# Enhanced Simulation for Homeland Security Training

**LDRD**
LABORATORY DIRECTED RESEARCH & DEVELOPMENT

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## Problem

- DHS and other government agencies charged with preparing for WMD attacks and other catastrophic events have turned to expert facilitated multi-person exercises using computer-based simulation to address preparedness training.

- Valuable approach that has its drawbacks:
    - Requires use of expert facilitators,
    - A significant number of trainees must be using the system at the same time,
    - Generally takes a day or longer to run through a threat scenario.

- These tool types are too scripted, time-consuming and specialized to be utilized by a broad user base.

> **Is there a complimentary approach that leverages advantages in computer gaming and cognitive modeling?**

### The "Experience Gap"

|  | Requirements | Experience | Benefit |
|---|---|---|---|
| **Full-Scale Exercise** | All impacted personnel, Logistical equipment, Facilitators, Scenario writers | Scripted (low risk) | Capability demo and logistics test. Practice with real equipment |
| **Scripted Run-Thru** | High-level decision-makers, Facilitators, Scenario writers | Scripted (low risk) | Open discussion of key issues |
| **Table-Top Exercise** | High-level decision-makers, Facilitators, Scenario writers, Rules development | Group Decision ⇒ Bounded Consequence | Intellectual decision-making experience based on abstractions |
| **Simulation-driven Exercise** | High-level decision-makers, Logistical equipment, Facilitators, Scenario writers, Simulation development | Group Decision ⇒ Consequence | Intellectual decision-making experience based on simulated data. Practice with real equipment |
| **Game-based Training** | Decision-makers, Game development | "My" Decision ⇒ Consequence | Visceral decision-making experience based on simulated data. Frequent use. |

### Research Design Choices

|  | Rationale |
|---|---|
| **Game-based Training** | - Train decision-making skills only acquired through experience |
| **Model based non-player characters** | - Simulated group environments<br>- Multiple-perspective play |
| **Short scenario run-time** | - Learn in short time bursts available<br>- Run more scenarios in a given time |
| **Adaptive training scenarios** | - AI-based "facilitation" |

## Research Objectives

|  | Objective |
|---|---|
| Game-based Training | - Incorporate advanced AI techniques while maintaining training objectives<br>- Leverage open source engine in conjunction with USC |
| Model based non-player characters | - Innovate on traditional "drone" non-player characters by incorporating emotionally driven cognitive models<br>- Leverage SHERCA / SCREAM |
| Short scenario run-time | - Investigate scenario time-compression options to determine appropriate techniques that meet training objectives |
| Adaptive training scenarios | - Innovate on statically defined skill levels by dynamically changing subcomponents of the scenario<br>- Leverage Automated Decision Support research |

### Research Accomplishments: Scenario and Platform

- Setting: Metropolitan area (geo-typical)
- Threat: Chlorine release from a tanker truck
- Player Character: Abstracted Incident Commander
- Non-Player Characters:
    - Firefighters
    - Police officers
    - HazMat team
- Key Decisions:
    - Shelter-in-Place City Blocks
    - Evacuate City Blocks
    - Equip PPE
    - Manage Traffic Intersections
- Assessment:
    - Number of lives saved

### Research Accomplishments: Testing and Publication

- Put game in front of responders early-on
    - Alameda County Public Health, HazMat (August 2007)
    - San Jose Police (September 2007)
    - South Bay Regional Public Safety Training Consortium (October 2007)
    - Campbell Police (October 2007)

- Papers and Presentations
    - Paper submitted; IEEE Symposium on Computational Intelligence and Games, (2008)
    - Presentation; Serious Games Summit / Game Developer's Conference, (2008). Submitted presentation for 2009.
    - Invited talk; Lockheed-Martin Information Technology Trends Conference (2008)
    - Present paper; International Conference on Software Engineering and Knowledge Engineering (2008)

## Significance

- Gaming is an important and emerging delivery path for knowledge about complex systems

- Current Programmatic Interest
    - DHS S&T: 2008 funded project extends gaming approach in analysis and training delivery
    - DHS OHA: Briefed Assistant Secretary Runge on this work and potential adoption in scenario planning. Proposal under consideration.
    - DOT: Two invited talks to Hazardous Materials Intermodal Meeting. Ongoing discussions.
    - DoD: Two proposals submitted to DTRA/JSTO

> This research address key issues in using this delivery path for DHS / WMD training and analysis systems

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