankwar



Indoor/HMD (cont.)

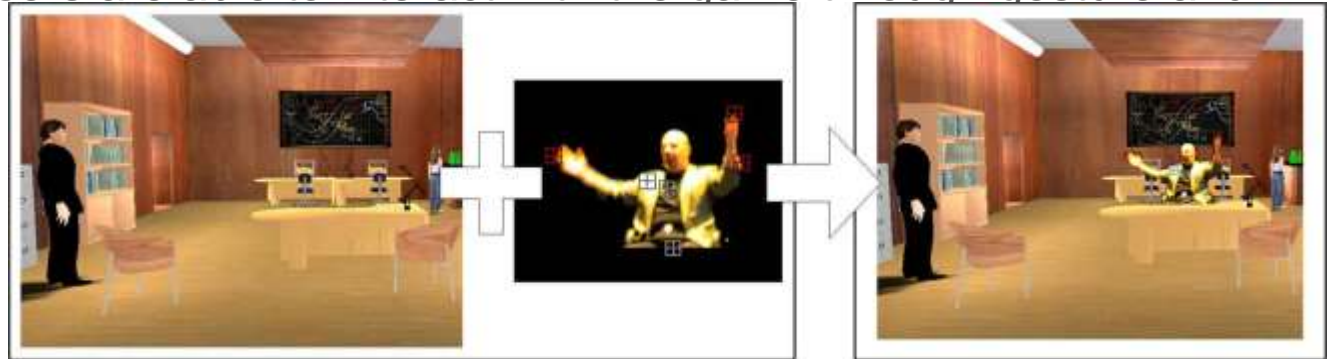
AR Karaoke, the idea is to play a favorite role of a movie inside the movie. The user wears an HMD and acts a role in a movie scene via voice and movement. The movie is shown to the user in a first-person perspective.



Indoor/Spatially immersive display(SID)

There are many SID-based AR games, including Comino, fantasy-based game, dueling card game, AR chinese checker, Ninja on a Plane, **story-telling system**, **game-based learning system** and so on.

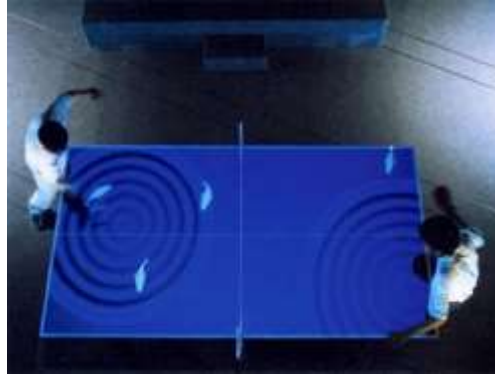
AR story-telling system, the user's image is captured in real time via a video camera. This form of AR is similar to post-production for special effects for a movie. The users are able to interact with the game through gesture and speech.



Indoor/SID (cont.)

Sport games, by their very nature, are well suited to SID environments.

AR PingPongPlus game



AR soccer game, Breakout for Two

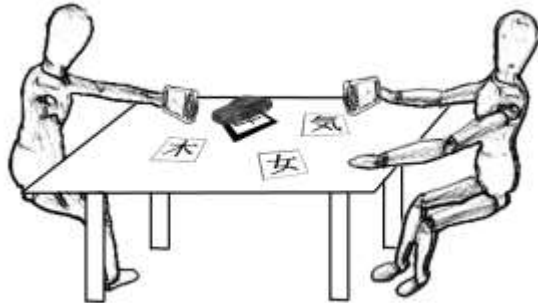


Indoor/Handheld

There are a lot of handheld-based AR games, including The Invisible Train, Kick-Real, AR Tennis, AR Japanese Kanji, Cows vs. Aliens and so on.

AR tennis, in this game players sit opposite each other with a table between them. The game is shown on the mobile phone.

AR Japanese Kanji symbols learning system, users are given an icon that represents symbols.



Indoor AR gaming

AR games for the indoor home follows the concept of users playing in one particular location.

There are many advantages to play games on a computer rather than on a physical world, such as the ability to introduce **animation** and other multimedia presentations.

Warpping the game's visual and sound around the user will draw the user futher into the game.

The employment of an indoor AR gaming provides a number of **interesting** user interface and entertainment applications.

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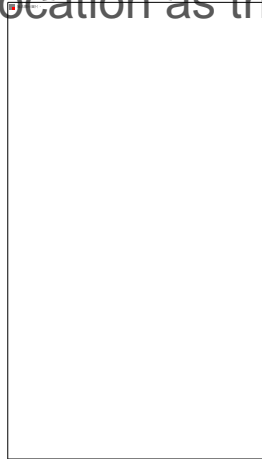
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Outdoor/Handheld

There are three handheld-based AR games, including Real Tournament, Forgotten Island, and LAMP3D.

Pokemon Go, players use a mobile device's GPS capability to locate, capture, battle, and train virtual creatures, called Pokémon, who appear on the screen if they were in the same real world location as the player.



Outdoor/HMD

ARQuake, Human Pacman, NetAttach, Epidemic Menace, Time Warp, ARCHEOGUIDE, AR for exploring in a old city, Augursope and so on.

Outdoor AR game for exploring history in an old city, Cologne city. They employed a new concept of presenting AR historical information in different time periods, like a time travel.



medieval



roman



Outdoor AR gaming

Due to the outdoor setting, these game are mobile applications.

The user is movable and able to walk through the physical space.

The application is situated in the physical world.

Outdoor gaming presents visual information that augments the world in indirect ways.

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Commercial AR gaming systems

Commercial AR games can currently be found on major gaming platforms, including consoles (such as PS3 and XBOX) and handheld devices.

Console-based AR game: Sony PS3 Start The Party!, the camera, EyeToy, was used to place the player in the game.

Handheld-based AR game: Sony PSP EyePet, allows users to move their virtual pets around the house or even outdoors.



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Conclusion

HMD display technology is not a real indication of the current focus of AR gaming, but it will be in future.

The number of commercial AR games with **handheld** display indicates this form of platform will be a deployment of AR gaming in the near future.

SID technology will also be an active area of investigation for AR gaming.

Spatial augmented reality (SAR), the extension of spatial immersive displays, is an exciting new direction for AR gaming. And it may help present information in an educational environment like a school.



Thank you.