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Enhancing heterogeneous mobile network management based on a well-founded reference ontology

- Julio Cesar Cardoso Tesolin, André M. Demori, David Fernandes Cruz Moura, Maria Cláudia Cavalcanti, Future Generation Computer Systems Journal, Volume 149, 2023, Pages 577-593, ISSN 0167-739X, https://doi.org/10.1016/j.future.2023.08.008.

  Abstract: The fulfillment of the Always Best Connected & Served concept in future mobile wireless networks depends on their ability to maintain a seamless association between the user's equipment and the network. As a result, many researchers and developers have proposed several decision-support mechanisms to cope with this challenge. One of the promising mechanisms to aid mobile wireless networks in achieving ubiquitous coverage with a seamless connection is semantic reasoning. However, once it relies on ontologies, proper representation of Link and Connection – entities that bind the communication nodes – is paramount. Unfortunately, although several network-related ontologies present these concepts, they are unclear on which entities they bind, nor do they present them simultaneously. Also, the same ambiguity can be perceived in vocabulary recommendations of several telecommunication standard bodies. Our main contribution is the ontological analysis that clarifies the definition of Link and Connection in telecommunication domain. Besides, we analyze their dependencies while refining other concepts such as Medium, Server, and Neighbor. Thus, we provide the foundations for a new network-related ontology to support mobility management in wireless networks.

  Keywords: Mobile networks; Seamless handover; Conceptual modeling; Ontology; Semantic decision; Knowledge graph

A Semantic Web Approach for Military Operation Scenarios Development for Simulation.

Demori, A.; Tesolin, J.; Moura, D.; Gomes, J.; Pedroso, G.; Silva de Carvalho, L.; Pignaton de Freitas, E. and C. Cavalcanti, M. (2023). In Proceedings of the 12th International Conference on Data Science, Technology and Applications - DATA; ISBN 978-989-758-664-4; ISSN 2184-285X, SciTePress, pages 390-397.

https://www.scitepress.org/Link.aspx?doi=10.5220/0012088600003541

Keyword(s): Semantic Web, Domain ontologies, Decision-making, Modeling and Simulation.

Abstract: The reality simulation process by computational means allows decision-makers to analyze and propose the best strategies to be adopted in a real environment. However, the scenario, sometimes heterogeneous, as in the case of military operations, requires formalization to achieve domain knowledge, allowing a more faithful reproduction of reality. In the case of military operation scenarios that address tactical, operational, and strategic elements and the use of communications, formalization could help organize knowledge, data sharing, and decision-making. This article proposes (i) the use of conceptual modeling that is based on concepts arising from a foundation ontology named UFO (Unified Foundational Ontology), (ii) the use of Web Ontology language (OWL), and (iii) the use of rule definitions expressed in the Semantic Web Rule Language (SWRL). Through this approach, this article describes the process of formalizing the domain knowledge as a reference and its corresponding operational ontology by identifying entities, relationships, rules, and all the categorizations made in the ontology for execution and decision-making in a battlefield simulator that is still in production. The application of this ontology is illustrated in representative and real-world examples, showing promising results of the proposed approach.

Integrating a Multi-Agent System Simulator and a Network Emulator to Realistically Exercise Military Network Scenarios

Barone, D.; Wickboldt, J.; C. Cavalcanti, M.; Moura, D.; Tesolin, J.; Demori, A.; Anjos, J.; Silva de Carvalho, L.; Gomes, J. and Pignaton de Freitas, E. (2023). **Integrating a Multi-Agent System Simulator and a Network Emulator to Realistically Exercise Military Network Scenarios**. In *Proceedings of the 13th International Conference on Simulation and Modeling Methodologies, Technologies and Applications - SIMULTECH*; ISBN 978-989-758-668-2; ISSN 2184-2841, SciTePress, pages 194-201.

https://www.scitepress.org/PublicationsDetail.aspx?ID=GGNal8En1vI=&t=1

Keyword(s): Integration, MAS, Military Network.

Abstract: Modern battlefield scenario are complex environment in which a myriad of equipment and people interact to accomplish a given mission. Most of this interaction is performed by means of wireless communication via Command and Control Systems, which efficiency represent a critical factor the mission success. The assessment of these systems, and their supporting networks, is of primal interest to decide for the best equipment and military maneuver approach. However, there is a lack of tools that provide all the necessary behavioral and network features to perform the task. Observing this fact, this work presents an alternative to simulate a battlefield environment model by means of integrating a network emulator and a Multi-Agent System simulator. By combining both software, it is possible to assess specific characteristics of each area without limiting the model, thus providing the necessary data for an informed military network setup assessment.