A Model and Simulation of a DOD Communications Network Based on the Stochastic Process in Real Time

http://www.csm.ornl.gov/Internships/posters04/v_moffett_pa.pdf

Veranda V. D. Moffett
Mississippi Valley State University

Research Alliance in Math and Science
Computational Sciences and Engineering Division
Oak Ridge National Laboratory
Mentor: Dr. Glenn Allgood

Abstract

The Oak Ridge National Laboratory (ORNL) is working on a communication model that will provide information and data among large spatially displaced elements on the battle field. The communication model is associated with latency, and how it applies in the Combat Identification (CID) System. The project was designed to develop the next generation Speed of Service Communication Model relevant to CID. The main task was to develop a Markov Chain and its associated probability that will be calculated in consideration of numerous elements, to include: latency, data integrity, quality of service, and commander confidence. My responsibility was to generate a function that would calculate the total probability for the model. This function will allow the model to transition through its various states supplying a time varying variable that will be used to adequately assess the impact of network security, wireless sensors, agent technology, and distributed energy resources on the communications infrastructure.

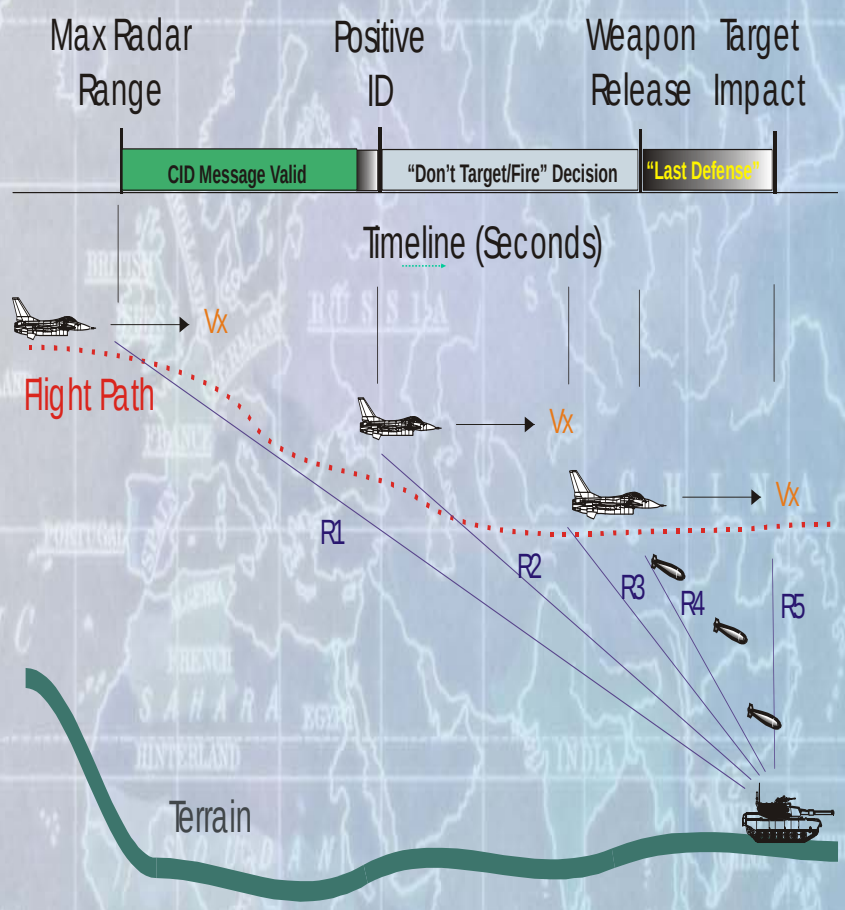
Objective

To provide a communication modeling and simulation tool to support combat identification trade studies as they relate to reduction of fratricide and combat efficiency.

Methods/Software Used

MATLAB 7.0

- **MATLAB** is a high-performance language for technical computing. It integrates computation, visualization, in an easy-to-use environment where problems and solutions are and programming expressed in familiar mathematical notation.
- **Typical Uses**
  Math and computation
  Algorithm development
  Modeling, simulation, and prototyping
  Application development, including graphical user interface building
- **Markov Model Process**
  With MATLAB I constructed a function to calculate the total probability of a five state Markov model. This function was integrated into a Markov model, which allows the model to transition through its various states.



Fighter Attack Geometry (F15 Platform)

Conclusion

A model was developed which will be implemented into a tool that is under development and will be used to address both security and performance issues for the current energy communication infrastructure as well as proposed future infrastructure.

Future Plans

The results of this research will be integrated into a Combat I.D. Systems of Systems Application and will be used to access information flow and integrity verifying network simulation.

This research was performed under the Research Alliance in Math and Sciences Program administered through the Computer Science and Mathematics Division, Oak Ridge National Laboratory. This Program is sponsored by the Mathematical, Information, and Computational Sciences Division; Office of Advanced Scientific Computing Research; U.S. Department of Energy. Oak Ridge National Laboratory is managed by UT-Battelle, LLC, for the U.S. Department of Energy under contract DE-AC05-00OR22725. This work has been authored by a contractor of the U.S. Government, accordingly, the U.S. Government retains a nonexclusive, royalty-free license to publish or reproduce the published form of this contribution, or allow others to do so, for U.S. Government purposes.