

CRISIS–Virtual-Reality-Based Training for Emergency Management

Henrik Eriksson, Rita Kovordányi, Amy Rankin

Dept. of Computer and Information Science, Linköpings universitet, SE-58183 Linköping, Sweden

Abstract—This article describes ongoing work within the EU Seventh Framework project CRISIS involving twelve partners. The project’s objective is to develop a state-of-the-art virtual reality (VR) environment for response training in connection to airport emergencies.

I. INTRODUCTION

Emergency-response exercises using simulated environments are often regarded as a valuable complement to real-world exercises. The advantages of using simulated environments include lower cost, easier operation, and the possibility to train scenarios that would otherwise impose danger to the trainees. The use of simulated environments for emergency response training is widely spread. For example, Rudinsky and Hvannberg [1] list a range of simulation-based training tools that are currently used for emergency response training. Examples include Minerva, Hydra, 10,000 Volts, Hazmat: Hotzone, and Tactical Iraqi.

The objective of the CRISIS project is to develop a virtual reality (VR) training environment focusing on real-time decision making and response to simulated but realistic crises mainly at airports (Figure 1). CRISIS is a European FP7 project involving twelve partners.

II. METHOD

In a first step, user requirements and representative emergency scenarios were developed on the basis of several unstructured interviews with representatives for the British, Icelandic and Portuguese emergency services, which normally collaborate during airport emergency-response operations. The emergency-service organizations included traffic police, firefighting agencies, and airport emergency personnel.

Four types of scenarios were chosen to be simulated in the VR-training environment: An airplane accident, a car/railway accident in the vicinity of the airport, a bomb placed at the airport, and finally, a number of shorter scenarios which can be injected into an ongoing exercise to create variation and to increase the difficulty of the training situation.

To translate the end-user requirements and scenarios into VR-environments *storyboarding* is used. This approach means detailing the scenarios and describing them as a sequence of roughly visualized snapshots suitable for VR-implementation. A storyboard is a low fidelity prototype consisting of a series of screen sketches, often used by designers to illustrate and organize their ideas. The initial storyboard will consist of a conceptual design for the chosen scenarios. These conceptual ideas will provide a floor for end-users, designers and engineers to address issues concerning, for example, user requirements, realism, design and foreseeable challenges in implementation. This iterative process gives the opportunity to

create common ground between partners and will allow more and more details to gradually be implemented into the design.

III. FUTURE WORK

We see several avenues for continued work in connection to VR-simulation-based emergency-response training. A major task in VR-based emergency response training is to develop metrics and software tools for emergency response performance evaluation. We plan to use topic maps [2] to represent knowledge on emergency response procedures and use this knowledge base to evaluate response training performance during the exercises. This knowledge base could also be used as a platform for advanced decision support and critiquing techniques.

Second, we plan to investigate the possibility to include foresight training into the evaluation and debriefing stage of the response training exercises, with the aim to increase the trainees’ risk awareness and mindfulness [3].

Third, we plan to extend *episode analysis*, which is a method for analyzing simultaneously on-going threads of communication. An episode comprises all communication within a specific subject matter or a common activity. As episodes emerge from the bottom-up approach not only predetermined missions, but also issues not directly associated to the task at hand are captured, such as emergent phenomena and improvisation [4]. We see several ways in which episodic analysis could be employed. It could be used both to analyze communication during real-world emergency response operations, as well as to analyze communication during a VR-based emergency response exercise.

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