Realidade Mista

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https://www.flickr.com/photos/28889534@N06/4444800454/

Palestra para MAC0101

19/05/15

Resumo

- Conceitos
  - Realidade Virtual, aumentada e mista
  - Realidade mediada
- Realidade Mista
  - realidade ou ficção (onde estamos?)
  - aplicações (e softares)
  - como funciona
- Aqui no DCC (o que estudar)

Conceitos

Realidade Virtual

REAL ENVIRONMENT — **MIXED REALITY (MR)** — **VIRTUAL ENVIRONMENT**

Tangible User Interfaces (TUI)

A TUI uses real physical objects to both represent and interact with computer-generated information (Ishii & Ullmer, 2001).

Augmented Reality (AR)

AR 'adds' computer-generated information to the real world (Azuma, et al. 2001).

Augmented Virtuality (AV)

AV 'adds' real information to a computer-generated environment (Regenbrecht, et al. 2004).

Virtual Reality (VR)

VR refers to completely computer-generated environments (Ni, Schmidt, Staadt, Livingston, Ball, & May, 2006; Burdea & Coffet 2003)

Projection Augmented models (PA model) are a type of Spatial AR display, and are closely related to TUIs

Spatial AR

Spatial AR displays project computer-generated information directly into a user's environment (Bimber & Raskar, 2005).

'See-through' AR (either optical or video)

A user wears a head-mounted display, through which they can see the real world with computer-generated information superimposed on top (Cakmakci, Ha & Rolland, 2005; Billinghurst, Grasset & Looser, 2005).

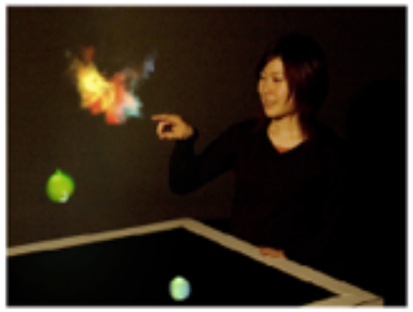
Semi-immersive VR

A semi-immersive VR display fills a limited area of a user's field-of-view.

Immersive VR

Immersive VR, which uses either a head-mounted-display or a projection-based system, completely fills the user's field-of-view.

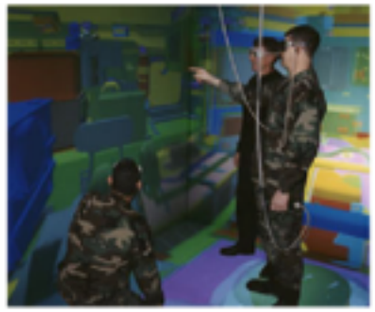
Using physical objects to create a virtual model (Ichida, Itoh, & Kitamur, 2004). As a user adds a physical 'ActiveCube' to the construction, the equivalent virtual model is automatically updated.



The 'Bubble Cosmos' – 'Emerging Technology' at SIGGRAPH'06. The paths of the smoke-filled bubbles are tracked, and an image is projected into them as they rise.

See-through AR: the butterfly is computer-generated, and everything else is real (Fischer, Bartz & Straßer, 2006; Kölsch, Bane, Höllerer, & Turk, 2006).

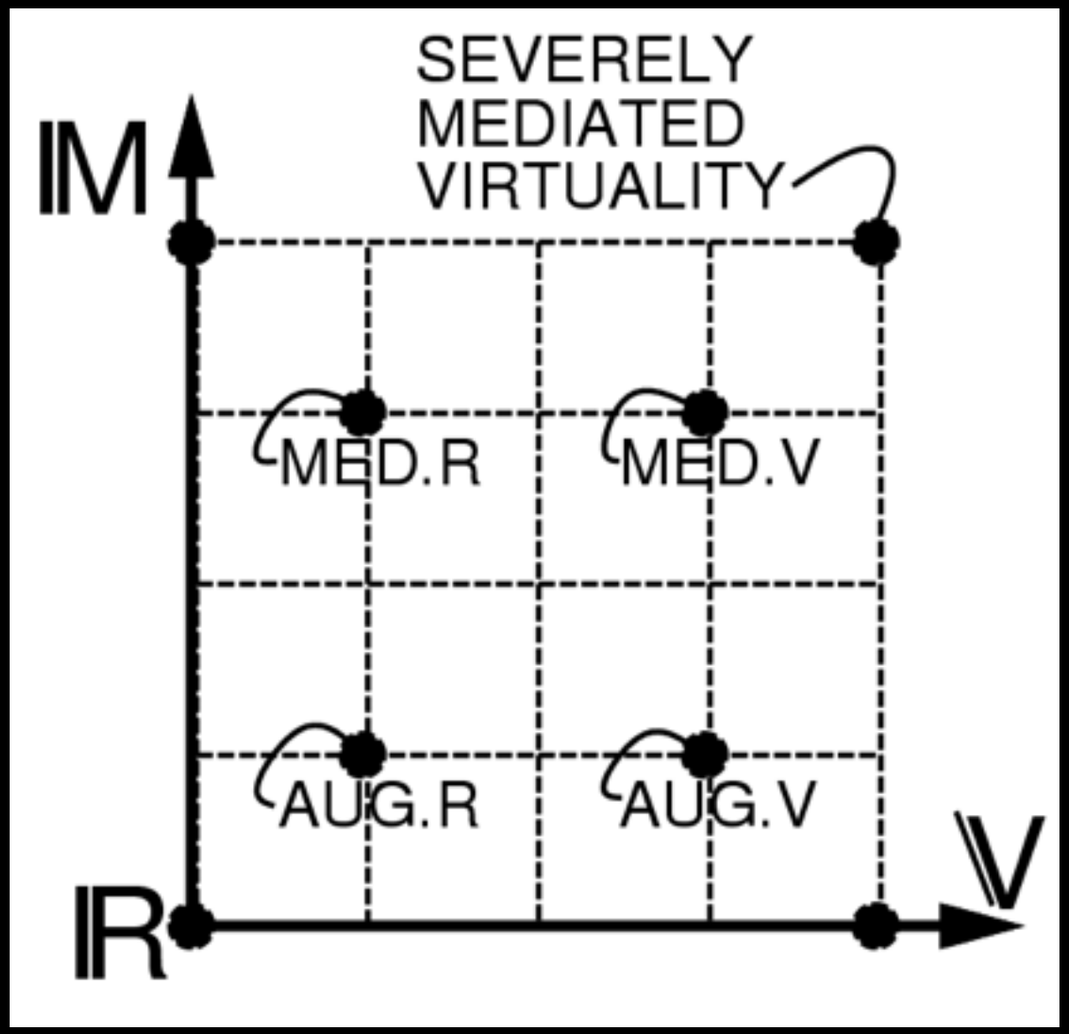
Semi-immersive VR using the Barco Baron workbench (Drettakis, Roussou, Tsingos, Reche & Gallo, 2004).



Projection-based immersive VR. The users are fully immersed in the 'CAVE' (FakeSpace, 2006; Cruz-Neira, Sandin & DeFanti, 1993).

http://upload.wikimedia.org/wikipedia/en/archive/d/d2/20071229194039!Adapted_milgrams_VR-AR_continuum.png

Realidade Mediada



- Permite modificações da realidade ou da virtualidade
- Realidade diminuída

+ terminologia

- Realidade aumentada: sistema onde o usuário atua sobre uma versão “melhorada" da realidade. As “melhorias" são virtuais (geradas por computador).

- Realidade mista: sistema que combina objetos reais e virtuais, e informação.

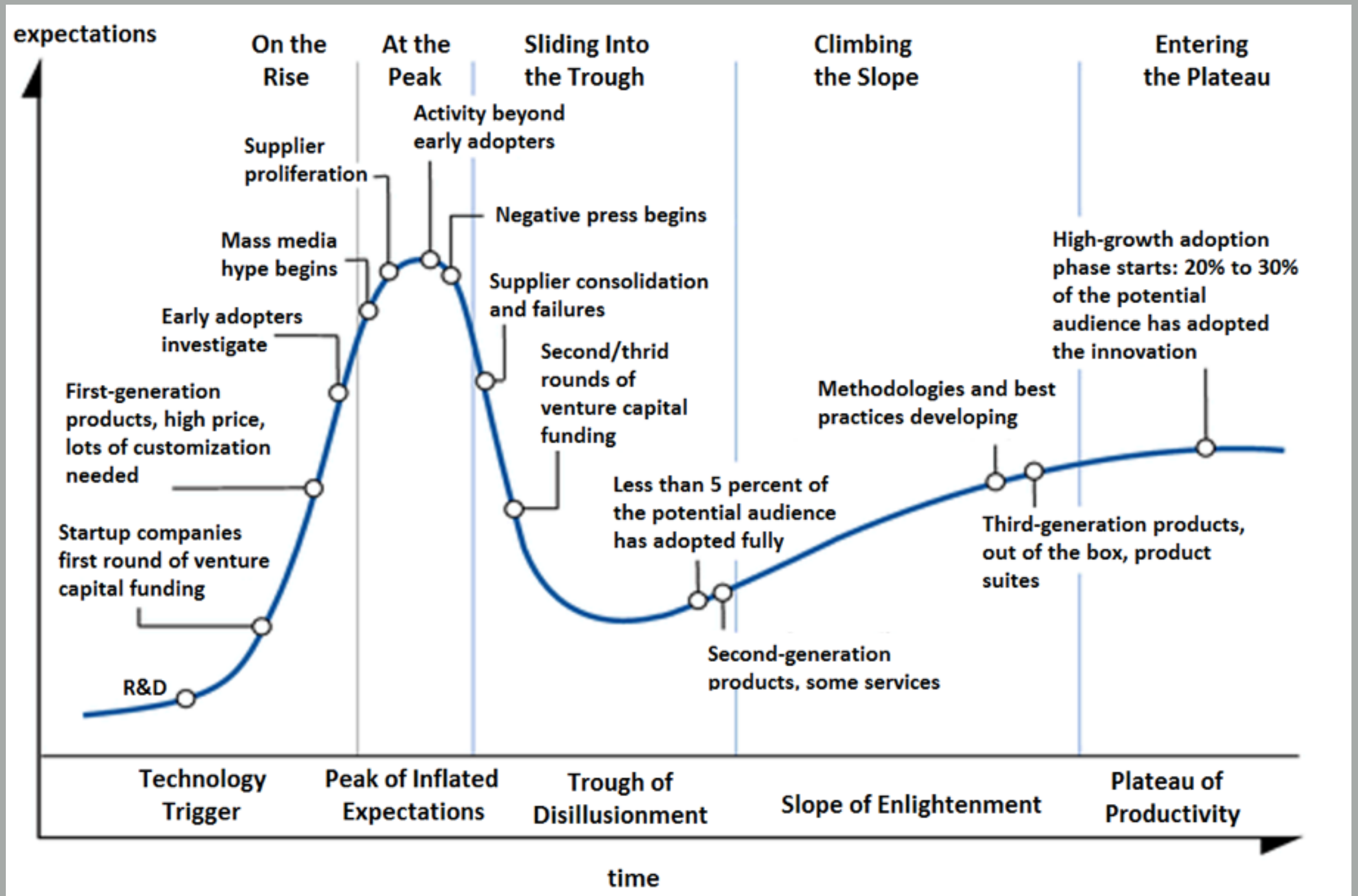
Realidade Virtual

Occulus Rift
Google CardBox
Microsoft HoloLens

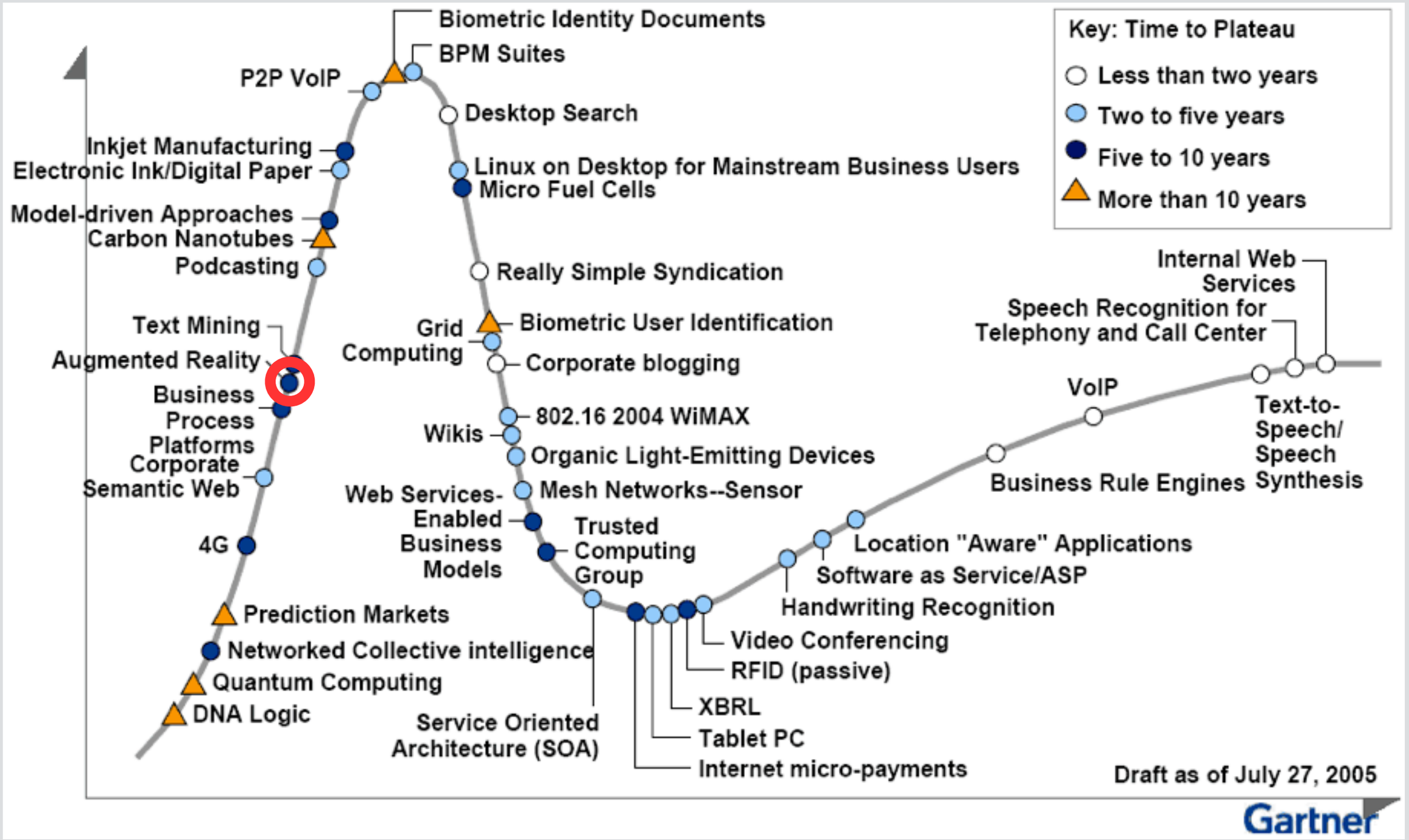
Mixed Reality

hype or reality?

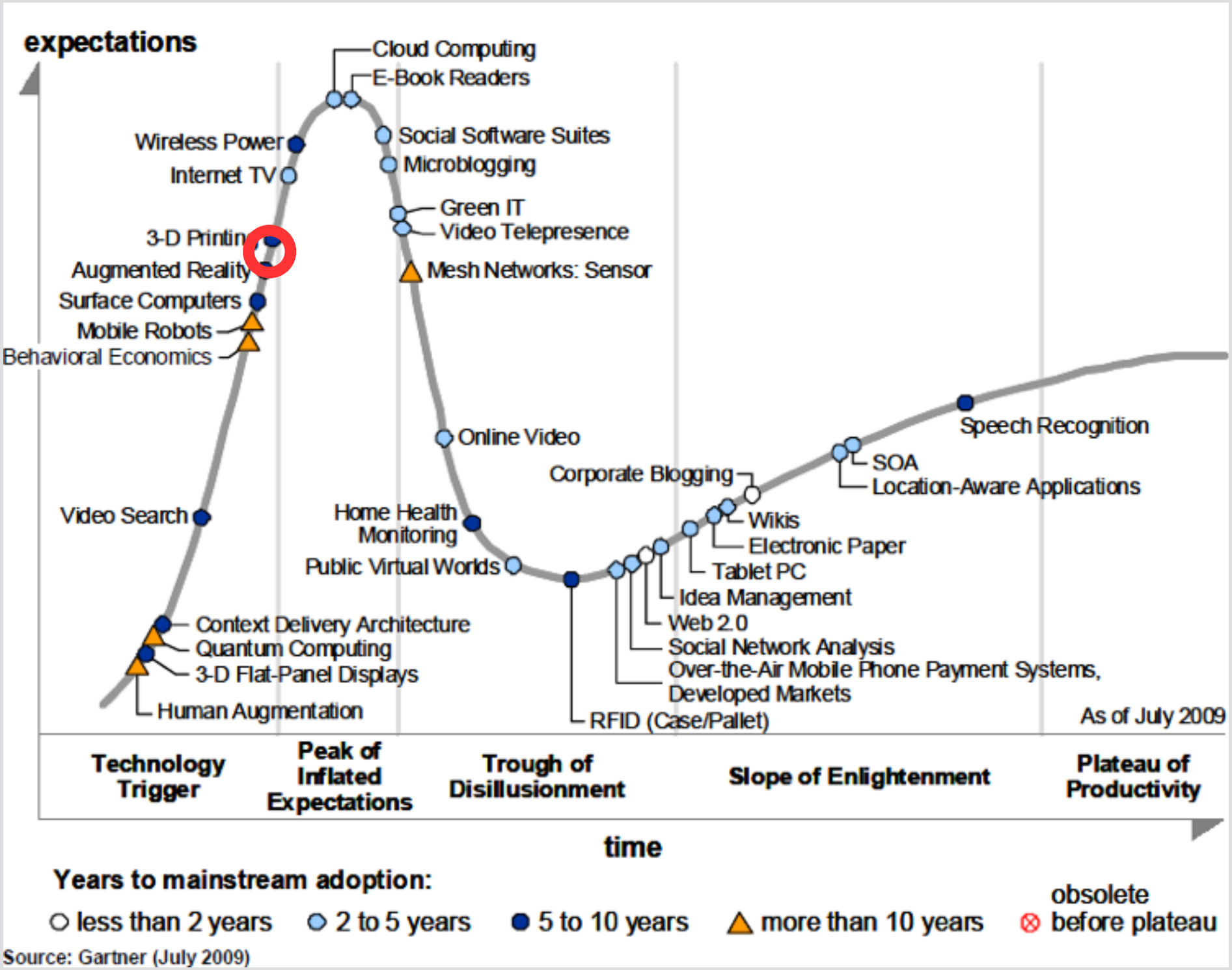
The AR hype curve



The AR hype curve

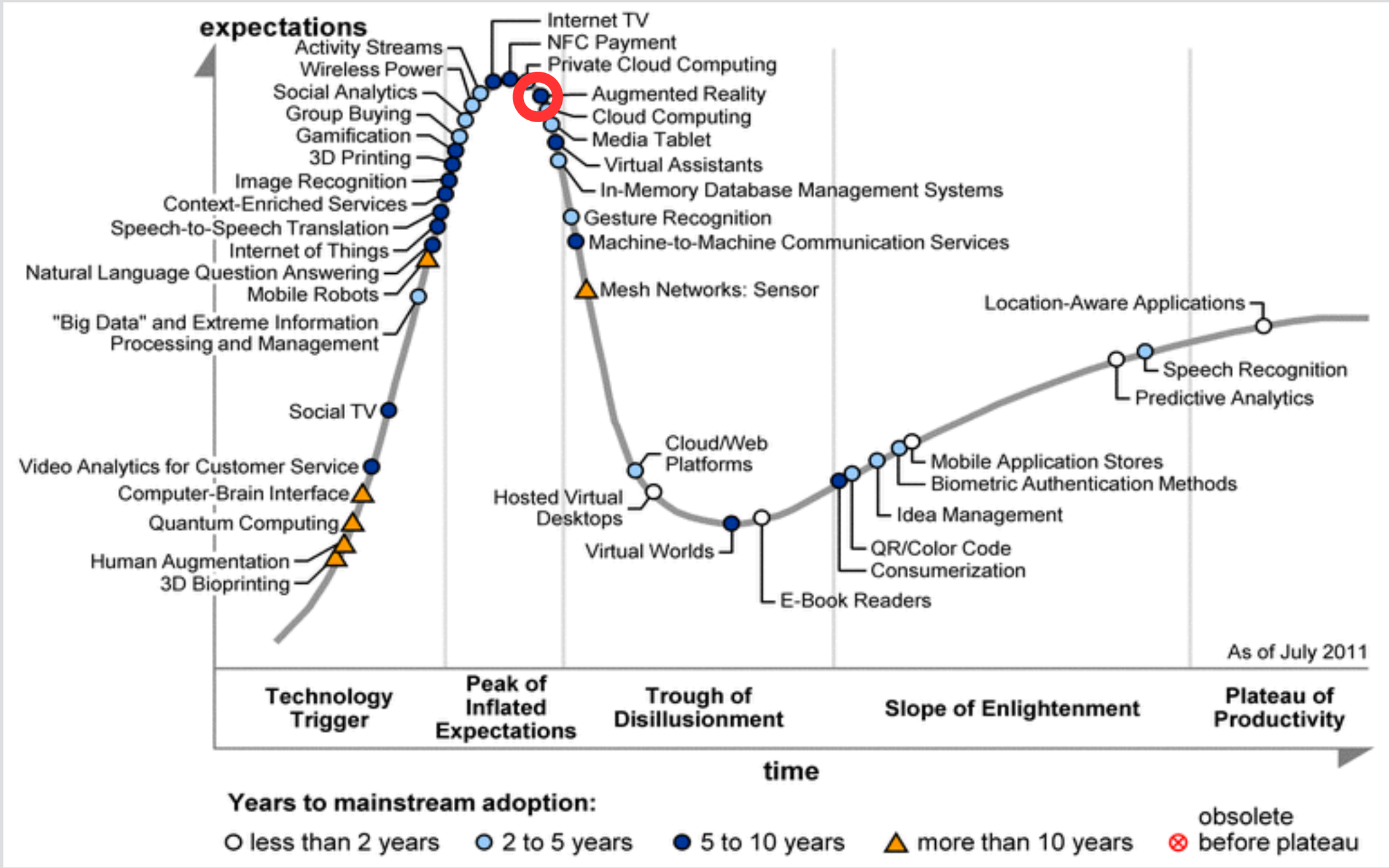


The AR hype curve

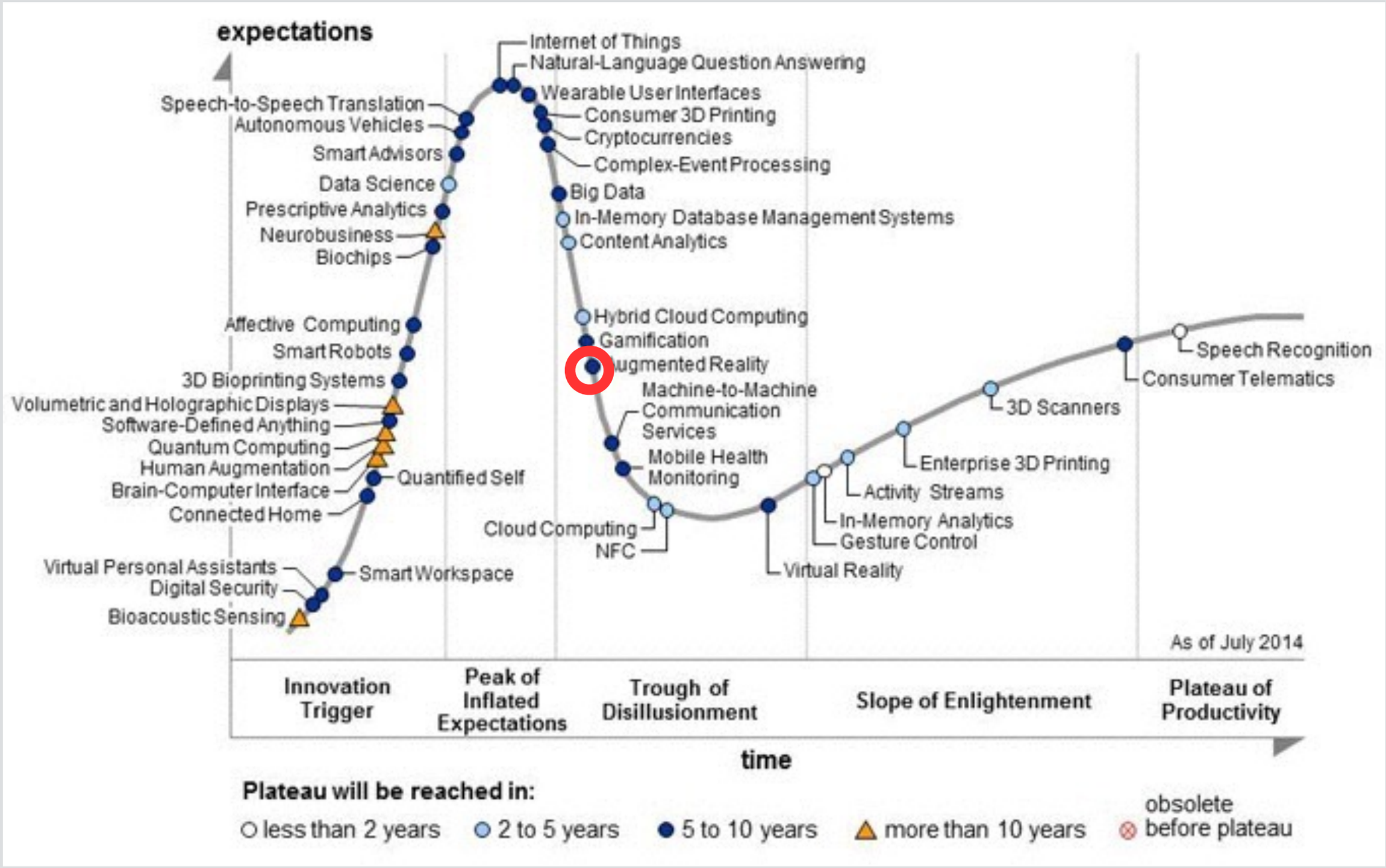


Source: Gartner (July 2009)

The AR hype curve



The AR hype curve



Aplicações

- Manutenção
- Treinamento
- Turismo, cultura
- Design, arquitetura, construção
- Militares

still, there are loads of...

Frustration with AR

Expectations

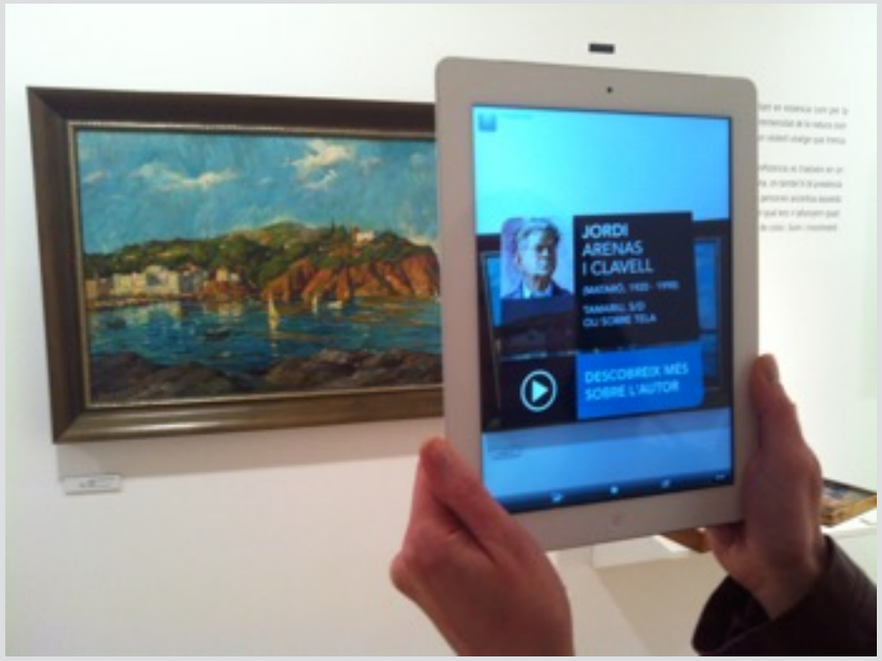
©MagicLeap

- Compelling and immersive
- Always on but non-obtrusive
- Can't live without it

+

Wow experience

Reality



- Virtual and real clearly apart
- Very specific and device-oriented
- Useful but expendable

+

Meh experience

yet, everyone is betting on...

AR for the future

Top 10 Strategic Technology Trends for 2015

Merging the Real World and the Virtual World	1	Computing Everywhere
	2	The Internet of Things
	3	3D Printing
Intelligence Everywhere	4	Advanced, Pervasive and Invisible Analytics
	5	Context-Rich Systems
	6	Smart Machines
The New IT Reality Emerges	7	Cloud/Client Computing
	8	Software-Defined Applications and Infrastructure
	9	Web-Scale IT
	10	Risk-Based Security and Self-protection

Which could mean:
AR + wearables + augmented cognition

Gartner SYMPOSIUM ITXPO 2014

AR software scene

commercial

metaio
AUGMENTED SOLUTIONS

D'Fusion® Studio Suite

AURASMA

craftar
BY catchoom

wikitude
See more.

layar

Qualcomm®
Vuforia™

open-source

ALVAR

ArUco

DroidAR

BEYONDAR

andAR

mixare
augmented reality engine

AR Toolkit

osgART

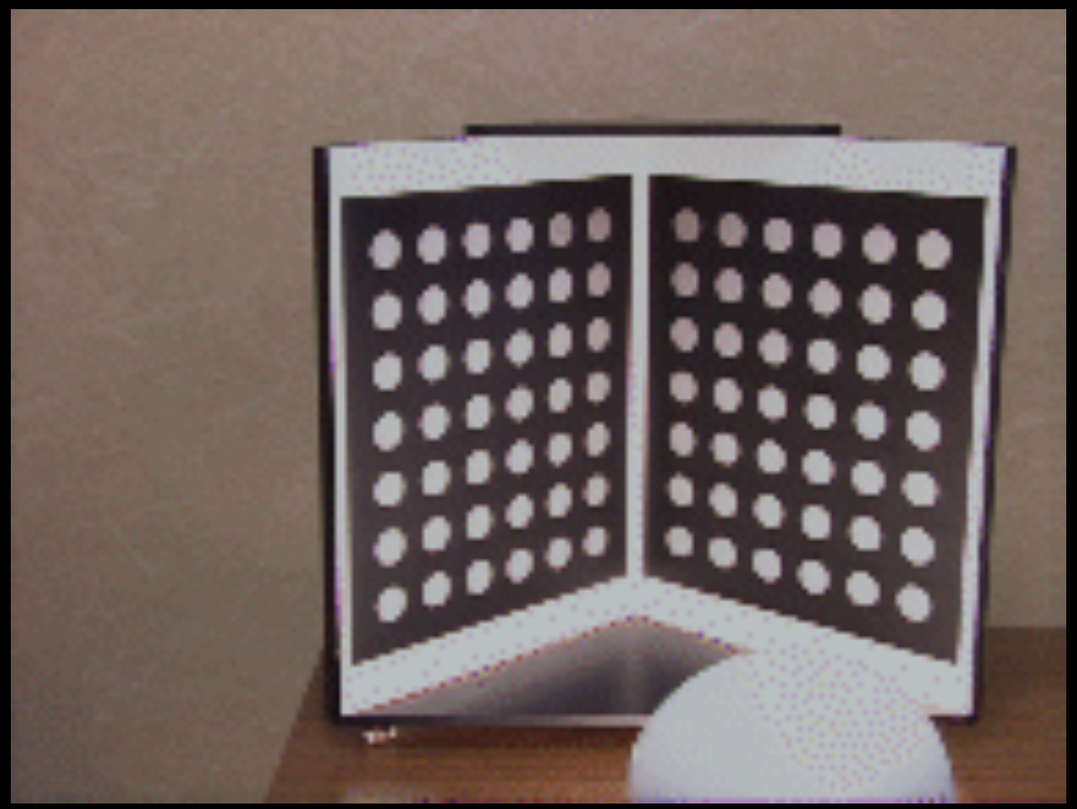
Mixed Reality

Como funciona?

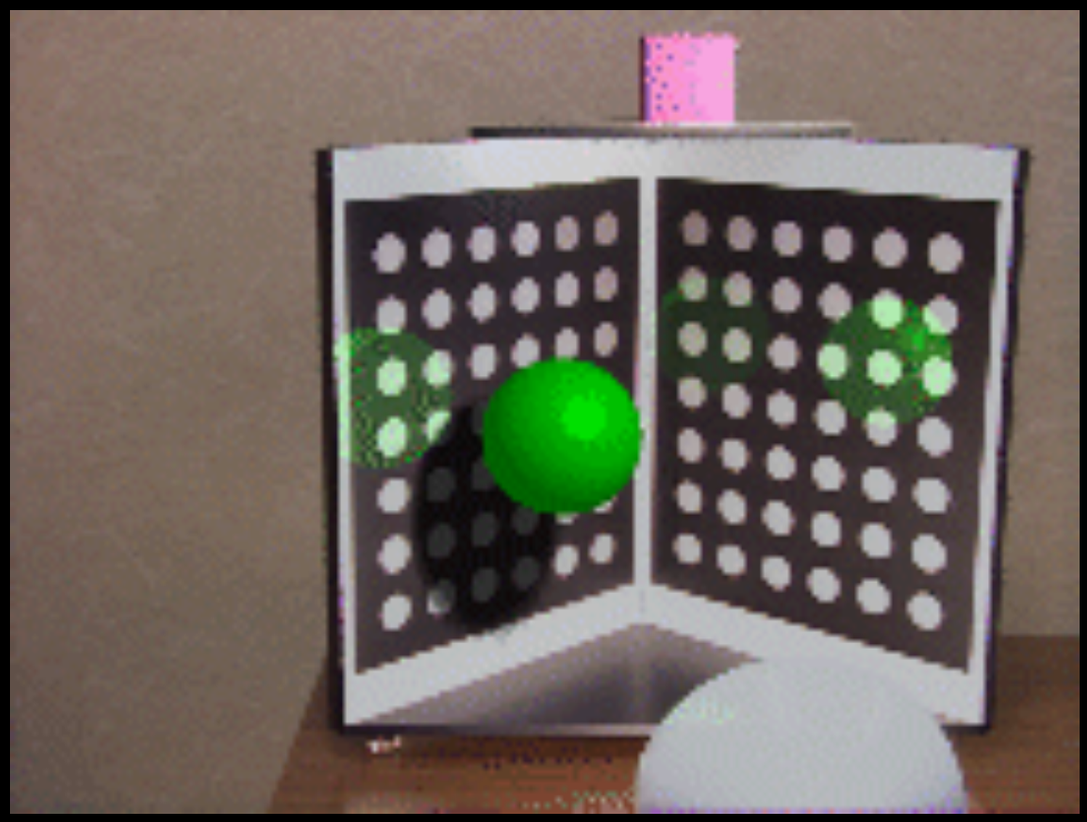
Como combinar real com virtual?

- Requer modelos dos objetos virtuais (computação gráfica)
- Conhecer os locais e propriedades ópticas da câmera e do display (visão computacional)
- Calibração dos dispositivos

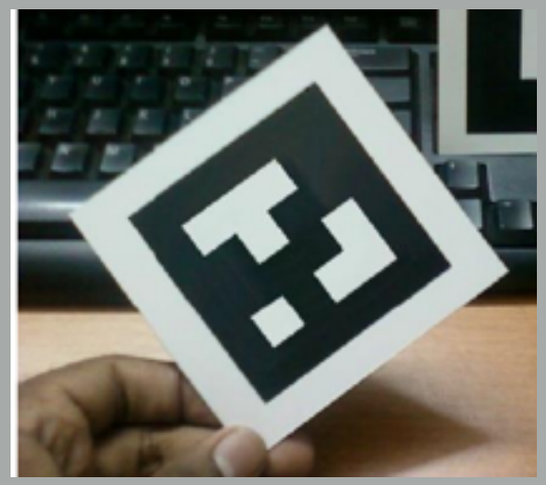
- Registro dos modelos 3D dos objetos sobre os seus locais na cena (marcas)
- Rastrear as marcas, o usuário, e as interações do usuário, marcas e cena.



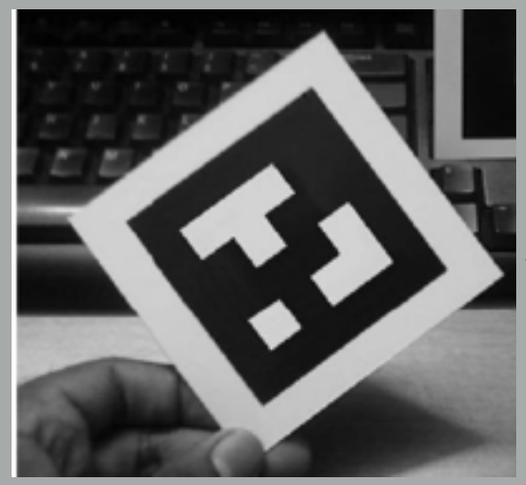
- Desafios
  - Comportamento realista
    - movimentos
    - sombras
  - Oclusão
  - Detecção de colisão



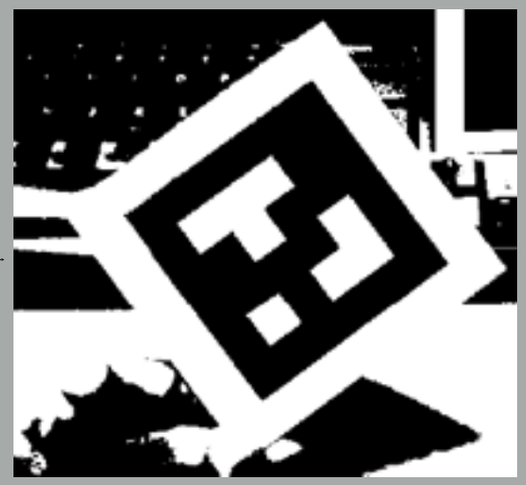
Uso de Marcadores



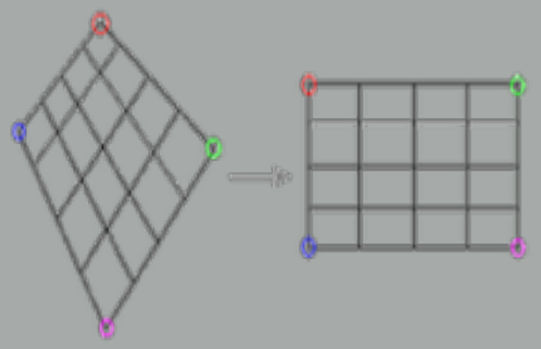
Input RGB image



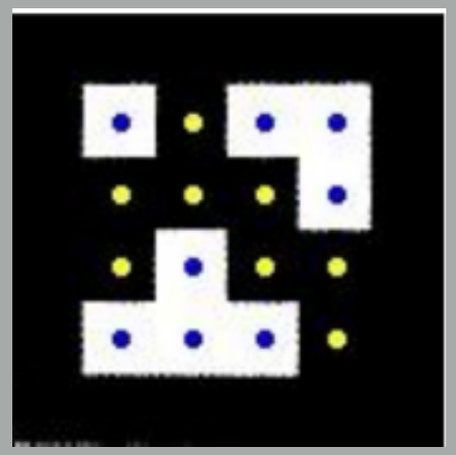
Convert to grayscale



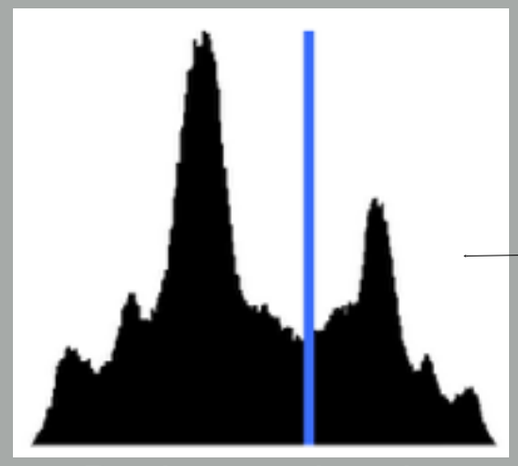
Threshold it



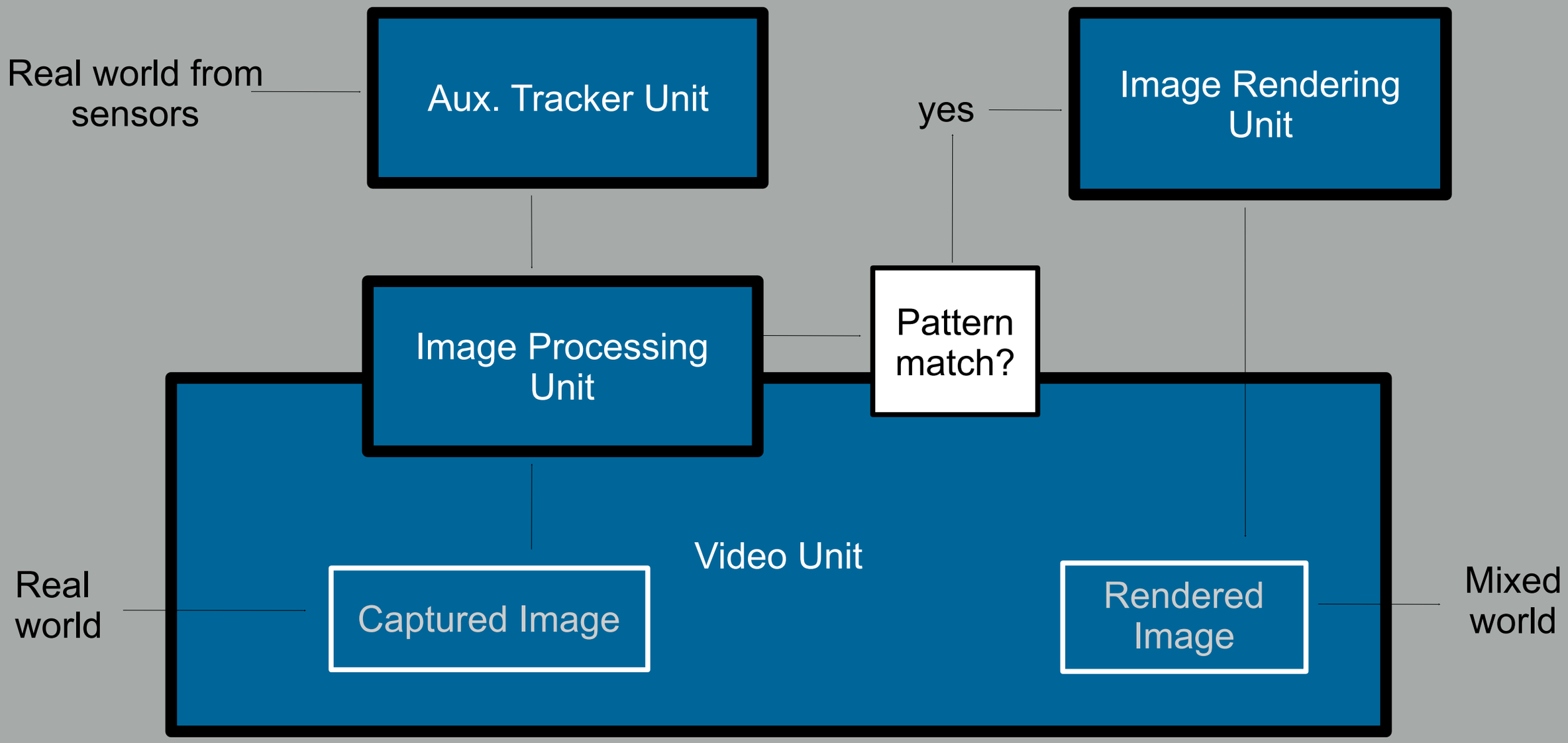
Do some projective mapping before rendering



Find connectivity and decode



Background and foreground classes



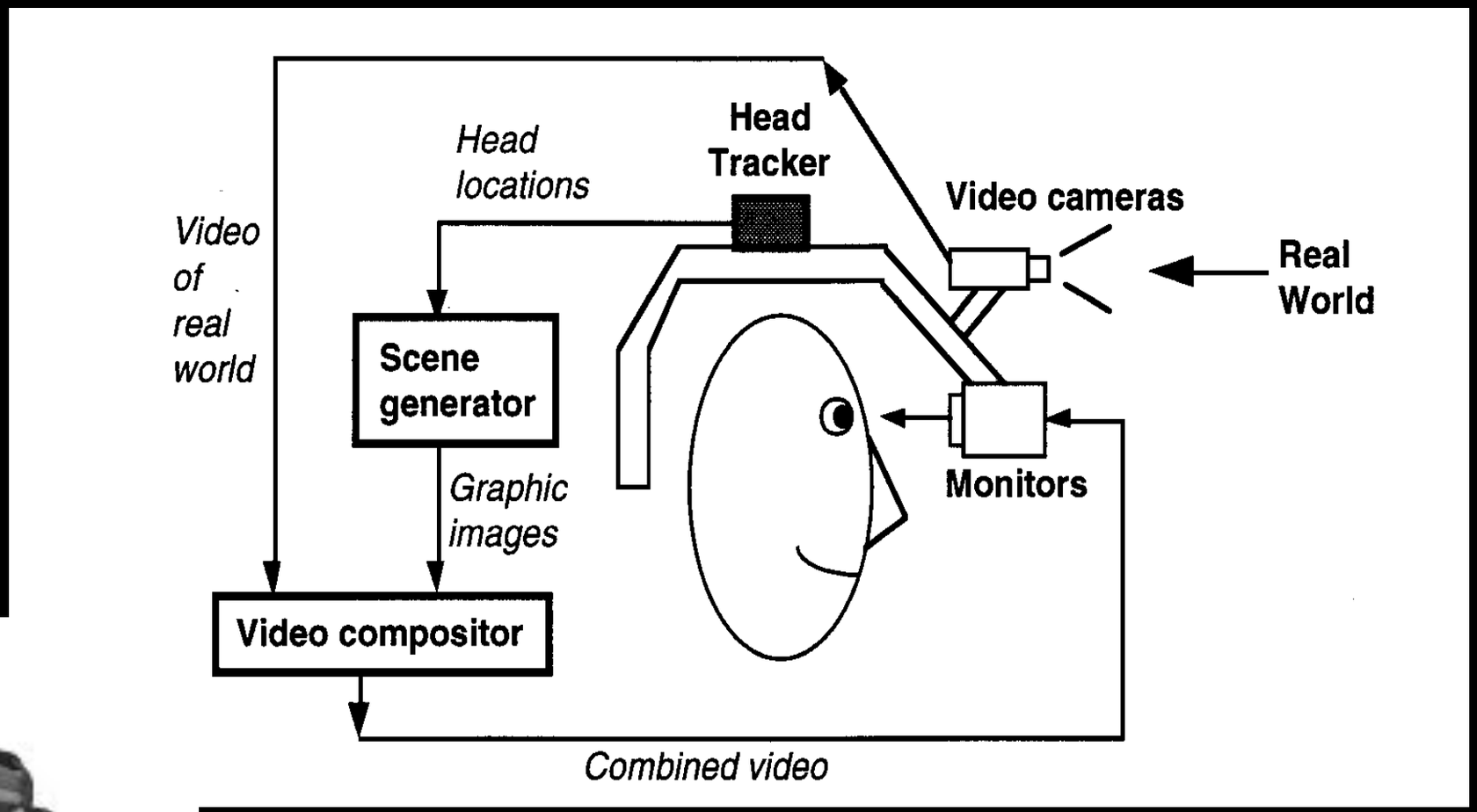
Mixed Reality System Components

Tecnologias p/ Display

- Monitor
  - Dispositivos móveis
  - Notebooks
  - projetores
- Montado na cabeça
  - Vídeo see-through
  - Optical see-through

Uso de monitores

Video see-through

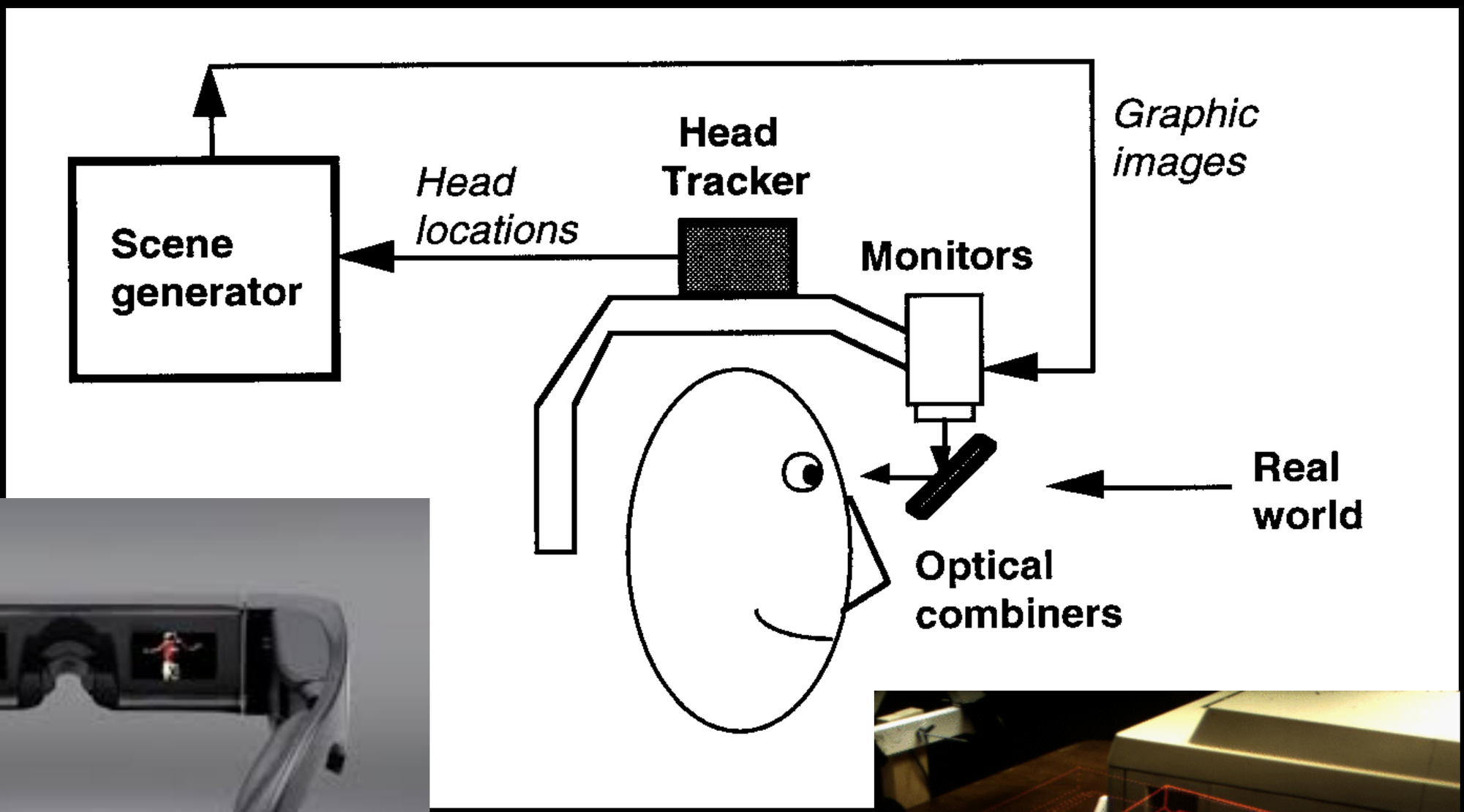


David Johnson

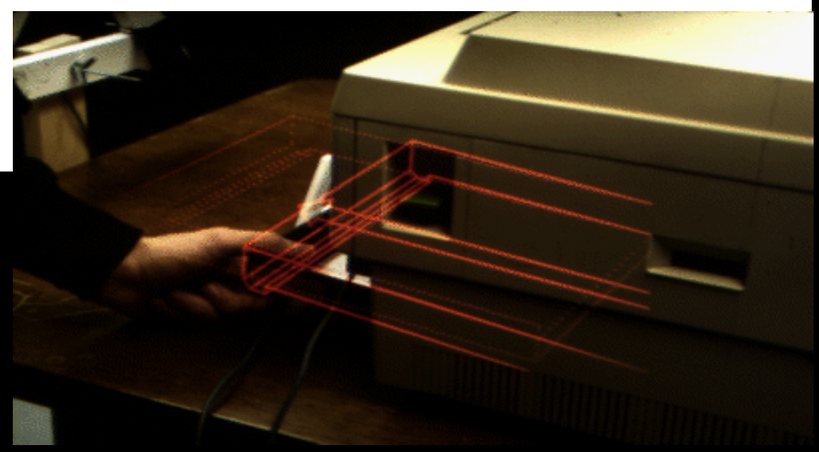
www.worldviz.com

Optical see-through

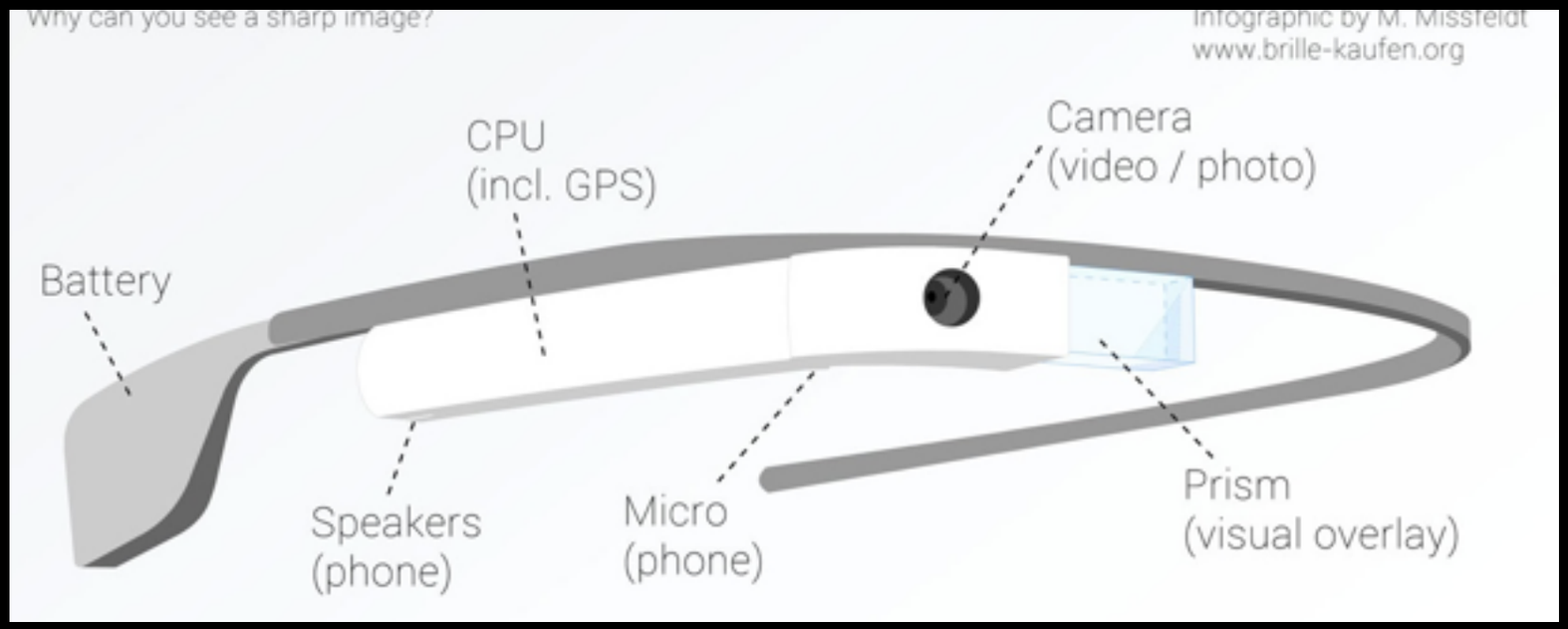
by David Johnson



Epson Moverio

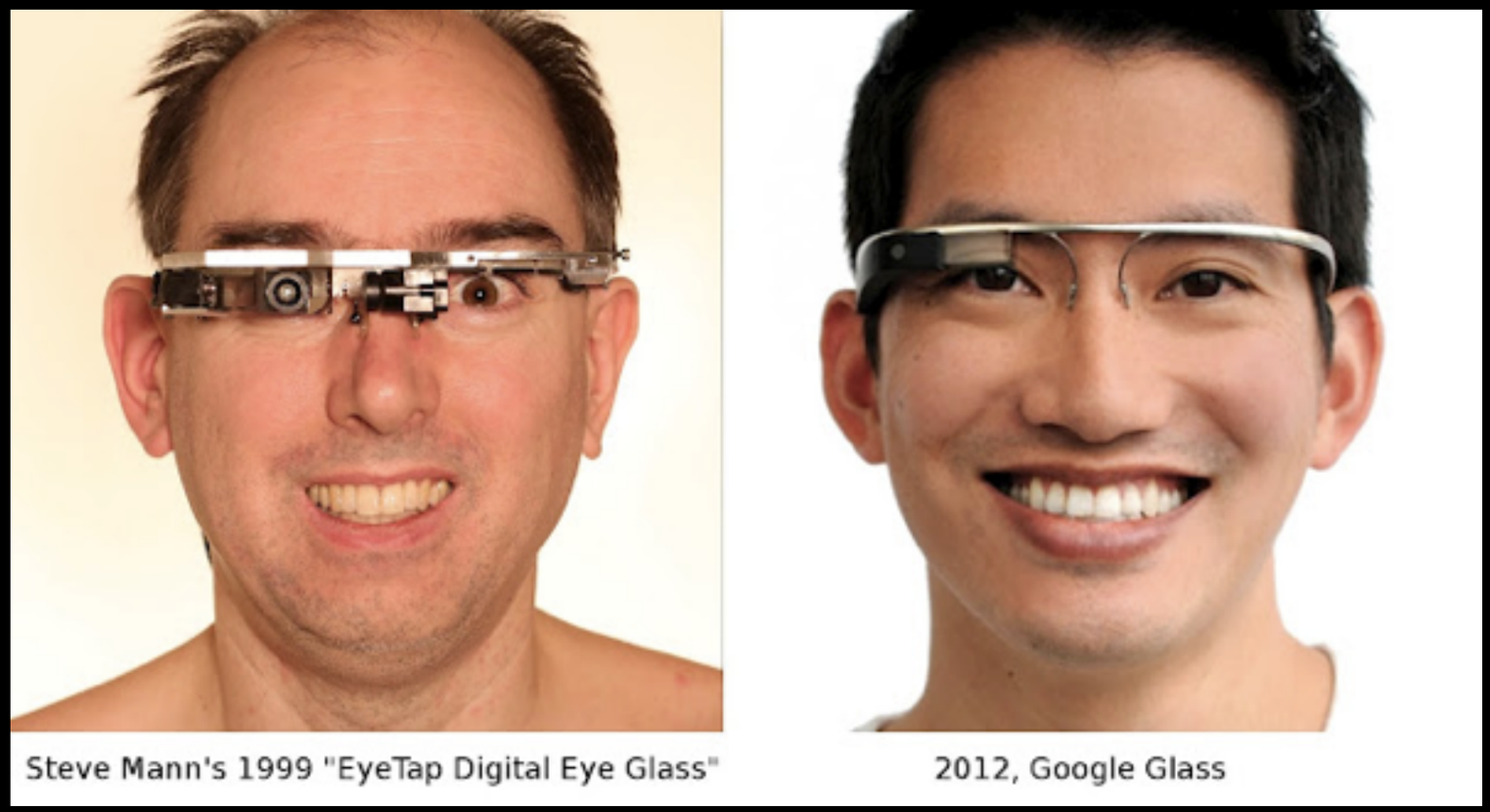


KARMA
- Feiner et al, UIST, 91



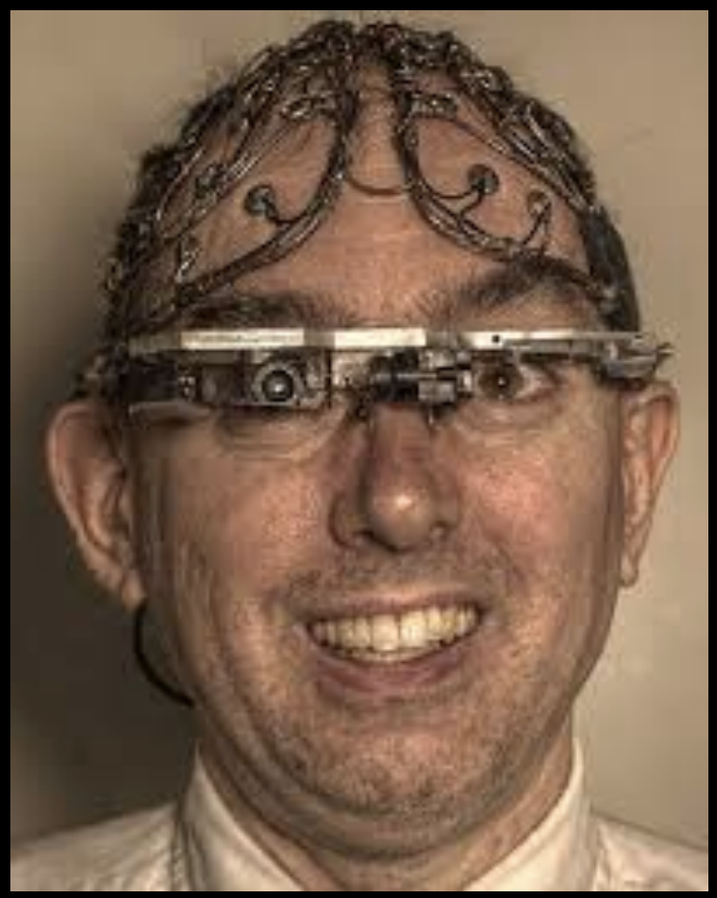
Realidade Aumentada

- Google Glass
- Vuzix M100
- Epson Moverio



Realidade
Mediada

Computação
Vestível



You will be assimilated!

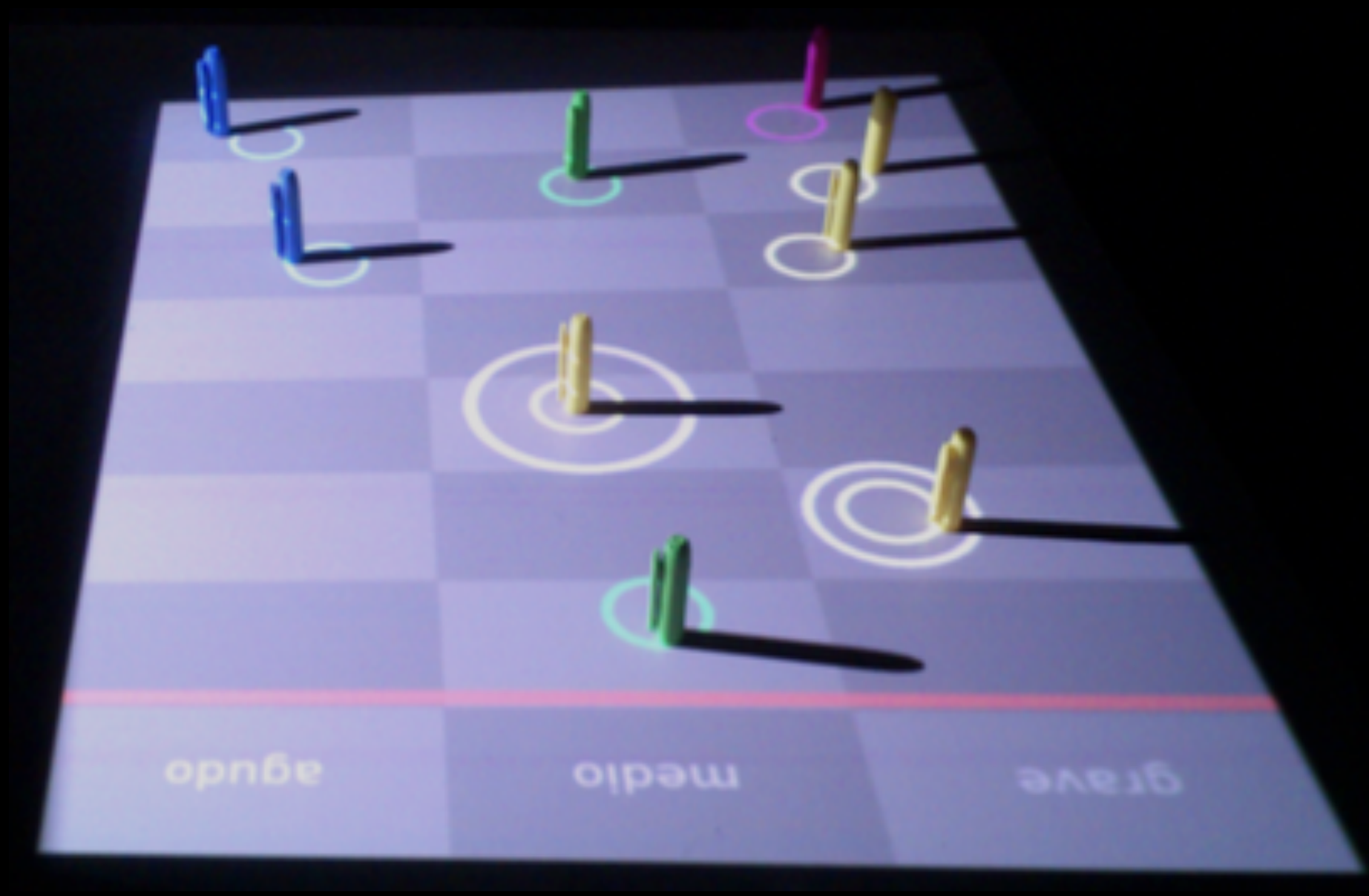
Problemas e desafios

- Interação:
    - conflito entre real e virtual, não há mais uma separação clara
- Limitações do display (saída)
    - precisão do rastreamento e registro
    - sem costuras
- Limitações dos controladores (entrada)
    - precisão do rastreamento e registro
    - sem costuras

Aqui no DCC

Onde e o que estudar?

Interfaces tangíveis

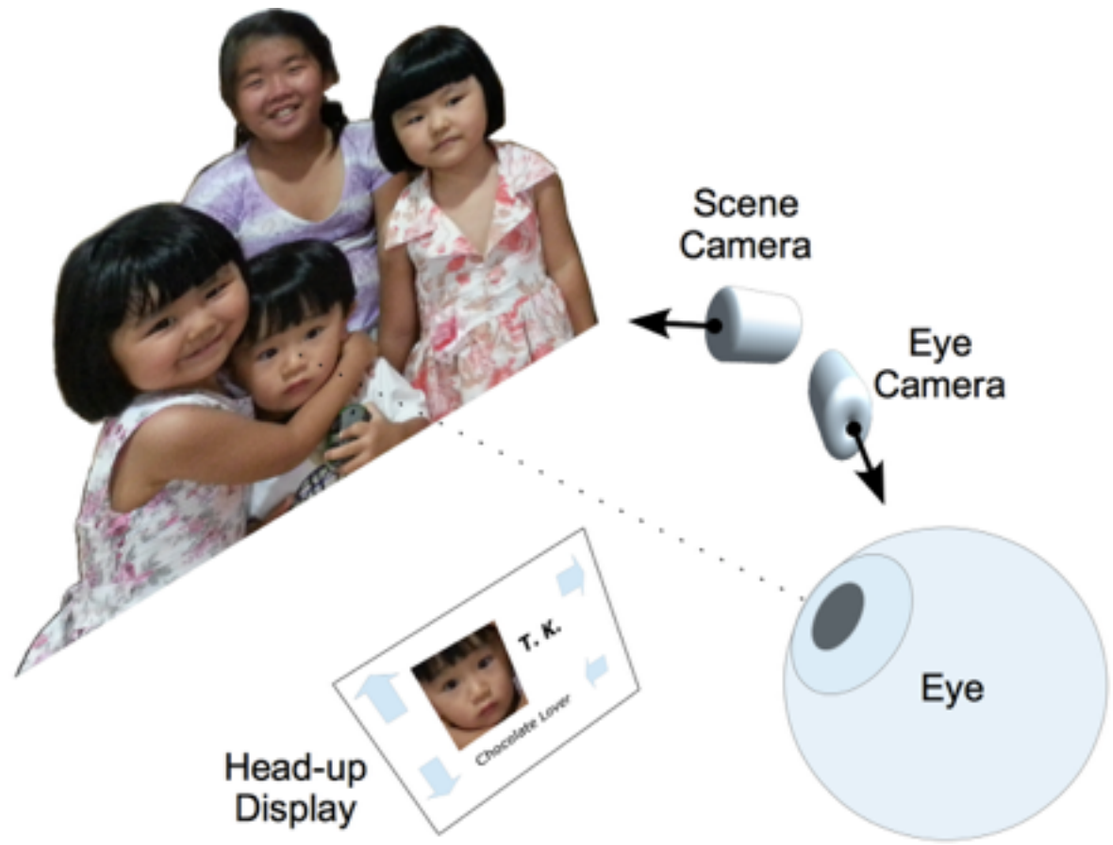


- https://youtu.be/hHYpzCQUFEQ

“Espelho" interativo

https://www.youtube.com/watch?v=C1ho9x7IpM8#t=39

http://www5.usp.br/88587/espelho-virtual-desenvolvido-no-ime-permite-simulacao-instantanea-de-maquiagem/


Scene
Camera
Eye
Camera
Eye
T. K.
Chocolate Lover
Head-up
Display

O que estudar

- Básicas
  - Cálculo, Física, Estatística, Álgebra Linear
- Intermediárias
  - Algoritmos
  - Otimização (contínua e discreta)
- Específicas
  - Visão Computacional e Processamento de Imagens
  - Computação Gráfica
  - Interação Humano Computador

Perguntas?