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HAPTICS IN AUGMENTED REALITY

_augmented reality (AR)

_live view of real-world environment

_augmented (“expanded”) by
computer-generated sensory input

_examples: sound, video, GPS

_enhancing the perception of reality

_virtual reality is the opposite (real-
world replacement)

_augmented reality (AR)

_in general:

_AR is providing the user with more information than is actually available (on the direct look)

_AR provides information that would not be available at all in the current position

_AR supports the user in the field of work, everyday life, entertainment, interests etc.

_AR technology

_hardware in general:

_processor

_display

_sensors

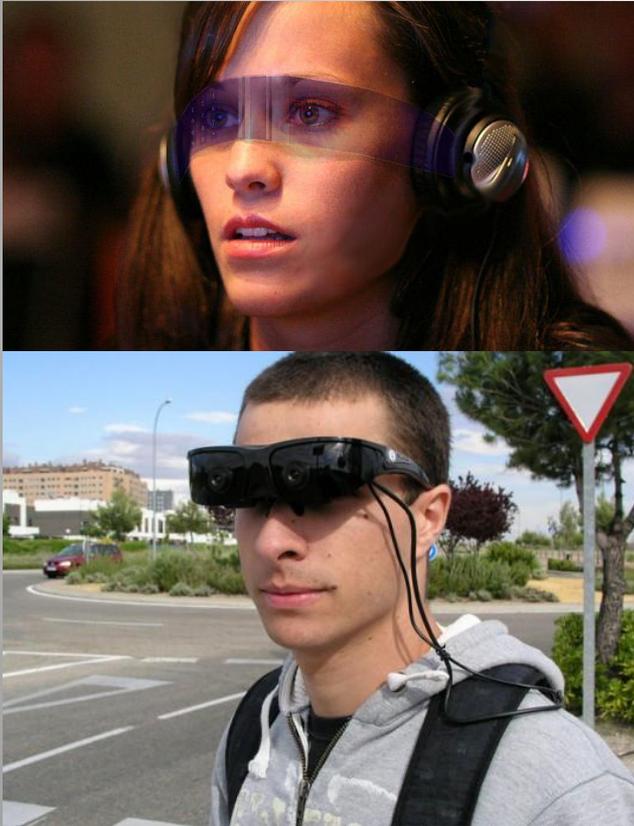
_input devices

_mostly experimented with:

smartphones / tablets

**(accelerometer, GPS, solid state
compass = AR platform basis,
already included here)**

_AR displays



_head-mounted

_display paired with headset, e.g. combined in a helmet

_information / images are placed “on top” of the user’s view

_6 DOF – augments the view according to user’s head movement in any direction / angle

_AR displays



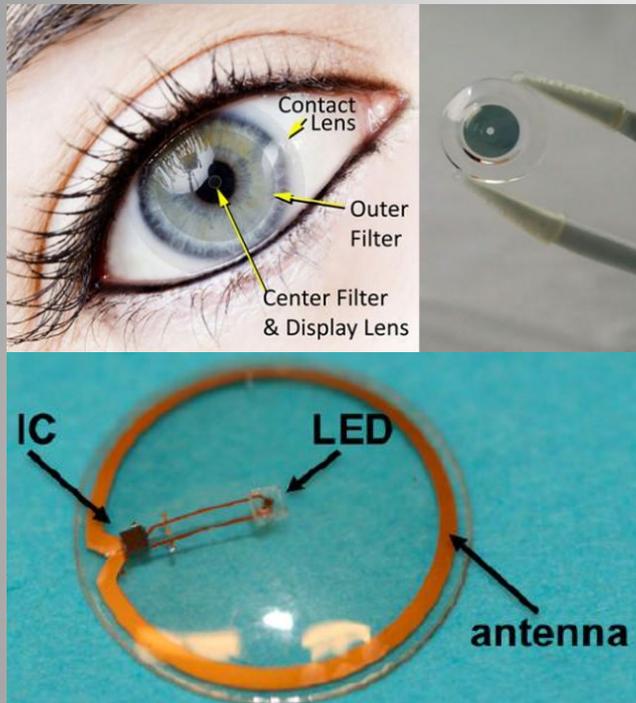
_eye glasses

_display on the inner side of the glasses

_sensors in the glasses render the user's perspective of the real-world and augment it on the lenses of the wearing device

_Google Glasses (with small UI in front of the glasses)

_AR displays



_contact lenses

_lenses that provide images directly
“on the eye”

_including an antenna for wireless
communication

_in development / military use

_combines near-to-eye picture with
distant objects into the same view

_AR displays



_virtual retina display

_projects objects directly on the retina of a viewer

_the UI / AR appears to be floating in front of the eye

_in development

_AR displays



_handheld devices

_current technology for AR

_use of device's camera as the "eye"

_enables clicking / selecting by known touch interaction (easier for testing AR)

_ubiquitous smartphones vs. holding it all the time

_first commercial success of AR (e.g. Wikitude World Browser)

_AR displays

_associations with AR

_projections on surfaces

_helping guides in malls

**_touchscreens on machines, e.g.
vending machines**

_“Google Maps” / GPS Navigator

_AR examples

_how to imagine AR

_Google Goggles:

http://www.youtube.com/watch?feature=player_embedded&v=9c6W4CCU9M4#!

_SAP SiWear

<http://www.youtube.com/watch?v=C4b2Npnbhz0>

_haptics in AR

_in general: tactile feedback when interacting with augmented information

_object manipulation

_main use cases: car industry (first industry to use AR), medicine, games & entertainment systems, ...

_AR not just limited to vision as often understood

_haptics in AR

_haptics in games as AR:

_Nintendo Wii U

_augmented reality for each player on the game pad with visualized information and tactile feedback (e.g. gaining bonuses during the game)

_actually a virtual reality (game environment) but information is displayed and perceived in real time in the user's real-world environment on the display and tactile sensors (game pad)

_real-world environment vs. virtual reality as initial question

_haptics in AR

_haptics in games as AR:

_tactile feedback of actions made in virtual reality, e.g. firing a weapon, bumping into a car, boxing with an opponent

_tactile feedback makes virtual reality actions become augmented reality for the user

_haptics in AR

_haptics in games as AR:

_to better understand: haptic feedback gives the player information that would not be available with vision only, e.g. solving the digging game

_feeling of different surfaces

_Senseg's Touch Technology
http://www.youtube.com/watch?feature=player_embedded&v=FiCqIYKRlAA#!

_haptics in AR

_haptics in software functions as AR:

_Senseg's JukeBox

_tactile feedback added to favourites (songs, interprets, albums) for faster selection while browsing

_different (!) tactile feedback for different functions (visualization actually not needed anymore), e.g. most important tweets get a special tactile feedback in a list, users get another

_haptics in AR



_haptics in AR:

_PHANTOM Stylus object manipulation as standard demo (feeling of surfaces and consistency of objects)

_Head-mounted display combined with PHANTOM Stylus to touch and feel objects visualized in front of the user, e.g. scales of a fish

_Magic Vision Lab

_haptics in AR

_used technology in cars

_BMW HUD

_projects information in the front window, such as speed limit, navigation system, music information, warnings

_haptic feedback via steering wheel, e.g. when speeding, changing the lane

<http://www.youtube.com/watch?v=aolgxnnK22Q>

_haptics in AR

_used technology in cars

_alert mechanisms with vibration in the seats

_according to the side of the alert coming from

_sensors measure distances to other cars and give vibrating alerts when the driver wants to change the lane while a car passes

_overall vibration when driving and cars are stopping in front abruptly

_haptics in AR

_AR in medicine:

_developing technology

_Head-mounted displays give the surgeon supporting information to avoid mistakes

_X-Rays, CAT scans, depth of cuts, ...

_Tactile feedback on the finger tips and in the display

_haptics in AR

_AR in medicine:

_training for surgery

_Head-mounted display and two PHANTOM Stylus devices allow the surgeon to see organs and whole body parts to train surgery

_tactile feedback in the fingers when cutting, removing, moving the devices through the body/organs (VHB System – Virtual Haptic Back)

_haptics in AR



_own ideas for handheld devices:

_as basis: route navigator with additional information to buildings, streets, locations etc.

_tilting / shifting for functions, e.g. tilting to the front to zoom in, tilting back to zoom out, shifting to change focus on particular objects, short tilts for object selection

_tactile feedback to announce the beginning/end of zooming, the selection of objects, the change of directions, ...

_what to expect

_AR is not used commercially much yet
(at least not what people understand
as AR with futuristic functions)

_haptics in general are developed and
used

_combination of AR and haptics is
pretty new (commercially) and just
about to start (e.g. Senseg's game
distribution starts around Christmas
2012)

_what to expect

_enormous potential:

_use of multiple sensory input channels allows more and different forms of information to be processed at a time

_augments 2D surfaces / displays with 3D information

_”opens” a new dimension of user and customer behaviour

_what to expect

_futuristic outlook:

<http://vimeo.com/46304267>

_enjoy

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