DEVELOPING A FIRE RESPONSE SIMULATION TEST BENCH BASED ON NFID

Adriano O. Solis, Ali Asgary, Jenaro Nosedal-Sánchez and Beatrice Zaccaro



RESEARCH OBJECTIVE

To develop a simulation engine leveraging the NFID in order to provide fire departments across Canada with a data driven tool for evidence-based planning and response to fire incidents.

NFID INITIAL ANALYSIS /ASSESSMENT

□ Very significant amount of missing values (blanks) in NFID.

□ E.g., relevant data field for modelling and simulation (M&S) of FD operational performance: RESPONSE (time to respond to incident).

- available only for the jurisdiction of Alberta (13.2% of reported incidents).

□ Proportion of fires and fire related incidents in relation to other types of emergencies that fire departments respond to.

INCIDENT DATA SET

- Gaps in key operational data (incident location, time of alarm receipt, response time, etc.), as currently reported in the NFID
- □ Collaboration with Vaughan Fire & Rescue Service (VFRS) in Province of Ontario in order to be able to develop a simulation model.

□ 88% of data found utilizable after clean-up process (set of key data fields related to incidents and responses).

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INTEGRATION OF EMPIRICAL DATA FOR SIMULATION





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SIMULATION MODELS & OUTPUTS

- □ Incident Generation Model (*Discrete Event Simulation*): appears to simulate occurrence of emergencies more or less following actual patterns arising in historical data.
- □ Incident Response Model (*Agent-Based Simulation*): appears capable of reproducing performance of the system in terms of responding to emergencies.

EXTENSION AND IMPROVEMENT OF SIMULATION MODELS

□ Simulation of protocols for numbers of responding units depending upon types of emergency incidents.

Developing more extensive experiments to evaluate different scenarios

- impact of demand fluctuations on response times and operational resources (crews/vehicles),
- comparison between assignment of responding units according to responsible district/region vs. geographically closest station(s).

POSSIBLE EXTENSION/IMPROVEMENT OF THE NFID

- We propose including in the NFID relevant information about all types of emergency incidents responded to by Fire Departments.
- □ Key relevant data fields: RESPONSE, DISTANCE, INCIDLOC (longitude/latitude coordinates), YEAR, MONTH, DATE, DAY, TIME, CREWSIZE, NUMBER OF ENGINES, NUMBER OF AERIALS, NUMBER OF TANKERS.
- □ We recommend encouraging fire departments, especially those of major cities, to share relevant information in order to learn about, and gain insights on, overall performance in responding to emergencies.

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