

RP 11

Augmented Reality Platform for Advanced Maintenance in Scientific Facilities

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SenseTrix

Project: 07/11 – 06/14



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Background Information

- Education

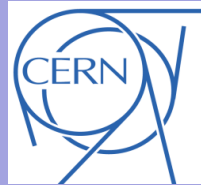
- Industrial Engineering Licentiate (2009) (Master's Degree)
 - Automation and Robotics
- MEng: System Engineering and Computer Science (2011)

- Work experience:

- BSH Home appliances (10/2008 – 09/2009)
- University of Zaragoza (10/2009 – 01/2010)
- Aragon Institute of Technology (03/2010 – 06/2011)

CV

AR



Background Information

- PURESAFE
 - Supervisor: Seppo Laukkanen
 - Organisation: SenseTrix
- PhD studies at Tampere University of Technology (TUT)
 - To be completed: Next week (defense 30.01.2015)
 - PhD Supervisor: Professor Jouni Mattila



Research Goals and Results



Research Goals and Results

- Aim of RP11 → implement an Augmented Reality system for maintenance in hazardous facilities that is
 - suitable for large scientific facilities
 - easy to use
 - flexible



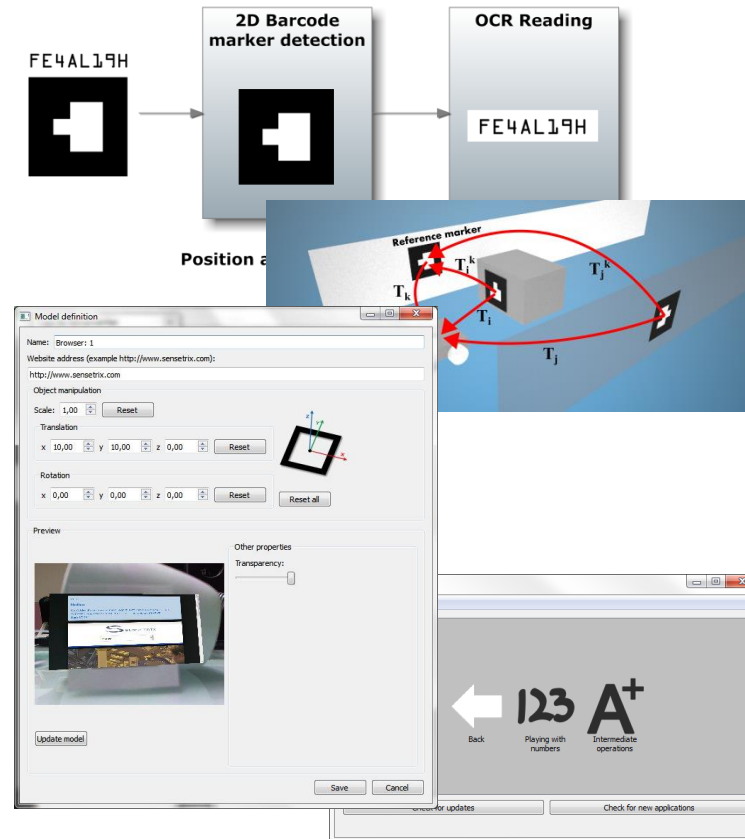
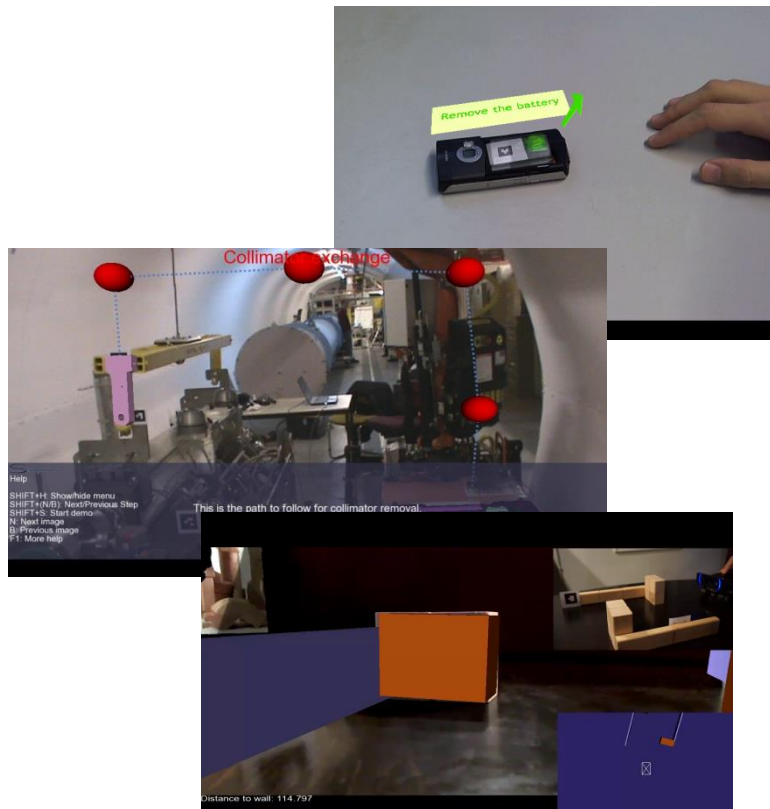
Research Goals and Results

- Research methods
 - The work has been carried out by ESR in SenseTrix office
 - Supervised by ESR supervisor and PhD supervisor
 - Collaboration and interaction with PURESAFE partners and potential customers
 - Materials
 - State of the art software libraries and own developments
 - Wide variety of hardware (High performance PC, webcams and network cameras, mobile devices, depth sensors, etc.)



Research Goals and Results

- Research results



Research Goals and Results

- Journal articles

- Héctor Martínez and Seppo Laukkanen, 2015, “Towards an augmented reality guiding system for assisted indoor remote vehicle navigation”, EAI Endorsed Transactions on Industrial Networks and Intelligent Systems (in press)
- Héctor Martínez and Seppo Laukkanen, 2014, "An Augmented Reality Platform inside PURESAFE project", SBC Journal on Interactive Systems, vol. 5, no. 1
- Héctor Martínez, Thomas Fabry, Seppo Laukkanen, Jouni Mattila and Laurent Tabourot, 2014, “Augmented Reality Aiding Collimator Exchange at the LHC”, NIMA (Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment), vol. 763, pp. 354–363, DOI: 10.1016/j.nima.2014.06.037
- Héctor Martínez, Danai Skournetou, Jenni Hyppölä, Seppo Laukkanen and Antti Heikkilä, 2014, “Drivers and Bottlenecks in the Adoption of Augmented Reality Applications”, Journal on Multimedia Theory and Applications, 1(1), DOI: 10.11159/jmta.2014.004



Research Goals and Results

- Journal articles

- Héctor Martínez, Seppo Laukkanen and Jouni Mattila, 2013, “A New Hybrid Approach for Augmented Reality Maintenance in Scientific Facilities”, International Journal of Advanced Robotic Systems, 10(321), DOI: 10.5772/56845.
- Héctor Martínez, Seppo Laukkanen and Jouni Mattila, 2014, “A New Flexible Augmented Reality Platform for Development of Maintenance and Educational Applications”, International Journal of Virtual Worlds and Human Computer Interaction, 2(1), DOI: 10.11159/vwhci.2014.003

- Book chapters

- Héctor Martínez, "Designing for Augmented Reality", openSE (an open, lean and participative approach to systems engineering). (in press)
- Héctor Martínez and Seppo Laukkanen, 2014, “STEDUS, a New Educational Platform for Augmented Reality Applications”, At the Edge of the Rift, ISBN: 978-1-84888-321-5

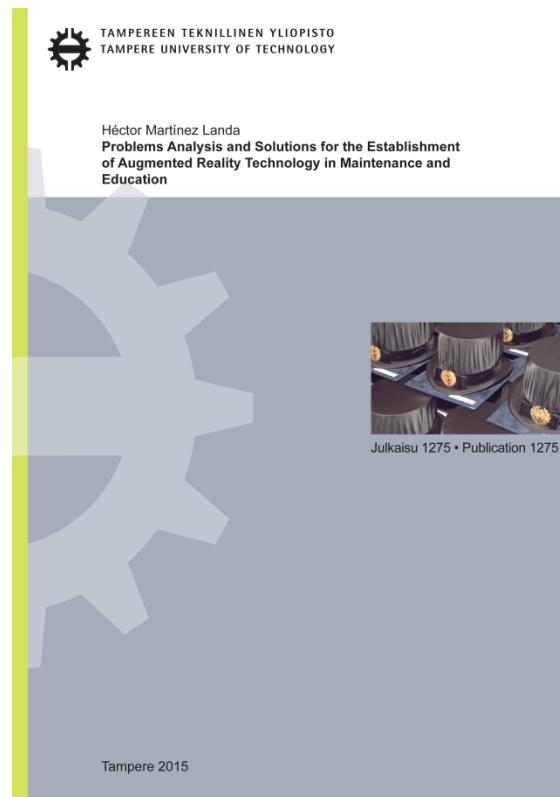
Research Goals and Results

- Conference papers and posters
 - Héctor Martínez and Seppo Laukkanen, 2014, “STEDUS, a New Educational Platform for Augmented Reality Applications”, 4th Global Conference on Experiential Learning in Virtual Worlds, Prague, Czech Republic.
 - Jenni Hyppölä, Héctor Martínez and Seppo Laukkanen, 2014, “Experiential Learning Theory and Virtual and Augmented Reality Applications”, 4th Global Conference on Experiential Learning in Virtual Worlds, Prague, Czech Republic.
 - Héctor Martínez, Seppo Laukkanen and Jouni Mattila, 2012, “Augmented Reality System for Advanced Maintenance in Large Scientific Facilities”, 1st International Workshop on Telerobotics and Systems Engineering for Scientific Facilities, Madrid, Spain.



Research Goals and Results

- Doctoral dissertation



Research Goals and Results

- Goals vs results
 - Implement an Augmented Reality system for maintenance in hazardous facilities
 - ✓ AR engine
 - easy to use
 - ✓ Intuitive interface
 - ✓ Authoring tool



Research Goals and Results

- Goals vs results
 - flexible
 - ✓ Can be adapted to different types of interventions:
 - Human intervention
 - Remote handling
 - Vehicle navigation
 - ✓ Can be applied to other fields
 - suitable for large scientific facilities
 - ✓ Developed hybrid marker approach
 - ✓ Database system integrated



Research Goals and Results

- Impact
 - Research impact
 - Several scientific publications
 - Doctoral dissertation
 - Commercial impact
 - Several institutions and companies have shown interest
 - Results can be applied in several fields: Maintenance, training, education...
 - Benefits for maintenance use:
 - Reducing maintenance times and errors
 - Increasing safety
 - Preventing potential accidents



Research Goals and Results

- Future of research
 - Improve current developments
 - Develop new features
 - Currently many ideas
 - Several potential partners



Collaboration and Interaction



Final Conference, 19th – 23rd January 2015
Geneva, Switzerland

Collaboration and Interaction



- Tampere University of Technology (TUT)
 - Close interaction:
 - Project matters (Juho-Pekka Karjalainen, Liisa Aha...)
 - Doctoral studies (Anna Nykänen, Risto Riatala...)
 - Project coordinator is also PhD supervisor (Jouni Mattila)
 - Collaboration with RP10 and RP14 about doctoral courses and documents



Collaboration and Interaction



- CERN
 - Direct collaboration with RP13:
 - Testing of the developed platform for a real use case with a real device
 - Publication of an article in NIMA (Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment)
 - Also, interaction with CERN PURESafe supervisors and with RP2 and RP6



Collaboration and Interaction



- CERN
 - Collaboration with Pierre Bonnal:
 - For openSE
 - For the organization of the Augmented Reality Seminar given by SenseTrix at CERN (21st November 2012)



Collaboration and Interaction



- bgator
 - Direct collaboration with RP3 and her supervisors Danai Skournetou and Antti Heikkilä:
 - Publication of an article in Journal on Multimedia Theory and Applications
 - Publication of a conference paper with RP3
 - Also interaction with other bgator members (Pietari Kauttu and Tuomo Pentikäinen)



Collaboration and Interaction



- OXFORD TECHNOLOGIES
 - Collaboration with RP15:
 - Design and testing of a shared control of a robotic arm
 - Many interactions during the whole project



Collaboration and Interaction

- PURESAFE interactions
 - Interaction with all PURESAFE ESRs and supervisors during PURESAFE events, including GSI, KIT and UPM



Final Conference, 19th – 23rd January 2015
Geneva, Switzerland

Collaboration and Interaction

- Private sector interaction



Summary

- Great experience personally and professionally
- Host institution:
 - Nice atmosphere, great flexibility and freedom in the research work
- PURESAFE consortium
 - Very motivating
 - Interdisciplinary
- Marie Curie ITN
 - Good framework for researchers
- ESRs
 - Good people and good friends



Thank you for your attention

