Participation design of the final product or production by exploiting multi-site and -user virtual environments

INRS 2017

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VTT Technical Research Centre of Finland Ltd
Content of the presentation

- Overview of VTT
- VTT’s Virtual/Mixed/Augmented Reality laboratory
- Background
- Objective
- Developed proof-of-concept
- Design Methods
- Use cases
- Results
- Conclusion
VTT – Technology for business

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- Turnover 277 M€ (VTT Group 2014), personnel 2,600 (VTT Group 1.1.2015)
- Unique research and testing infrastructure
- Wide national and international cooperation network

25 years history of VR and 10 years of AR
More than 100 cases with end-users
What we are doing?

Developing customers Human-Machine Systems and Augmented Human by utilising Virtual/Mixed/Augmented Environments
Virtual/Mixed/Augmented Reality laboratory

Powerwall: 3 x Barco BLM-W12 active stereo projectors (+floor if needed)

VR / Visualization: Unity 3D + MiddleVR (Virtools 5.0)

Tracking / Motion Capture: Vicon T20 (10 cameras)
(Vicon Pegasus => Jack)

AR / Head Mounted Display: HoloLens, Oculus Rift, Epson Moverio BT-200, Vuzix M100...

Controls: several game controllers & real controls system of machine e.g. crane

Motion Platform: MeVEA 3DOF (Max 500kg)

5.1 surround sound

Visualization with several PCs
Current Research Projects

- ESA - Augmented Reality for AIT, AIV and Orbit Operations (Coordinator)
- EU - Use-It-Wisely - Innovative continuous upgrades of high investment product-services (IP-Coodinator)
- EU-WEKIT - Wearable Experience for Knowledge Intensive Training
- Fimecc - MANU – LeanMes - Digitalize your factory floor
- VR-cameras – Augmented cameras for vehicles control
- Rolls Royce - From future concept of information visualization on tug boat
- Kemppi – Future user interface for welding
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Background

- Designers’ don’t often have the real experience how the final product is really used to achieve work task’s goals
- High investment product producers are using VR for product review, but most of the stake holders, specially customers are around the world.
- Also personal smartphones, tablet and even VR system are getting common in customer market
Objective

- Develop proof-of-concept of Multi-site and –user VE
- Improve stakeholders’ experience of final product
- Test/evaluate design methods with Multi-site and –user VE
- Collect feedback from end-user companies
Proof-of-concept of Multi-site and -user VE

Remote design review
Individual participants
Several locations

- Smartphone HMD
e.g. Google cardboard, Samsung Gear

- Tablet / smartphone
e.g. iPad, android phone

- VR-devices
e.g. Oculus Rift

On-site design review
One locations
Several participants

Design review in VR - laboratory
e.g. VTT Tampere
Exploited Design methods

- Human Centered Design (HCD) approach
- Participatory Design
- Focus group
Use case

Car maintenance – Public
- Used set-up
  - Power wall with active stereo and tracking
  - HMD with tracking
  - Tablet and smart phone

Forest tractor assembly sequence design – Confidential
- Used set-up
  - Power wall with active stereo and tracking
  - HMD with tracking
  - Tablet
Remote design review
Individual participants
Several locations

Smartphone HMD
e.g. Google cardboard, Samsung Gear

Tablet / smartphone
e.g. iPad, android phone

VR-devices
e.g. Oculus Rift

Web server - MySQL

On-site design review
One locations
Several participant

Design review in VR - laboratory
e.g. VTT Tampere
Results

- System was demonstrated to six companies in field of machine- and shipbuilding, space and military
- More than 50 persons were participating to design review or demonstration
- Multi-site and –user VE is good environment for keeping the focus group meetings by exploiting participatory design
  - but having discussions is sometimes hard via Skype
- Important to have end-user (assembly worker, driver, …) to perform the task better and proper way
Conclusions

- VE technology maturity is already in good level for the design purposes and it is already daily base use in companies. The Multi-site and –user VE still need to improve to have better communication between stakeholder’ even its already improves communication in significantly.
- For better immersion and interaction in Multi-site and –user VE the sound feedback from system should be more realistic for the better experience.
- It is also important to remember that the use of HCD and Multi-site and –user VE in design process is iterative process and it means that sometimes many focus group meetings are required.
- Although some improvement are needed, case studies results support the use of Multi-site and –user VE for improving stakeholders’ ability to experience the real use better already in early design phase especially
Questions?

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