The information on this page is used to assign your poster to the right track
Please answer the following.

- **Title of Poster**: Capturing the task model of experts in emergency response using SYnRGY.

- **Track**. Human Experiences in the Design of Crisis Response and Management Services and Systems

Capturing the Task Model of Experts in Emergency Response using SYnRGY.

Jean-François Gagnon
Université Laval
Jean-Francois.Gagnon.22@ulaval.ca

François Couderc
Thales Canada Inc.
Francois.Couderc@ca.thalesgroup.com

Martin Rivest
Thales Canada Inc.
Martin.Rivest@ca.thalesgroup.com

Sébastien Tremblay
Université Laval
Sebastien.Tremblay@psy.ulaval.ca

STATEMENT OF TOPIC
Emergency Response Task Model of Experts.

SIGNIFICANCE AND RELEVANCE OF THE TOPIC
This paper addresses the issue of the measurement of task modeling in the context of emergency response. Emergency response entails great complexity and dynamism, consequently leading to complex interactions between decision makers and their environment. There is a need for better measurement of these complex interactions in order to develop models of expert cognition in naturalistic environments. We report the development of a human centered technological tool for emergency management that entails measurement and simulation capabilities. These capabilities will allow the development of dynamic models of expert cognition of emergency response in naturalistic environments and provide guidelines for the development of better tools, training methods and procedure in this context.

ABSTRACT
The need for better team measurement in realistic environments has been recognized as one of the key challenges that characterize the field of team work studies (Salas, Cooke, & Rosen, 2008). This challenge is particularly hard to address in the context of emergency response, due to the inherent complexity and dynamism of the domain. Emergency response is part of the emergency management cycle, and refers to the mobilization of the adequate actors and resources to mitigate the impact of an incident on the public and on the environment (Abrahamsson, Hassel, and Tehler, 2010). Emergency response often requires the cooperation of multiple agencies such as police, medical, and fire services, consequently increasing the complexity of such operations. We report of how SYnRGY – a human-centered emergency response technological tool – is embedded with extensive measurement and simulation capabilities to allow tracing of experts' task models in a silent and reliable way. We describe how these capabilities; combined with an innovative modeling technique – dynamic cognitive task modeling - can be used to extract experts' representations of the task. We discuss the importance of such a model for training, improvement of emergency response procedures and development of emergency response tools.

SYnRGY is a safety and emergency dynamic system based on a geographic information system (Figure 1) that provides timely data and geospatial capabilities to integrate, analyze, visualize, and disseminate information related to the various events unfolding during emergency response. It allows multiple users from different services (e.g. Police, Fire, Medical) to share a common operating picture, communicate and coordinate for efficient emergency response. SYnRGY can be fed either with actual data from the ground or with simulated data. Simulation mode allows the experimenter to script several parameters of the scenario, record actions performed by the users, replay an event after its occurrence and export cognitive metrics. In simulation mode, users play the role of an emergency manager, or one of the emergency dispatchers. The role of the emergency manager is to monitor for the occurrence of critical events and, if needed, send "requests for support" to the emergency dispatchers of the appropriate agencies. For this project, three agencies are simulated: Local police, Fire department, and Ambulance services. The role of each emergency dispatcher is to respond to the "request for support" sent by the emergency manager by allocating the most appropriate resources available.

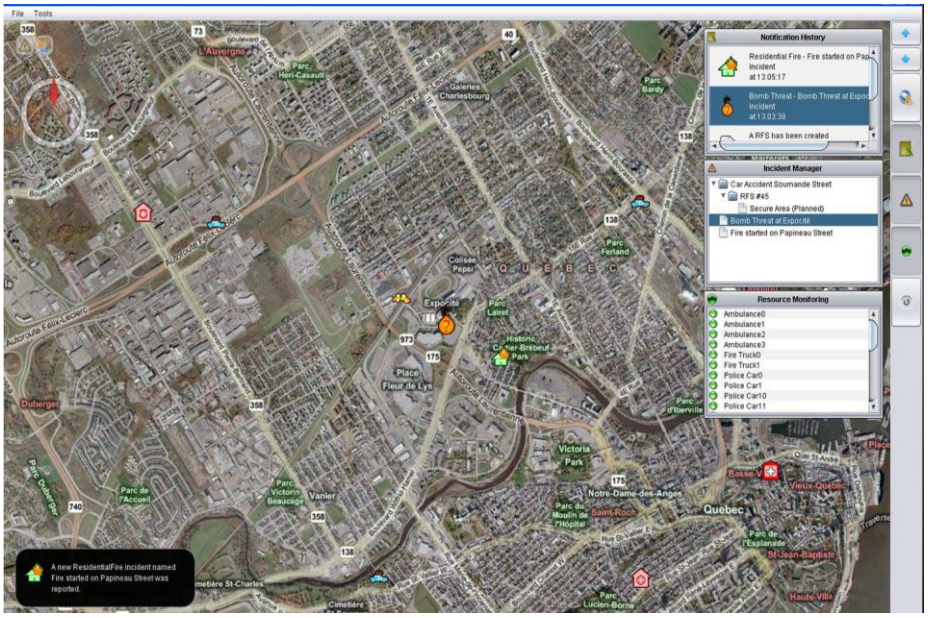

Figure 1. SYnRGY Emergency manager interface.

Critical events that can be simulated include a residential fire, vehicle accident and bomb threat. Each of these events is characterized by a list of parameters that specify what actions are required by the emergency manager and emergency dispatchers. In addition to critical events, the simulation allows control of the number of vehicles available for each agency, the starting location of the vehicles, and their resource capabilities. For instance fire units may or may not have "jaws of life" capabilities. The efficiency of a unit in response to a specific event will be determined by the parameters of the critical events in conjunction with the parameters of the vehicles.

A better understanding of the interactions of experts with their environment requires the development of measures that are reliable, valid, unobtrusive and dynamic (Cooke & Gorman, 2009). These measures must describe how people interact with the tools when they perform their task. These requirements are notoriously hard to achieve, especially when the complexity of the task increases, such as in emergency response. SYnRGY attempts to achieve these measurement requirements in the context of emergency response by silently recording every action performed by the users and synthesizing the results in cognitive metrics such as coordination efficiency, monitoring, and adaptability. For instance, adaptability is inferred by comparing taskwork behaviors before and after the occurrence of critical events. This measurement capability allows the application of a novel method for extracting experts' task knowledge: Dynamic cognitive task modeling (Gagnon, Jeuniaux, Dubé and Tremblay 2011).

With the extended simulation and measurement capabilities of SYnRGY, we aim reaching a high level of realism and experimental control that will allow the extraction of a valid and reliable task model of emergency response. This model will provide guidelines for the further development of emergency response tools like SYnRGY, but also for the improvement of procedures and training methods.

REFERENCES

1. Abrahamsson, M., Hassel, H. and Tehler, H. (2010) – Towards a System-Oriented Framework for Analysing and Evaluating Emergency Response, *Journal of Contingencies and Crisis management,* 18, 1, 14-25.
2. Cooke, N.J. and Gorman, J.C. (2009) – Interaction-Based Measures of Cognitive Systems, *Journal of Cognitive Engineering and Decision Making*, 3, 1, 27-46.
3. Gagnon, J-F., Jeuniaux, P., Dubé, G. and Tremblay, S. (2011) – Dynamic Cognitive Task Modeling of Complexity Discovery: A Mix of Process Tracing and Task Analysis, *Proceedings of the Human Factors and Ergonomics Society*, 55, 1, 1346-1350.

   Salas, E. Cooke, N.J., and Rosen, M.A. (2008) – On Teams, Teamwork, and Team Performance: Discoveries and Developments, *Human Factors: The Journal of the Human Factors and Ergonomics Society*, 50, 3, 540-547.