Advanced Decision Support in Simulator-Based Training for Crisis Management

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Abstract—This paper describes the development of a decision support and knowledge management system as part of an EU FP7 funded project, CRISIS. In its final form, the decision support and knowledge management system was implemented as an Android app that uses Esper for complex event processing. The reasoning engine of the decision support and knowledge management system is backed with an ontology and knowledge representation implemented in Topic Maps.

I. INTRODUCTION

Although humans have an ability to make well-thought-through rational decisions, they have a propensity to revert to intuition-driven, experience-based decisions when faced with critical situations. This latter mode of decision making is commonly called Naturalistic Decision Making (NDM), and is often used by professional rescue workers when under time pressure, when faced with critical, life-threatening crisis, or when decisions have to be made in a highly dynamic, rapidly evolving environment, for example during a real-world emergency response action or during simulator-based training for crisis management.

II. BACKGROUND

CRISIS is an EU FP7 funded project, where we have developed a virtual-reality simulation system for crisis training (http://idc.mdx.ac.uk/projects/crisis). The CRISIS system offers software modules for planning, running, and debriefing simulator-based exercises.

Simulator-based training poses special challenges for both trainees and exercise management staff. As the flow of events can be speeded up and the simulator can generate large amounts of data on a level of detail that is normally not possible in a live exercise, both trainees, but in particular the exercise management staff can experience a high cognitive load.

III. METHOD

As part of the CRISIS system, Linköping University in Sweden, in collaboration with Space Application Services in Brussels, has developed an advanced decision-support and knowledge management module.

During the first year of the project, we conducted research into naturalistic decision making, and how this form of decision making can be supported unobtrusively. In addition, end-user input was analyzed, and interviews were conducted with in-project subject matter experts, to further understand the exact nature of emergency response work in particular and crisis management in general, and to clarify the need for decision support at various stages during an exercise, with emphasis on the exercise instructors’ task.

The Decision Support and Knowledge Management (DSKM) module is one among several support tools integrated into the CRISIS system, and offers support to exercise instructors supervising the running of an exercise. The design—decision to support instructors, rather than trainees was made early in the project, with the main motivation to avoid affecting trainees’ interaction with the simulated environment and instead letting their learning experience resemble as closely as possible real-live exercises, where normally no support is offered during the exercise.

IV. RESULTS

On the basis of our theoretical research, and guided by end-user input, we have developed and demonstrated a series of prototypes for real-time decision support and knowledge-management (see, e.g., Kovordanyi et al, 2012).

Upon end-user requests, and because exercise instructors tend to walk around during a CRISIS exercise, the final version of the CRISIS DSKM module was implemented as an Android app (Figure 1) with a user-configurable graphical user interface (user-configurability is achieved through XML configuration files). The DSKM app can be run on any 4.3 Android Jelly Bean tablet or phablet, but is designed for landscape mode on high-resolution 6 or 7 inch screens.

References