Augmented Reality in FF Training

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Augmented Reality

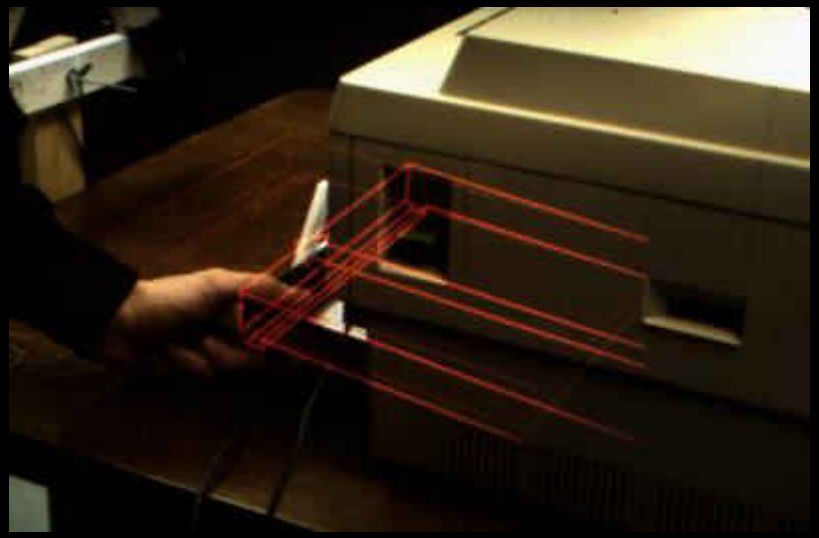
History

R2D2, Star Wars Episode IV *"A new hope"* (1977)

Steven Feiner, Blair Macintyre, and Dorée Seligmann. 1993. *Knowledge-based augmented reality*. *ACM Communications,* July 1993.

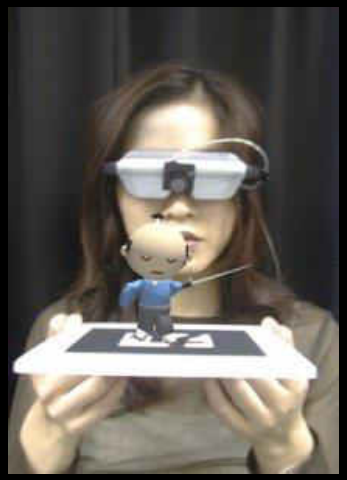
Augment (not replace) real-world

Overlaid graphics



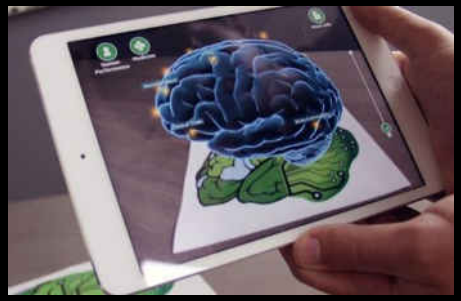
Augmented Reality

What is it?



A combination of

- a real scene sensed by a user and a virtual scene generated by a computer.



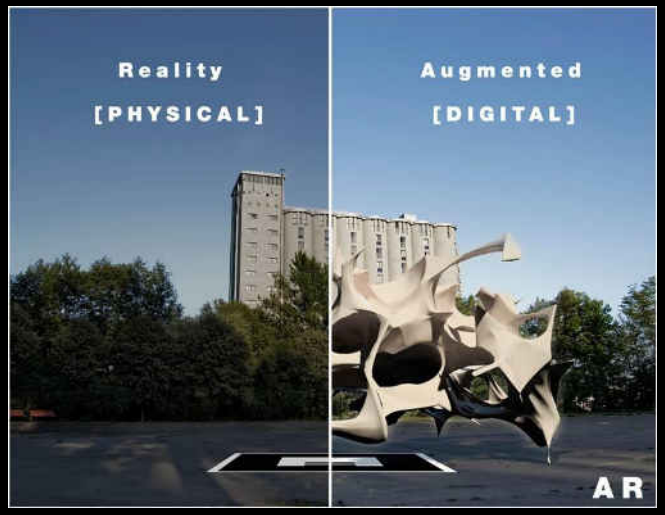
“ An AR system adds virtual computer-generated objects, audio and other sense enhancements to a real-world environment in real time… “

Augmented Reality

Features

- Overlay
  - warnings & notifications
  - explanatory text
  - 3D objects
- Object detection
  - machine vision capabilities based on camera
- Interconnect with e-learning platform or internet
- Video streaming using heads-up display camera
- Localisation (mostly through software)
- …

Capabilities



Augmented Reality

What it’s NOT?

Augmented Reality is NOT Virtual Reality

Augmented Reality

- System augments the real world
- User maintains a sense of presence in real world
- Needs a mechanism to combine virtual and real worlds
- Hard to register real and virtual

Virtual Reality

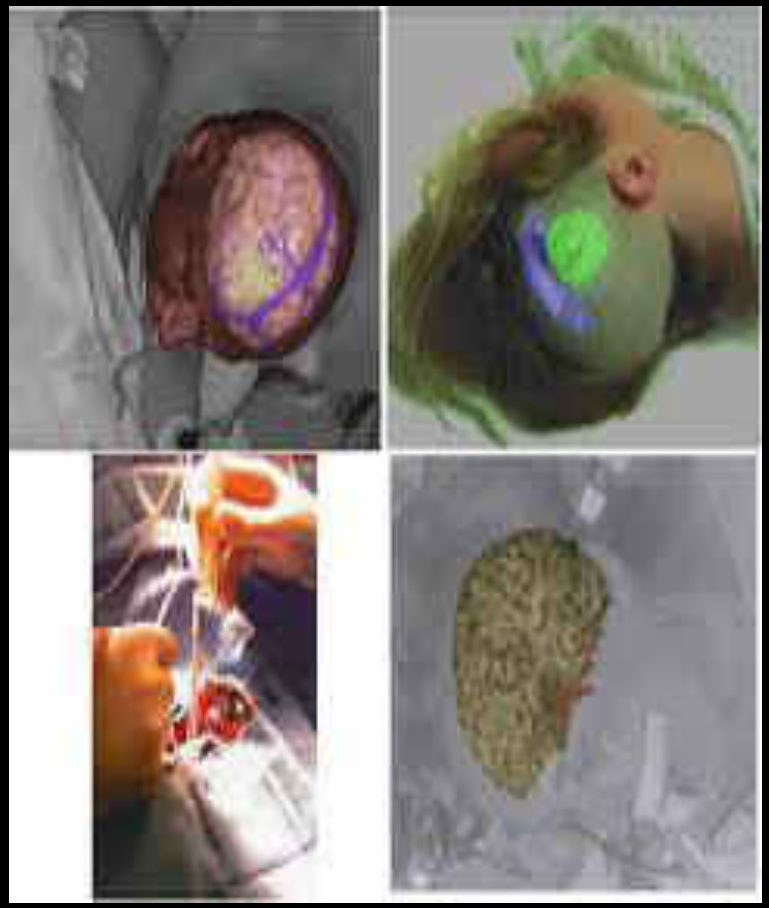
- Totally immersive environment
- Senses are under control of the system
- Needs a mechanism to feed virtual world to user
- Hard to make VR world interesting

Augmented Reality

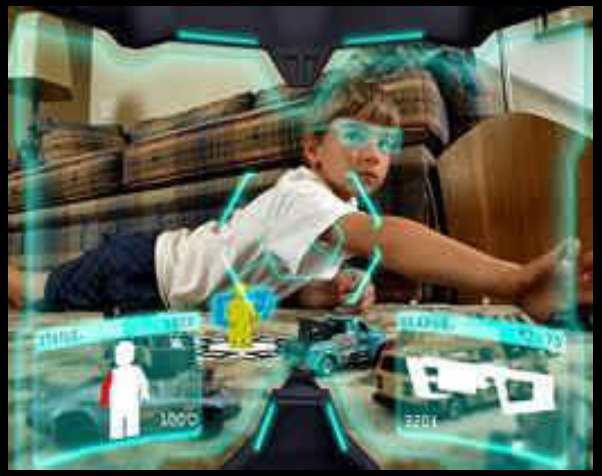
Examples

Medical


Radius (The radius is the bone of the forearm that extends from the lateral side of the elbow to the thumb side of the wrist. The radius is situated on the lateral side of the ulna, which exceeds it in length and size. It is a long bone, prism-shaped and slightly curved longitudinally. The radius articulates with the capitulum of the humerus.
The word "radius" is Latin for "ray." In the context of the radius bone, a ray can be thought of rotating around an axis line extending diagonally from centre of capitulum to the centre of distal ulna. The purpose of the radius is to connect the elbow to the forearm.
Radius



Entertainment



Defence

Education

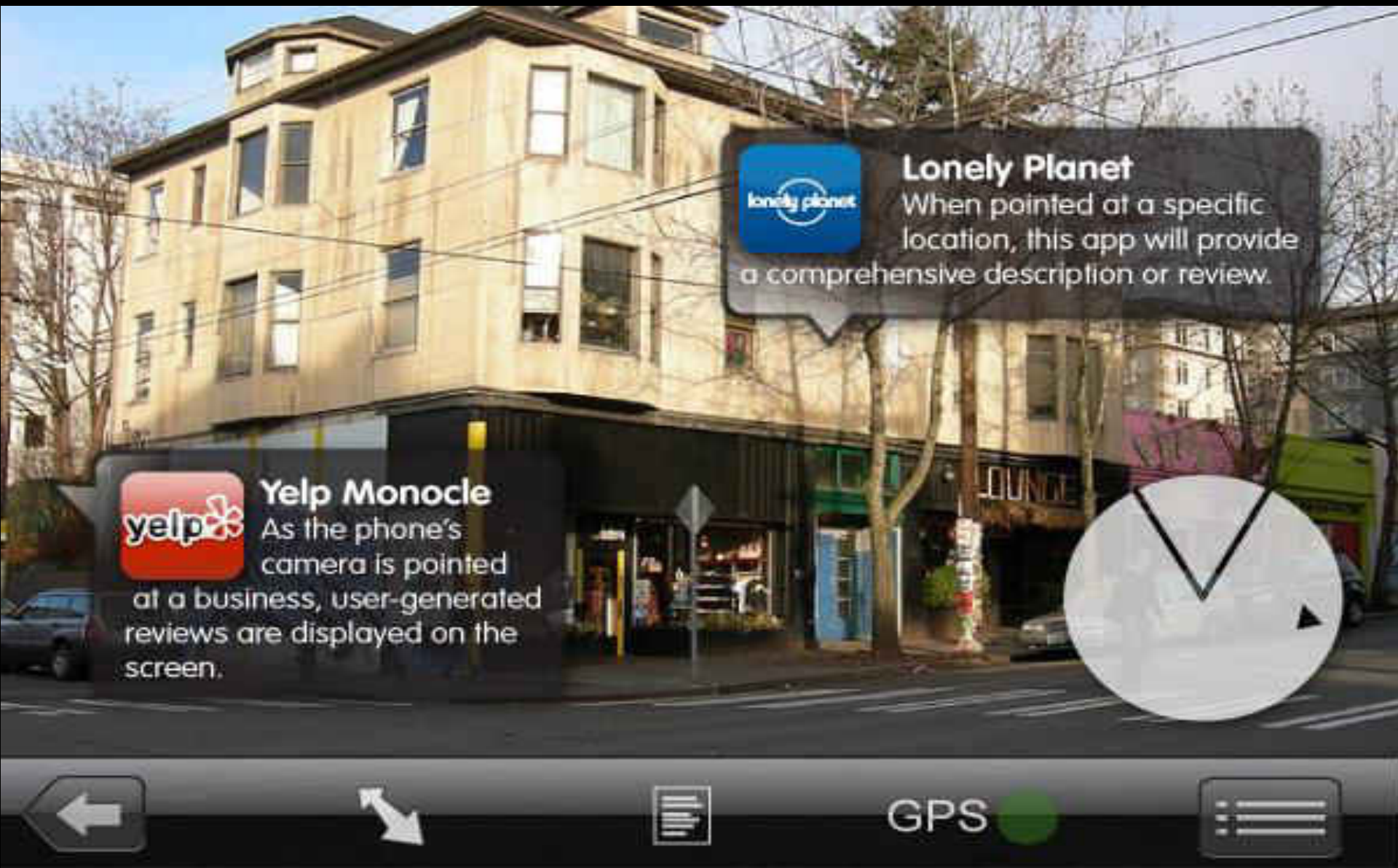
Augmented Reality

More examples

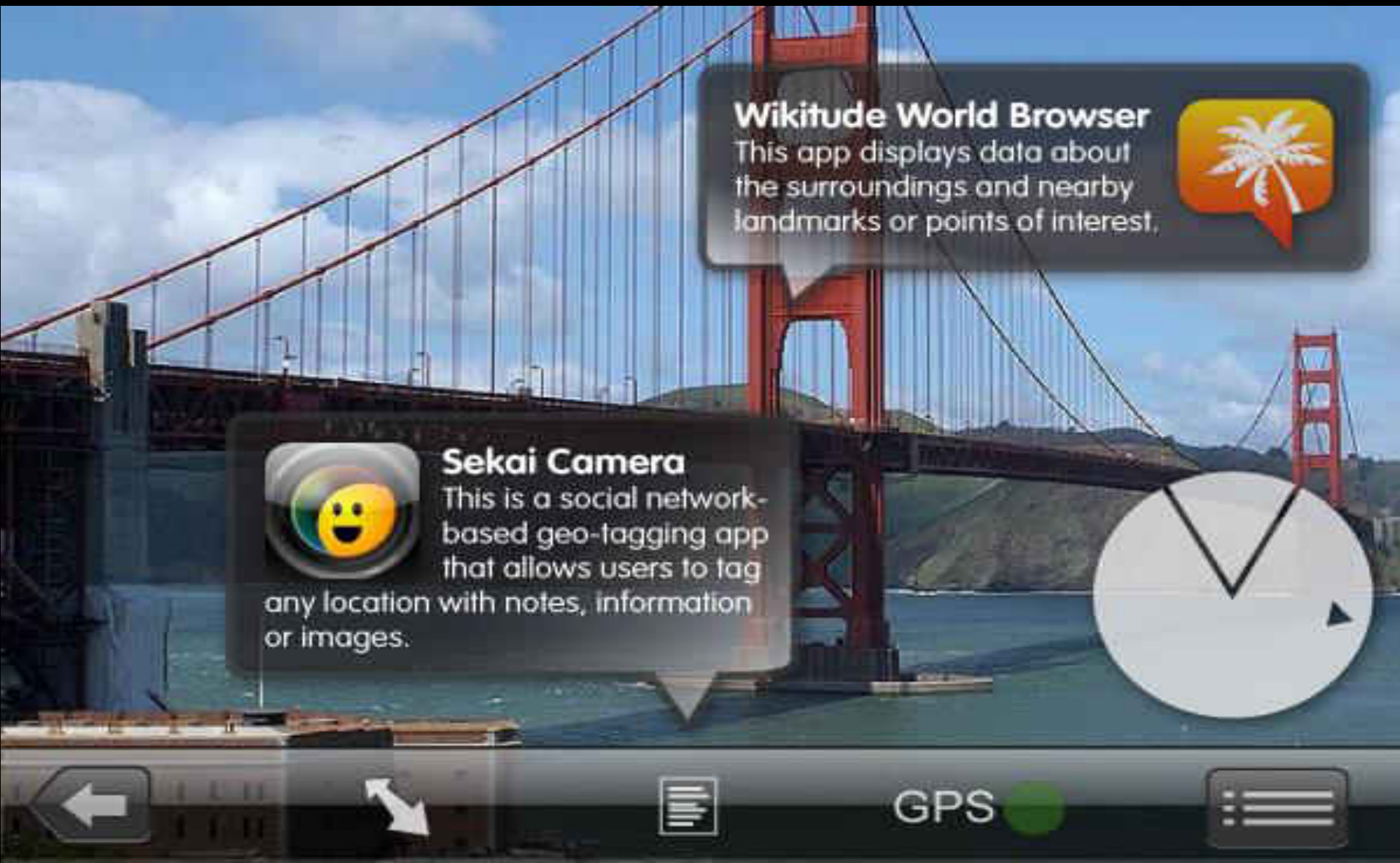
Navigation


Nearest Places
This app will direct you to the closest underground station in larger metropolitan regions.
Wikitude Drive
This app overlays arrows and directions on the screen.
Panasonic
OUTLET
GPS

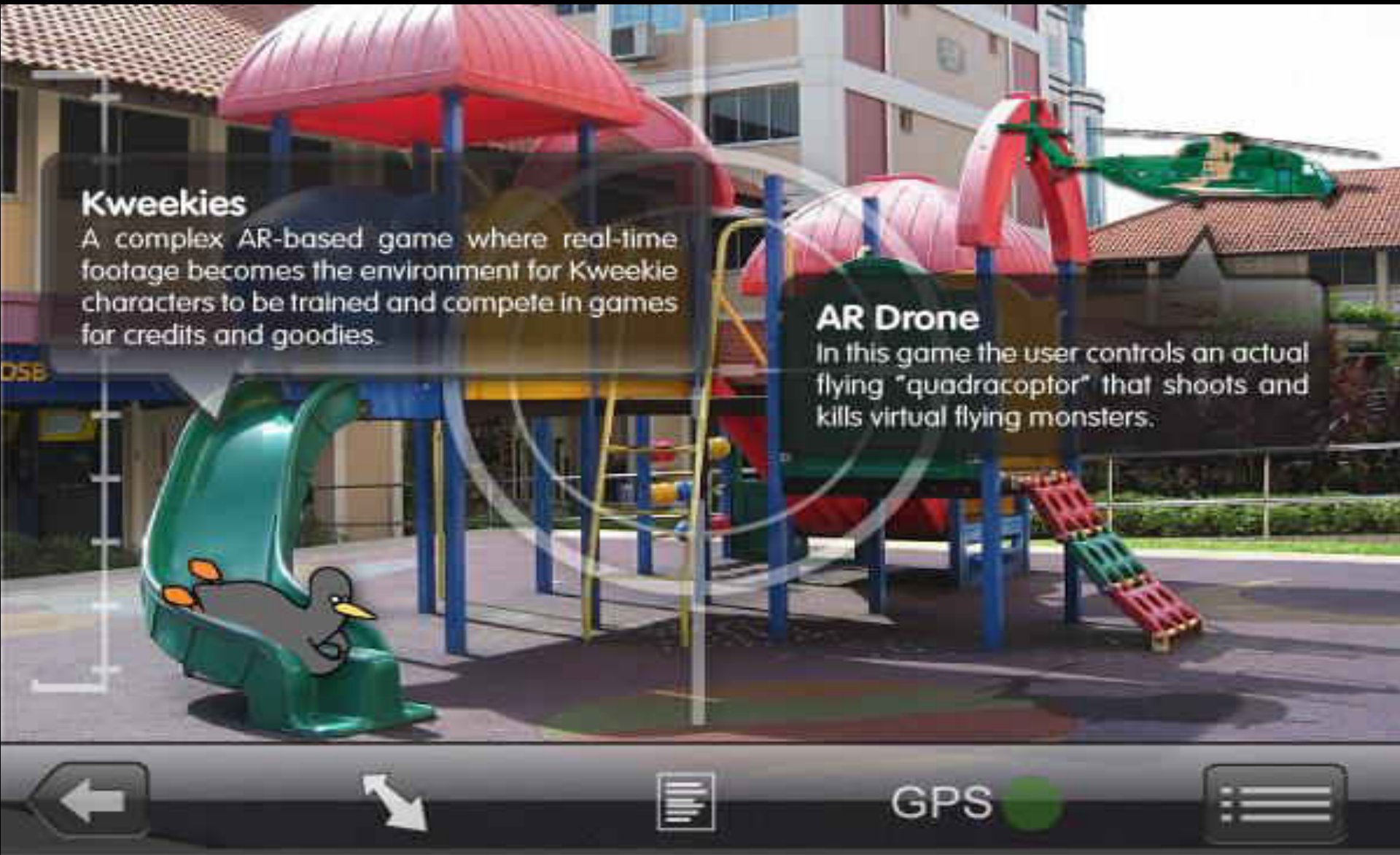
Travelling


Lonely Planet
When pointed at a specific location, this app will provide a comprehensive description or review.
Yelp Monocle
As the phone's camera is pointed at a business, user-generated reviews are displayed on the screen.
GPS

Geo-Info


Wikitude World Browser
This app displays data about the surroundings and nearby landmarks or points of interest.
Sekai Camera
This is a social network-based geo-tagging app that allows users to tag any location with notes, information or images.
GPS

Gaming


Kweekies
A complex AR-based game where real-time footage becomes the environment for Kweekie characters to be trained and compete in games for credits and goodies.
AR Drone
In this game the user controls an actual flying "quadracoptor" that shoots and kills virtual flying monsters.
GPS

Augmented Reality
in Firefighting Training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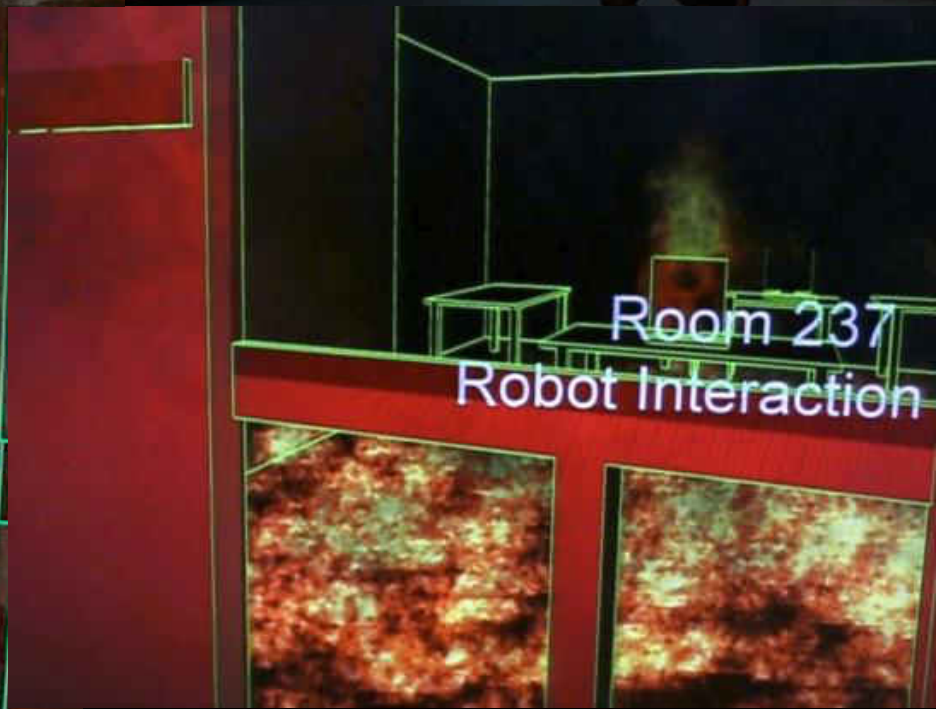

Room 237
Robot Interaction

Augmented Reality

Scope in NAFTES

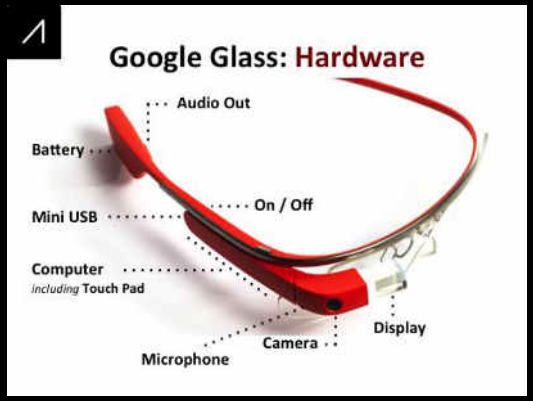
“ Develop an AR application for on-site FF training fulfilling end-user needs… ”

Impact

- **Increase quality of training**
- **Simulate a realistic environment as close to a real-world situation as possible**
- **Act complementarily to classroom training for a complete learning session**
- **Help non-experienced learners to familiarize with FF in a simulation environment**
- **Reliable evaluation of trainees**

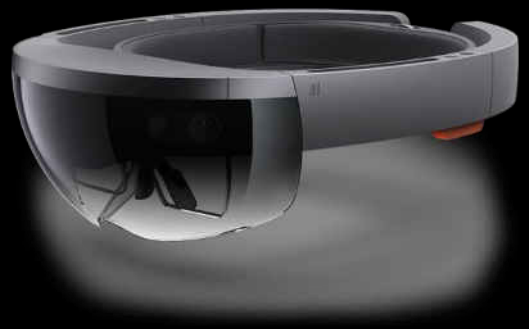
Equipment

- **Google Glass**
  - Typical functionality of a smartphone
  - Notifications, warnings, etc.
  - Limited 3D rendering
  - Limited processing power
  - ~1500€



- **DAQRI Smart Helmet**
  - Professional use in industrial environments
  - Not fully supported – custom applications
  - Not a product yet, expensive (>7000€)

- **Microsoft HoloLens**
  - Balanced solution
  - S/W support – Vuforia and Unity 3D
  - Efficient rendering
  - Sensors
  - ~3000€



HL Specs

Optics

•See-through holographic lenses (waveguides)
•2 HD 16:9 light engines
•Automatic pupillary distance calibration
•Holographic Resolution: 2.3M total light points
•Holographic Density: >2.5k radiants (light points per radian)

Sensors

- 1 IMU
- 4 environment understanding cameras
- 1 depth camera
- 1 2MP photo / HD video camera
- Mixed reality capture
- 4 microphones
- 1 ambient light sensor

Human Understanding

- Spatial sound
- Gaze tracking
- Gesture input
- Voice support

Processors

- Intel 32 bit architecture with TPM 2.0 support
- Custom-built Microsoft Holographic Processing Unit (HPU 1.0)

Input / Output / Connectivity

- Built-in speakers
- Audio 3.5mm jack
- Volume up/down
- Brightness up/down
- Power button
- Battery status LEDs
- Wi-Fi 802.11ac
- Micro USB 2.0
- Bluetooth 4.1 LE

Power

- Battery Life
  - 2-3 hours of active use
  - Up to 2 weeks of standby time
  - Fully functional when charging
- Passively cooled (no fans)

Weight

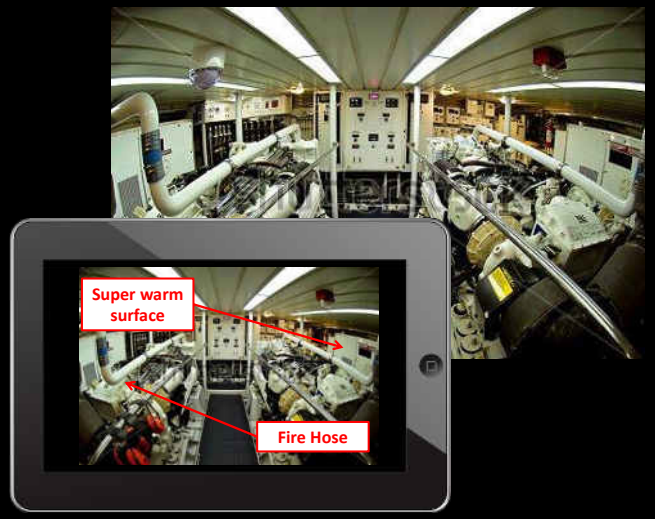
- 579g

Memory

- 64GB Flash
- 2GB RAM

Case 1 – AR Walker

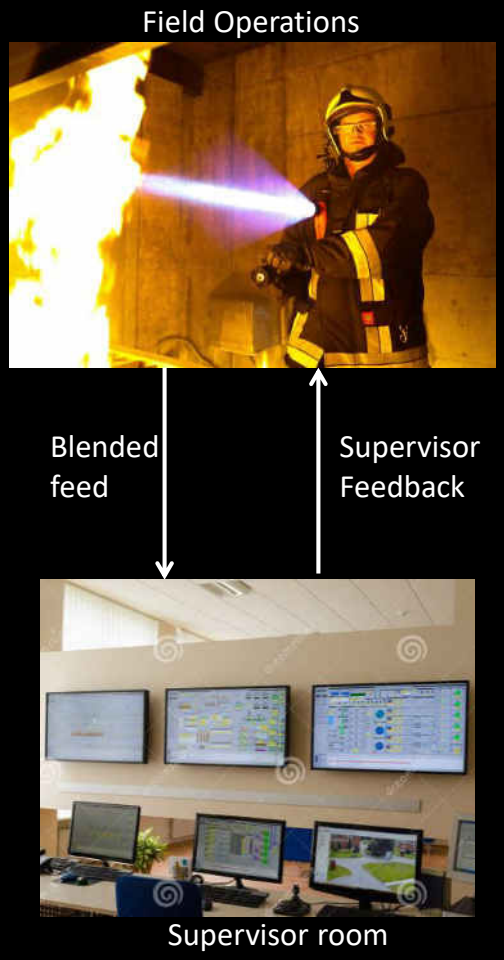
- **Description**
  - User navigates in in fire-prone areas in a warship by receiving using QR codes



- **Target**
  - Familiarize personnel with FF equipment and processes (even offline)

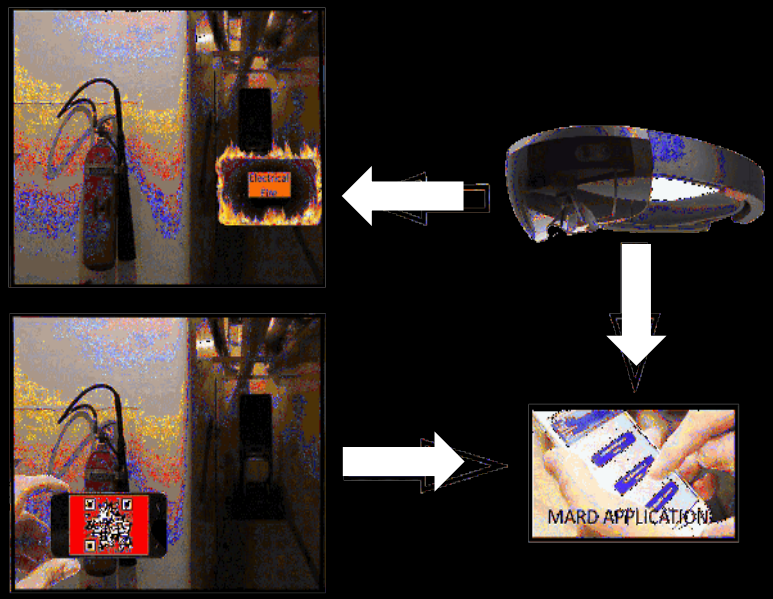
Case 2 – See what the trainee sees

- **Description**
  - **Direct communication between field operations and classroom**
- **Target**
  - **Supervision and real-time assessment of the training process**



Case 3 – AR Drill Kit

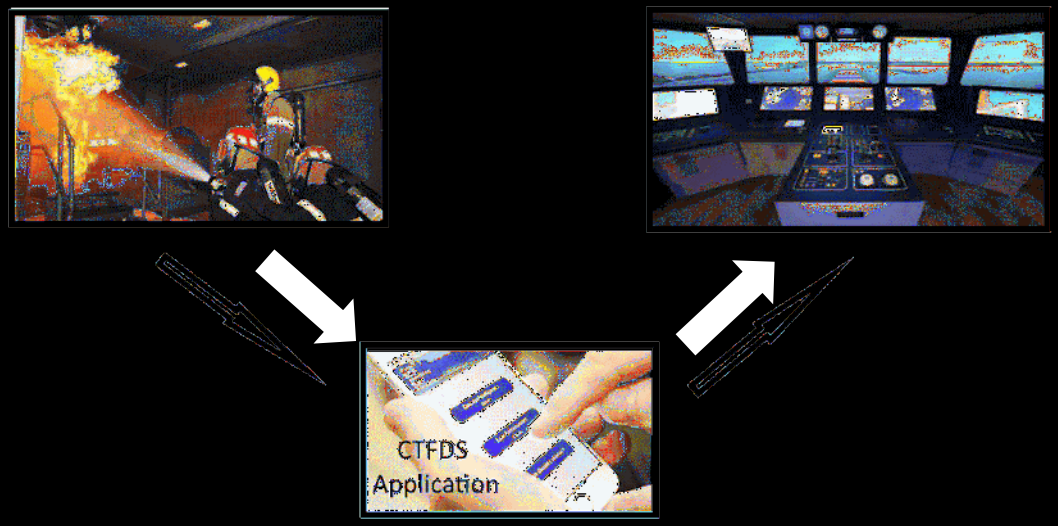
- **Description**
  - Define and sequence of FF actions
  - Combination of AR glasses + QR codes
- **Target**
  - Familiarize personnel with FF equipment and processes



Case 4 – Combined Training Fire Drill

- **Description**
  - Communication between DCS simulator and bridge simulator

- **Target**
  - COP & combined training



Augmented Reality

Your turn!

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