

Setting-up a Virtual Reality Simulation for Improving OSH in Standardisation of River Locks

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Introduction

- German network of waterways (about 7400 km, about 450 lock sites)
 - increase freight transport volume, reduce costs, improve OSH
 - use of standardised components for river locks
- How to improve safety and ergonomics through design early on
 - research project initiated by UVB, collaborators: UVB and WSV
 - risk assessments and documentation according to EU Directives
 - recommendations for procedural guidelines



Methods

- Setting-up VR simulations of machinery in the context of use
 - provide dynamic simulation versus perform assessments
 - stepwise procedure in 9 steps; iterative, flexible, creative process
- Generic and specific VR modelling and simulation
 - improve OSH for components and whole machinery
 - provide recommendations for component standardisation
 - facilitate procedure for any other machinery or work system

Illustration



Procedure

- 1 Clarify and specify purpose of VR model
 - EU Directives: Machinery (2006/42/EC), Construction Sites (92/57/EEC), OSH Framework (89/391/EEC)
 - support risk assessments, guidelines
 - evaluate measures for risk reduction
- 2 Understand and describe context of use
 - describe context of use (tasks, user, equipment, environment)
 - include: operational states, modes of operation, systems design and life cycle
- 3 Define and select scenarios
 - describe procedures of tasks/activities
 - storyboards for sequences of events
 - criteria based selection of scenarios (e.g. tasks, hazards, accidents, operators)
- 4 Identify and select all relevant information
 - select drawings (paper, CAD)
 - identify 3D models available, purchase 3D models, (manual) 3D redesign
- 5 Design model components
 - 3D CAD format, level of detail, design requirements for structure and dynamics
 - design of 3D CAD solids
 - vrml format and compatibility
- 6 Human-system interaction in scenarios
 - sequence of events, dynamics
 - control of scenarios (model to simulation, complexity, speed, repetition, activities)
 - components suitable for master model
- 7 Merge all into one VR master model
 - database and master model (position, orientation, size, show/hide)
 - compose environment (landscape, sky, barges, river lock components, sounds)
- 8 Evaluate the usability of the VR model
 - avoid hazards and impairments by VR
 - suitability of river lock simulation
 - suitability for risk assessments
- 9 Application of the VR model
 - VR media, SUTAVE, scenario control, activity log, performing risk assessments
 - interdisciplinary user group
 - documentation and OSH improvements

