Command and Control Initial Action and Response Assessment: Applying the Law of Requisite Variety and Fuzzy Logic to Critical Dynamic Situations

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Room:

Zoom Link

Abstract

Command and control (C2) is an interdependent activity facilitating planning and execution of goal directed tasking. The focus of this research is on the execution of C2 activities in real-time, complex, dynamic environments. This research is original in that it applies the fundamentals of the **law of requisite variety (LoRV)** and specifically its relationship to information theory in assessing the functions of C2 in a simulated wildland fire fighting environment. Additionally, through application of **fuzzy logic methods**, an original methodology is applied rendering expert domain perceptions and understanding in a calculable way to plot the severity of the fire against the capabilities of the dispatched response onto a graphical representation of the LoRV for **effectiveness evaluation**. C2 combines the decision making of what to go do along with the activities of carrying out the actions necessary towards achieving a desired result. With increased amounts of information available, processing it can cause delays in determining which action is needed to meet the goal. There is a need to aid the decision maker in assessing the situation, and how the relationships between available responses to the perceived disturbances meet the decision maker's expectations. Through a LoRV perspective of the domain, an event's information can be rendered into the needed knowledge in achieving one's goals through trained perceptions. This research explicates how the LoRV supports decision-makers' awareness of how the situation is evaluated and progressing by using human perceptions to build and convey the needed knowledge back to the resource dispatcher to attain the intended goal and minimize response latency. Further, using fuzzy logic to quantify human perception information and knowledge. This transformation compresses the meaning through a common lexicon, thus providing effective inputs into a LoRV evaluation of activities to achieve and maintain situation awareness and support decisions for subsequent capability deployment. Through the lenses and relationships between information theory and the law of requisite variety, this paper investigates characterizing C2 decision space to provide an understandable way by leveraging the decision-maker's knowledge and understanding.