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ENHANCED TRAINING THROUGH INTERACTIVE VISUALIZATION OF TRAINING OBJECTIVES AND MODELS

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About **myself**

Informatics Research Center

- University of Skövde, Sweden
- Artificial Intelligence Lab
- Data analysis, visual analytics, data intensive environments, decision support

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WELCOME TO SWEDEN

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About Combitech and Saab Training

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Virtual Training →

MAPAM 60 mm Indoor Trainer

TEMIS - Training & Exercise Management Information System

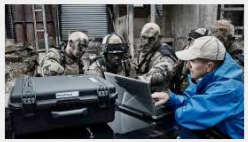
Integrated Training Environment

JFIST - Joint Fires Trainer

Vehicle Crew Trainer

SAVIT (Small Weapons Virtual Indoor Trainer)

Live Training →



ManPack 300

Precision Gunnery Training

Integration Platform

Urban Operations Training

Counter-IED and Search Capability

Infantry Training

Anti-Tank Weapons Simulator

Vehicle Weapons Simulator

ManPack 120

Live Fire Training System →

Live Fire Training System

Live Fire Tactical Training

Saab training

Live virtual and constructive

Combitech

1800 employees in technology, security and environment

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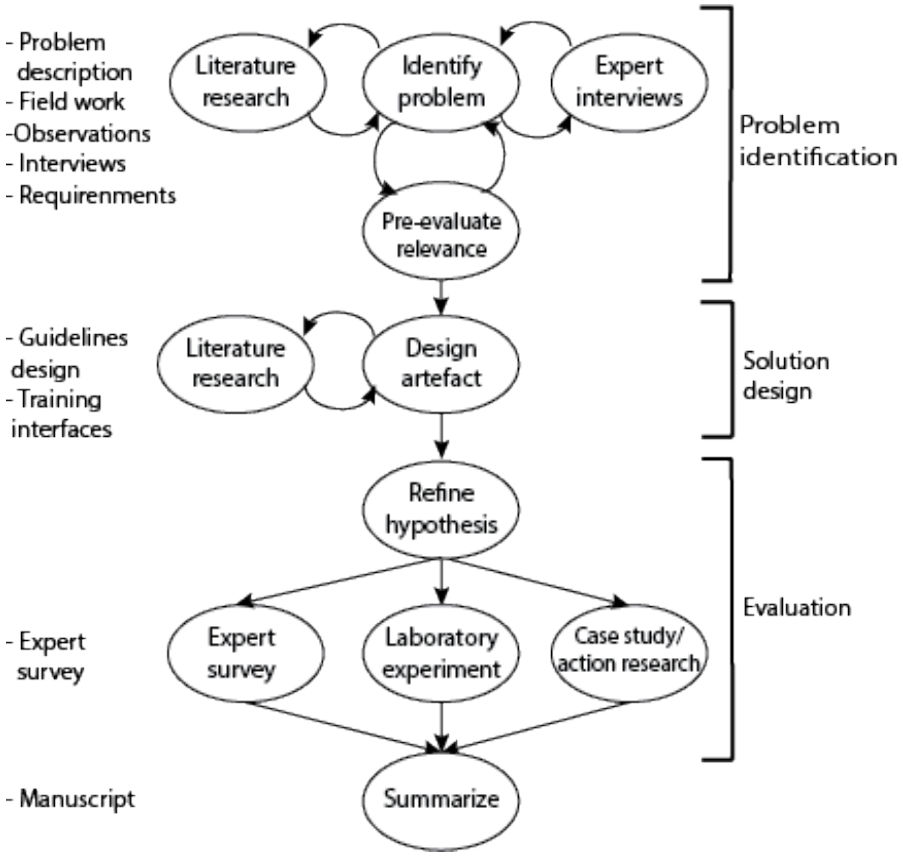
Motivation: Training Objectives

- Military forces operate in complex and dynamic environments [1] where bad decisions might have fatal consequences.
- Many of the virtual training are designed without thorough consideration of the effectiveness and efficiency of embedded instructional strategies [2], and without considering the cognitive capabilities and limitations of trainees.
- As highlighted in [3], large military training exercises require a significant commitment of resources, and to net a return on that investment, training scenarios for these events should systematically address well-specified training objectives, even if they often, do not.

Summary

- We present a design solution for a proof-of-concept prototype that visualizes and manages training objectives and performance measures, at individual and collective levels.
- We present a task analysis study with experts from Combitech and Saab Training.
- Focus on visualizing **training objectives and training models.**
- Real-world data from Live training exercises.
- Discussion how to learn from previous training experiences using data mining methods in order to build training models to provide instructional personalized feedback to trainees.

DESIGN PROCESS



Design process used in this work, adapted from Offermann et al. [4]

TASKS TO BE SUPPORTED

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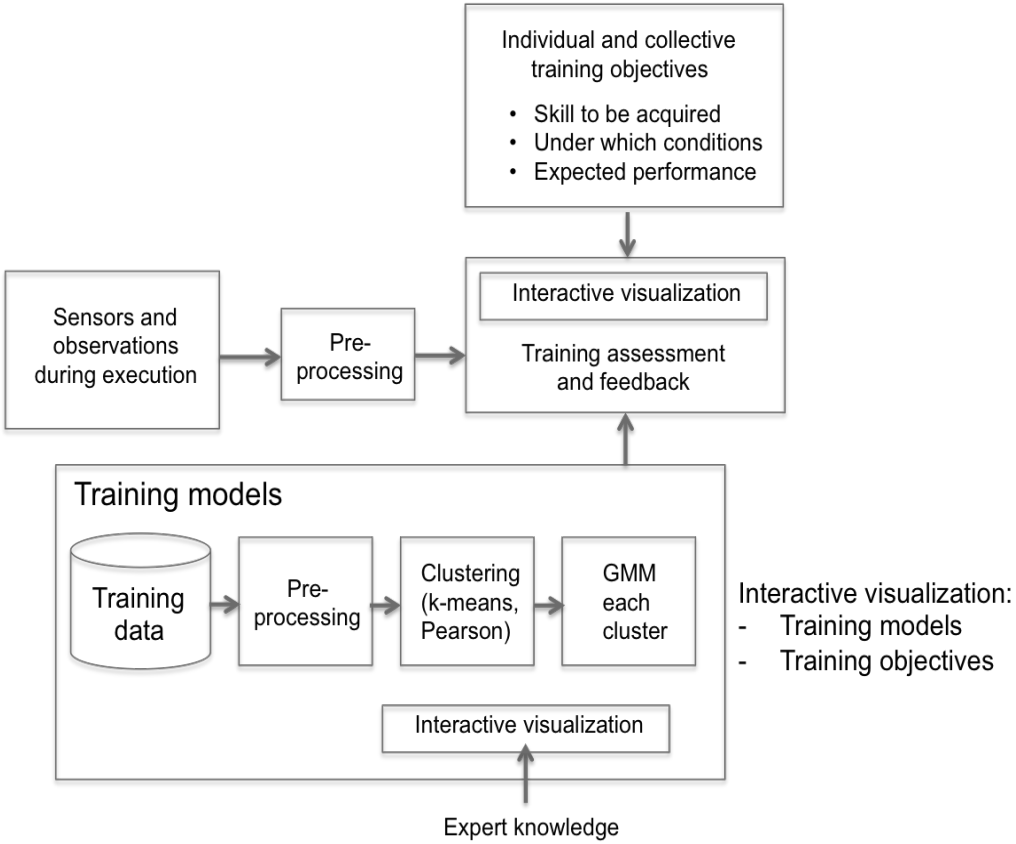
The formative user study carried out with expert system developers and experts in training highlighted that the following tasks needed to be supported:

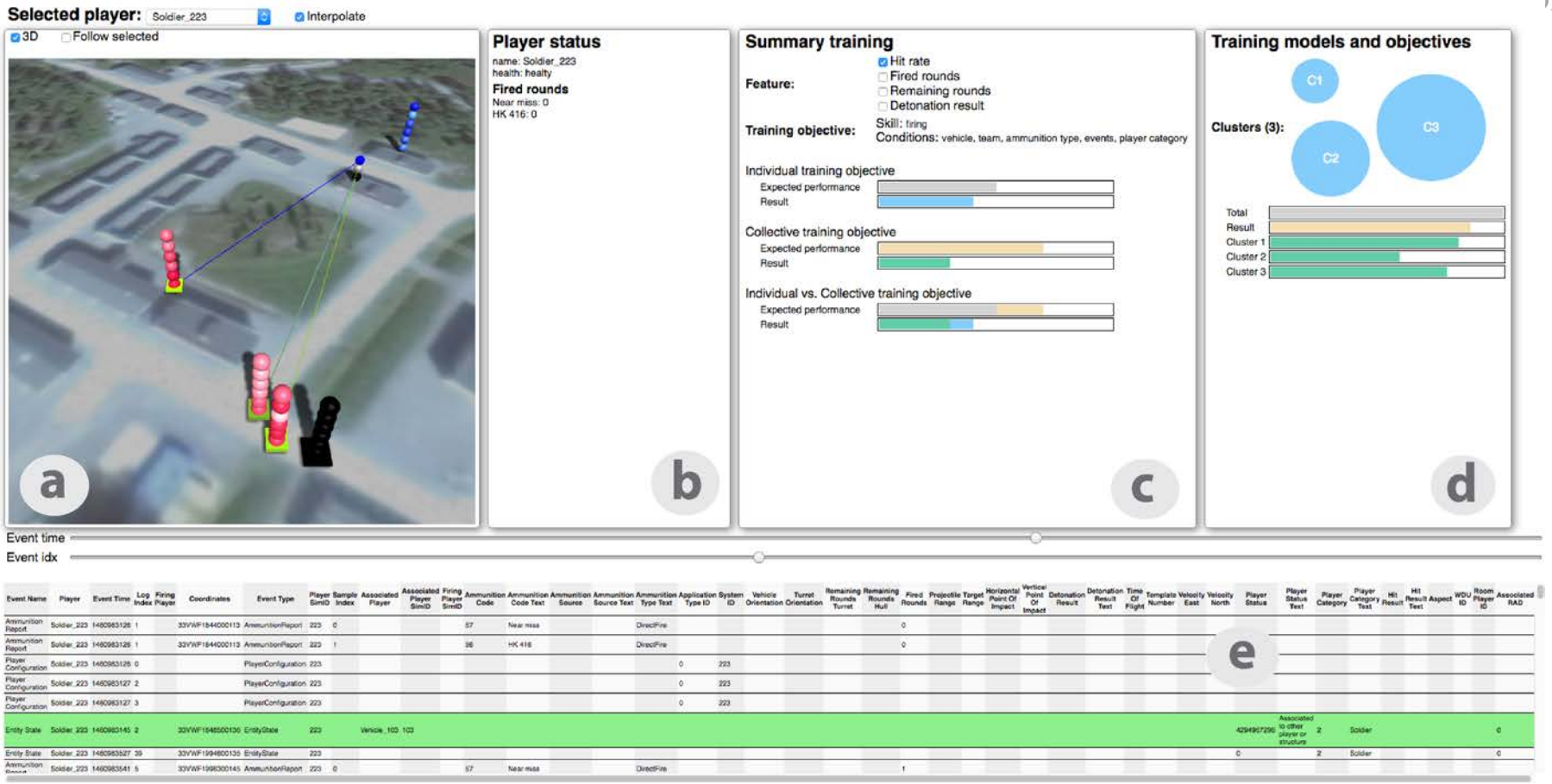
① Identify different groups of trainees.
② Create statistical models that characterize each of the identified groups.
③ Define training objectives (skill, conditions and expected performance).
④ Interactive support for after-action support:
   a. what happened?
   b. why did it happened
   c. how do we improve it in the future?
⑤ Support for comparison tasks both at the individual and collective level: compare results with training objectives and training models.
⑥ Play back multimedia data associated to exercises, combining all the information collected and the information from the aforementioned tasks.
⑦ Highlight differences and similarities between groups of trainees.
⑧ Provide feedback based on the models and the expected results, both at individual and collective level.

PROTOTYPE DESCRIPTION



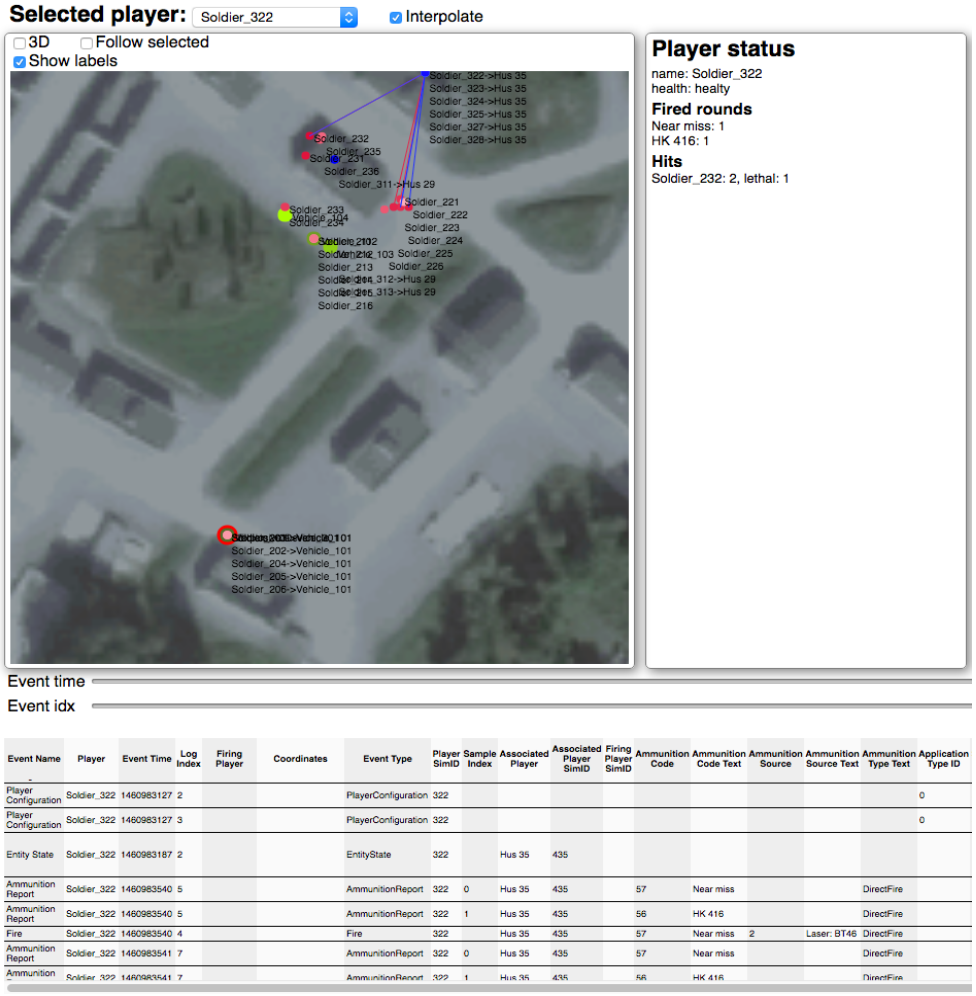
System architecture: (1) sensor observations, pre-processing, training assessment and feedback; (2) training models; (3) individual and collective training objectives. The analysts can interact with the various the modules.

PROTOTYPE DESCRIPTION



Main proof-of-concept interface, (a) 3D view of the exercise; (b) player status over time; (c) summary of the training exercise; (d) visualization of the training models and objectives; (e) playing bar and detailed view of the high-dimensional dataset.

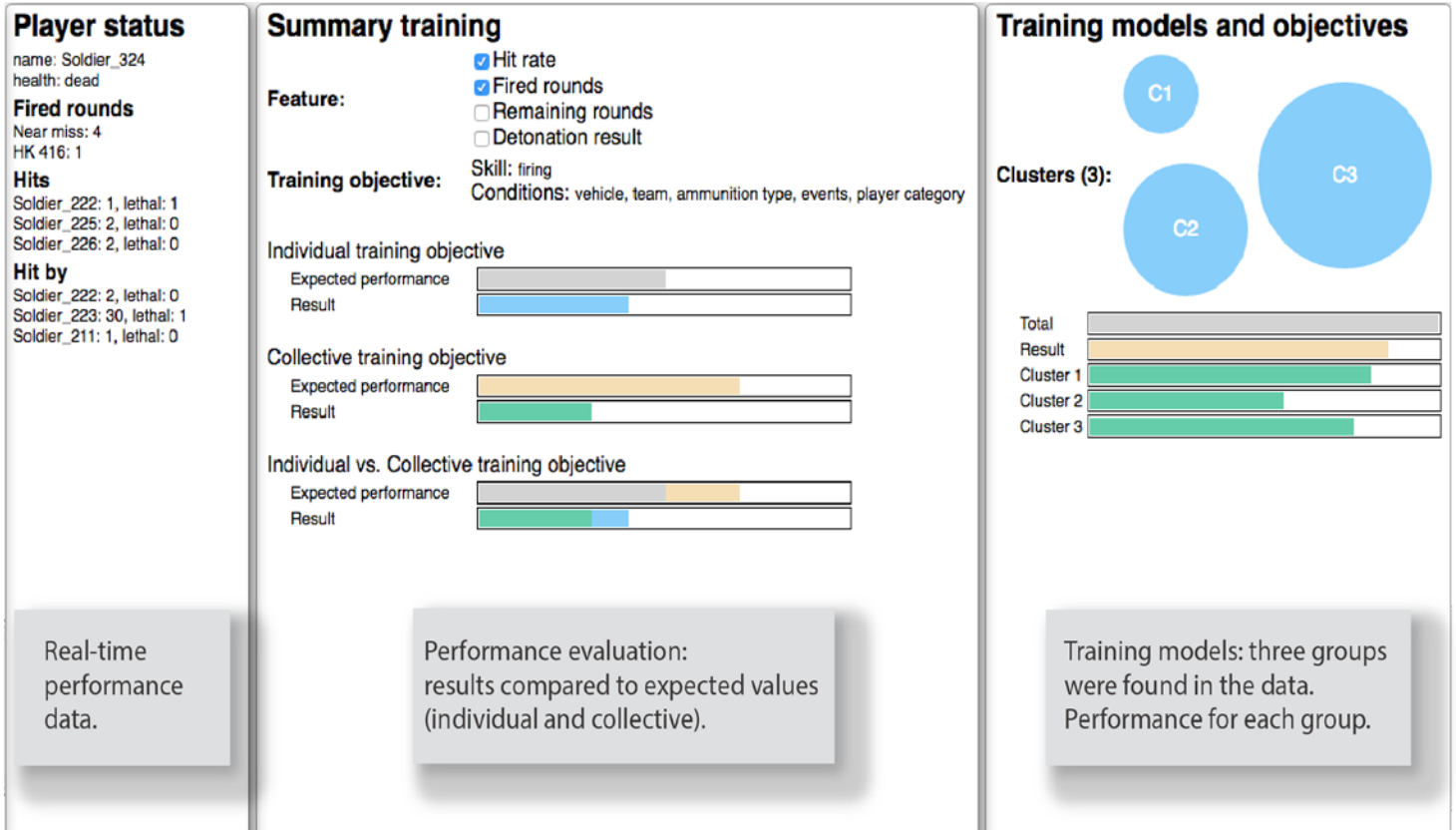
PROTOTYPE DESCRIPTION



Event Name	Player	Event Time	Log Index	Firing Player	Coordinates	Event Type	Player SimID	Sample Index	Associated Player	Associated Player SimID	Firing Player SimID	Ammunition Code	Ammunition Code Text	Ammunition Source	Ammunition Source Text	Ammunition Type Text	Application Type ID
Player Configuration	Soldier_322	1460983127	2			PlayerConfiguration	322										0
Player Configuration	Soldier_322	1460983127	3			PlayerConfiguration	322										0
Entity State	Soldier_322	1460983187	2			EntityState	322		Hus 35	435							
Ammunition Report	Soldier_322	1460983540	5			AmmunitionReport	322	0	Hus 35	435		57	Near miss			DirectFire	
Ammunition Report	Soldier_322	1460983540	5			AmmunitionReport	322	1	Hus 35	435		56	HK 416			DirectFire	
Fire	Soldier_322	1460983540	4			Fire	322		Hus 35	435		57	Near miss	2	Laser: BT46	DirectFire	
Ammunition Report	Soldier_322	1460983541	7			AmmunitionReport	322	0	Hus 35	435		57	Near miss			DirectFire	
Ammunition	Soldier_322	1460983541	7			AmmunitionReport	322	1	Hus 35	435		56	HK 416			DirectFire	

Collective 2D view with details for the selected player.

PROTOTYPE DESCRIPTION



From left to right, real time performance data, comparison between expected and achieved results, visualization of training objectives and groups of trainees (clusters) found in the historical data.

CONCLUSIONS

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- CONTRIBUTION:
  - Design proposal of a training proof-of-concept prototype that allows the interactive analysis of high-dimensional spatio-temporal data and manages training objectives for performance evaluation of training exercises.
  - Tasks being supported were outlined after a formative user study with experts from Combitech and Saab Training.
  - The prototype uses historical data for building models of training behaviour that then are compared with the results of training exercises in order to provide personalized feedback.
- FUTURE WORK:
  - Natural more engage ways of interacting with data

REFERENCES

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4. P. Offermann, O. Levina, O. Schönherr, and U. Bub, "Outline of a design science research process," in Proceedings of the 4th International Conference on Design Science Research in Information Systems and Technology, New York, NY, USA, 2009, pp. 1-11.

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THANK YOU FOR YOUR ATTENTION!

QUESTIONS?

COMBITECH

Knowledge Foundation

SAAB

Training & Simulation