

MODELING AND SIMULATION INTERNET SOURCES

APPLICABLE M&S STANDARDS

Army Standards Repository (ASTARS)

<http://www.msrr.army.mil/astars/>

The Army Standards Repository (ASTARS) is a user friendly web-based tool that houses all approved Army modeling and simulation (M&S) standards. The system has been online since June 1998. For each approved standard in ASTARS, the user can find a brief description of the standard, to include its utility and limitations, as well as a point of contact. ASTARS allows the user to search by standards category or conduct a general search of all standards, tools, and documents in the repository by title, description, or keywords.

High Level Architecture (HLA)

<https://www.dmsomil/public/transition/hla/>

HLA is general-purpose architecture for simulation reuse and interoperability. HLA provides a distributed simulation framework for new simulations. HLA is defined by a set of rules, an interface specification, and an object model template. Initial definition of the HLA was accomplished under the sponsorship of DARPA ADS program. It was transitioned to the DMSO in March 1995 for further development. HLA was approved by the Undersecretary of Defense for Acquisition, Technology and Logistics, USD AT&L, as the standard technical architecture for all U.S. DoD simulations on 10 September 1996. HLA is not a standard but only a methodology for developing standards. There are many different simulation standards being developed using the HLA architecture.

Aggregate Level Simulation Protocol (ALSP)

<http://alsp.ie.org/alsp/>

<http://ms.ie.org/alsp/>

Aggregate Level Simulation Protocol (ALSP), both software and a protocol, is used to interoperate simulations. It is used extensively by the United States military to link analytic and training simulations to support training requirements for Corps and above.

ALSP consists of three components: the ALSP Infrastructure Software (AIS) providing distributed runtime simulation support and management; a reusable ALSP Interface consisting of a set of generic data exchange message protocols (i.e., formal rules for information exchange) to enable interaction among objects represented in different simulations; participating simulations adapted for use with ALSP.

SIMULATION SYSTEMS AND SOFTWARE

Joint Simulation System (JSIMS)

<http://www.jsims.mil/>

The primary purpose of the Joint Simulation System (JSIMS) is to support training and education of ready forces by providing realistic joint training across all phases of military operations for all types of missions. JSIMS will provide for Joint training as well as Service specific training. A distributed, constructive war-gaming simulation, JSIMS is designed to create a single, seamlessly integrated Joint Synthetic Battlespace (JSB) providing a common environmental and operational picture of the battle space. It will interface with command, control, communications, computers, and intelligence (C4I) functions and equipment in the field, thus providing the interface between the JSB and the training audience. The resulting effect is a training environment indistinguishable by the training audience and the real world. JSIMS employs the DoD High Level Architecture (HLA) for Modeling and Simulation.

Joint Conflict and Tactical Simulation (JCATS)

http://www.jwfc.jfcom.mil/about/fact_jcats.htm

The Joint Conflict And Tactical Simulation (JCATS) is a self-contained inherently joint simulation in use for entity-level training in open, urban, and subterranean environments. JCATS represents an interactive, high-resolution conflict simulation that models joint-multi-sided air, ground, sea combat on high/low resolution digitized polygonal terrain. Uses range from the joint task force level down to tactical and

operations other than war in open/urban/subterranean environments using aggregates and individual systems. Most unique features include the replicating of small group tactics in urban terrain to include enhanced multi-floor buildings with doors, windows, interior walls, day-night operations under differing visibility and artificial lighting to include an underground environment. Other features include human characteristics— secondary suppression, fatigue, fratricide, health, etc. and its capability to mount/dismount entities and the use of linear and area sensors for rear-area security operation. JCATS was developed by Lawrence Livermore National Laboratory (LLNL) and is managed by the director for joint force training through the Joint Warfighting Center. Applications include training and exercises; analysis and experimentation; mission planning and rehearsals.

Warfighter's Simulation (WARSIM 2000)

<http://www-leav.army.mil/nsc/warsim/index.htm>

WARSIM 2000 is a computer based simulation with associated hardware and is the Army's next generation command and control training environment. In conjunction with JSIMS, it will support the training of unit headquarters and command posts from battalion through theater-level in joint and combined scenarios. Additionally, it will provide command post training events in educational institutions. It will be designed to allow units worldwide to train in their command posts using organic C4I equipment, with a minimum of overhead. This simulation system will meet emerging distributed simulation standards and protocols, thus providing a comprehensive joint environment capable of linking its simulation-based constructive entities with virtual (simulator-based) and instrumented vehicles.

Tactical Simulation (TACSIM)

[http://www-leav.army.mil/nsc/famsim/tacsim/index.htm /](http://www-leav.army.mil/nsc/famsim/tacsim/index.htm/)

TACSIM is a part of Models A Branch of Models Division, Constructive Directorate, U.S. National Simulation Center. The Tactical Simulation system is designed to provide training to intelligence staffs, collection managers, and analysts in a simulated war situation. TACSIM accomplishes this mission by simulating and or stimulating the entire spectrum of intelligence operations. TACSIM can support training from large-scale joint exercises to training on specific intelligence section tasks. Because of the realistic manner in which TACSIM portrays the Intelligence Battlefield Operating System (IBOS), TACSIM is also a tool for testing Intelligence Electronic Warfare (IEW) equipment. The TACSIM system is composed of several parts: a main simulator; peripheral devices that support computer generated analysis,

after action reports, and national collection systems; and, the Communications Support Processor (CSP).

Corps Battle Simulation (CBS)

<http://www-leav.army.mil/nsc/famsim/cbs/index.htm>

The Corps Battle Simulation is a part of Models A Branch of Models Division, Constructive Directorate, U.S. National Simulation Center. CBS is a geographically and functionally distributed air/land warfare simulation. CBS serves as an exercise driver to support training of commanders and staff officers at the Joint, Corps, and Army Division levels. CBS provides training stimuli for all ground forces staff elements from Brigade to Corps including combat, combat support, combat service support, and fixed and rotary wing air operations. All Battle Operating Systems are represented: Maneuver, Command & Control, Fire Support, Air Defense, Combat Service Support, Mobility / Countermobility / Survivability, Intelligence, as well as fixed and rotary wing air operations, NBC operations including Smoke and Chemical Recon and Decon, Special Operations, Civil Affairs and PsyOp.

CBS is written in SIMSCRIPT II.5. Network communications, workstation, and graphics software are written in C programming language. There are two expert systems utilized in CBS and are written in Ruleworks.

Joint Modeling and Simulation System (JMASS)

<http://www.redstone.army.mil/amrdec/jmass/>

JMASS is a Joint program to develop engineering level related simulation tools. JMASS is a simulation support environment, which is a collection of well-defined, well-documented interface standards to which a model should be built. It also includes a toolkit, which allows modelers to build representations of real world systems, configure those models, assemble them into simulations, execute those simulations, and process the results. JMASS is HLA compliant.

Air Force Electronic Warfare Evaluation Simulator (AFEWES)

<http://afewes.edwards.af.mil/>

AFEWES is a secure, Government-owned, Hardware-In-The-Loop (HITL) test laboratory, located at Air Force Plant 4 in Fort Worth, Texas. Managed by the Air Force Flight Test Center's (AFFTC) 412th Test Wing at Edwards AFB, CA, AFEWES develops and operates validated, high-fidelity Radio Frequency (RF) and Infrared (IR) threat simulators which evaluate the effectiveness of U.S. DoD and

Allied Electronic Combat systems in a controlled, ground-based laboratory environment. Simulated engagements are conducted at actual frequencies/wavelengths, in real-time, incorporate hostile operator-in-the-loop effects, and produce vector miss distance and other end-game data products. AFEWES provides many unique test capabilities not available at other types of T&E facilities.

Air Warfare Simulation (AWSIM)

http://afmsrr.afams.af.mil/index.cfm?RID=SMN_AF_1000000

AWSIM is the official U.S. Air Force theater-level war-gaming model. The purpose of AWSIM is to provide a training capability for the air warfare environment. In fulfilling this purpose, AWSIM represents the air component of commander-level battle staff training for Air Force conducted exercises, and the air portion of joint training exercises. AWSIM is an interactive and prescriptive, computer-driven, time-stepped simulation of a theater air warfare environment. AWSIM is latitude and longitude based and simulates day and night operations and limited weather conditions over a smooth earth (no terrain). It supports a two-sided scenario where opposing sides define, structure and controls their forces.

Modeled features include aircraft, air bases, surface-to-air missiles, short-range air defense systems, ships and radar sites. AWSIM results include success of individual aircraft missions, munitions consumption, and the systematic playing out of a scenario based on kill algorithms that determine the outcome of many separate aircraft interactions.

Business Simulation Packages

<http://www.towson.edu/absel/Packages/packages.html>

The web site provides links to the web pages of the following simulation games:

- AIRLINE: A Business Simulation
- Beefeater Restaurants Microworld
- Professional Services Microworld
- Alacrity Team Simulation Exercise
- Micro Business Publications
- The Business Policy Game - An International Strategy Simulation
- Business-Sims.Com
- BusSim: An Integrated Business Instruction System
- Capstone: The Business and Financial Strategy Simulation

- CEO: A Business Simulation for Policy and Strategic Management
- Simulated Collective Bargaining
- COMPETE: A Dynamic Marketing Simulation
- The Global Business Game
- Corporation: A Global Business Simulation
- DEAL: An Entrepreneurship Gaming Simulation
- Entrepreneur: A Business Simulation in Retailing
- GEO: An International-Business Gaming Simulation
- The Human Resources Management Simulation
- INFOGAME: Game for Research and Education in Information Systems
- INTOPIA: International Operations Simulation/Mark 2000
- MAGEUR: A General Business Game
- MANAGEMENT 500: A Business Simulation for Production and Operations Management
- The Management Accounting Simulation
- Manager: A Simulation Game
- Marketer: A Simulation Game
- Marketplace: a web-based business simulation game with several levels of difficulty.
- Smart Sims Includes many different simulations including MikesBikes-Advanced: An Advanced Business Simulation, MikesBikes-Advanced: Accounting Edition, MikesBikes-Intro: A general Business Simulation and music2go: A Marketing Simulation.
- The Multinational Management Game
- Threshold Competitor: A Management Simulation.

MAGNUS, A Simulated Environment for Decision Making

<http://magnus.comp.nus.edu.sg/>

MAGNUS, which stands for MAnagement Game, National University of Singapore, is designed to provide students an opportunity to learn and practice the art and science of corporate planning and managerial decision-making. It is also used for students in information systems to practice building and testing decision support systems. The system runs on a PC network with an Administration System and a graphical player interface running under Windows. The system is continually

undergoing development, which includes multilingual and internet support. A demo version is free for download.

M&S SELECTED PUBLICATIONS

Volume 9: Modeling and Simulation, of Technology for the United States Navy and Marine Corps, 2000-2035: Becoming a 21st Century Force

http://books.nap.edu/html/tech_21st/msindex.htm

Published by National Academy of Sciences. Provides extensive discussion of almost every aspect of DoD Modeling and Simulation.

Downloadable Articles from SIMULATION and TRANSACTIONS Special Issues

<http://www.scs.org/pubs/special/specinfo.html>

SIMULATION Articles from the Special Issue on High Level Architecture

SIMULATION Articles from the Special Issue on Parallel and Distributed Simulation

TRANSACTIONS Articles from the Special Issue on Parallel and Distributed Simulation

Articles from Military Magazines

<http://www.magweb.com/sample/readsamp.htm>

The web site contains sample articles from more than sixty military history and war-gaming magazines.

AIR FORCE INSTRUCTION (AFI) 14-206, Modeling and Simulation

<http://www.e-publishing.af.mil/pubfiles/af/14/afi14-206/afi14-206.pdf>

This instruction implements AFPD 14-2, Intelligence Collection, Production, and Application. This instruction guides intelligence modeling and simulation activities. It also includes intelligence support to modeling and simulation activities in weapon systems acquisition, research and development, test and evaluation, education and training, military operations, and national level policy making.

Conceptual Models of the Mission Space (CMMS)

<http://www.dtic.mil/ndia/livefire/sheehan.pdf>

This is the place where one can download Conceptual Models of the Mission Space (CMMS): Communicating Warfighter Requirements to Systems Engineers

Simulations and the Future of Learning

<http://www.amazon.com/exec/obidos/ASIN/0787969621/inseadcalt/103-5864299-1778267>

An Innovative (and Perhaps Revolutionary) Approach to e-Learning. Written by Clark Aldrich.

Simulations and the Future of Learning offers trainers and educators the information and perspective they need to understand, design, build, and deploy computer simulations for this generation.

Digital Game-Based Learning

<http://www.amazon.com/exec/obidos/ASIN/0071363440/inseadcalt/103-5864299-1778267>

The book is written by Marc Prensky.

A strategic and tactical guide to the newest trend in e-learning - combining content with video games and computer games to more successfully engage the under-40 "Games Generations." The book fully explores the concept of Digital Game-Based Learning, including such topics as How Learners Have Changed, Why Digital Game-Based Learning Is Effective, Simulations and Games, How Much It Costs, and How To Convince Management. With over 50 case studies and examples, it graphically illustrates how and why Digital Game-Based Learning is working for learners of all ages in all industries, functions and subjects.

M&S RESOURCE REPOSITORIES, REFERENCES AND WEB LINK SITES

RESOURCE REPOSITORIES

DMSO Modeling and Simulation Resource Repository (MSRR)

<http://www.msrr.dmsso.mil/>

The Modeling & Simulation Resource Repository, comprised of seven nodes, is a DoD-wide system of M&S databases that allows a user to discover, access, and obtain M&S resources that support military operations, training, and acquisition. MSRR is sponsored by DMSO, and operated by the Modeling and Simulation Information Analysis Center (MSIAC). Providers include the DMSO system, Army, Navy, Air Force, Missile Defense Agency, DIA, C4ISR Decision Support Center Information System & MSRR.

The MSRR is actually a collection of web sites for searching and navigating to M&S information and M&S related resources located on a wide variety of organizational web servers.

Air Force Modeling and Simulation Resource Repository

<http://afmsrr.afams.af.mil/>

The goal of the Air Force Modeling and Simulation Resource Repository is to provide a single source for information about and access to U.S. DoD models, simulations, data sources, algorithms, and other M&S resources in order to facilitate reuse and avoid duplication.

Navy Test and Evaluation Repository for Models and Simulations (NTERMS)

<http://nterms.mugu.navy.mil/>

An on-line searchable catalog containing M&S operational information.

Army Modeling & Simulation Resource Repository

<http://www.msrr.army.mil/>

The Army MSRR is part of the U.S. DoD-wide Modeling & Simulation Resource Repository (MSRR). The MSRR promotes interoperability, reuse, and commonality through information sharing and communication throughout the M&S community.

Users can locate, access, and obtain M&S resources that support Training, Exercises, & Military Operations (TEMO); Advanced Concepts and Requirements (ACR); and Research, Development, and Acquisition (RDA).

Ballistic Missile Defense Modeling & Simulation Resource Repository

<http://bmdssc.jntf.osd.mil/MSRR/Default.shtm>

Modeling & Simulation Resource Repository of the Ballistic Missile Defense Organization Simulation Support Center.

Classified Modeling and Simulation Resource Repository (CMSRR)

<http://www.fas.org/irp/program/disseminate/cmsrr.htm>

The Classified DIA MSRR is required to support the Department of Defense (DoD) Modeling & Simulation Community with Intelligence resources. The DIA is responsible for providing DoD Intelligence community support to DoD users of models and simulations. DIA is the DoD Modeling & Simulation Executive Agent (MSEA) for Intelligence and the Joint Simulation System (JSIMS) Executive Agent (EA). To meet the goals and objectives of the M&S community, DIA is responsible for the development of an initial capability of the classified Intelligence Node of the DoD CMSRR (DIA CMSRR).

M&S Resources

<http://home.ubalt.edu/ntsbarsh/ref/RefSim.htm>

Resources covering recent advances in discrete event systems simulation, including a classification of optimization techniques and unification of sensitivity estimators.

Simulation/Gaming Exchange (SGX)

<http://sg.comp.nus.edu.sg/>

SGX (Simulation/Gaming Exchange) is the Internet Clearinghouse for Simulation/Gaming Resources (including a specialized search engine for simulation/gaming).

REFERENCES

Mallory's Modeling and Simulation Acronyms and Web Sites

http://www.afams.af.mil/doclib/doclib.cfm?AFAMS_FID_2330

This is the web link to a file from the Air Force Agency for Modeling and Simulation that contains M&S acronyms and web sites. It is a very comprehensive list that includes every aspect of simulations and exercises. The information is subdivided into the following categories:

- U.S. DoD Modeling and Simulation Center Links
- M&S Related Organizations
- M&S Related Associations, Newsletters, Conferences and Courses
- DoD Academies, Universities, Colleges and Schools
- M&S References and Resource Repositories
- Exercises Wargames and Experiments
- M&S Related Policies and Standards
- Simulation Systems and Software
- M&S Web Link Sites on the Internet
- M&S Acronym and Glossary Web Sites on the Internet.

Online Glossary of Modeling and Simulation (M&S) Terms

<https://www.dmsomil/public/resources/glossary/>

From MSIAC, official glossary of modeling and simulation terminology, abbreviations, and acronyms for use throughout the U.S. Department of Defense.

Automated Joint Threat Systems Handbook (AJTSH)

http://afmsrr.afams.af.mil/index.cfm?RID=DTS_AF_1000141

The AJTSH is a classified database available to U.S. DoD and contractors that provide information on available threat simulators, foreign materiel, threat M&S, targets, and the ranges and facilities in which they are located.

Discrete Event Systems Simulation

<http://home.ubalt.edu/ntsbarsh/simulation/sim.htm>

This site surveys concepts and techniques for system modeling and simulation using digital computers including computer simulation languages such as Simscript II.5 and

GPSS; variance reduction techniques; input/output analysis; sensitivity and optimization of systems simulation and application of computer simulation to various practical scenarios.

Simulation & Games for Education

<http://www.insead.fr/Encyclopedia/Education/Advances/games.html>

Business simulation games, education games, etc.

Database with Literature on Gaming and Simulation

<http://www.kun.nl/methoden/refbase/>

This is a database with more than one thousand references of literature on gaming and simulation. It is a database that has grown during the last couple of years. The list, stored as a Filemaker 4 file, allows for sorting, searching and selecting.

ISAGA mailing list

<http://groups.yahoo.com/subscribe/isaga>

A mailing list on simulation, games and related methodologies.

M&S WEB LINK SITES

M&S Website (Link) Directory

http://www.msiac.dmsi.mil/msosa-net/link_directory.asp

This is the web site of the MSIAC's list of useful web sites for sources of M&S operational information and support to assist M&S activities.

Air War College Gateway to Wargames, Simulations, and Exercises

<http://www.au.af.mil/au/awc/awcgate/awc-sims.htm>

Contains numerous links to sites pertaining to wargames, simulations, and exercises.

SimCentral Modeling and Simulation Portal

<http://www.simcentral.com/>

The modeling and simulation information network.

Modeling and Simulation Resources

<http://home.hiwaay.net/~georgech/Common/modsim.htm>

A collection of resources for modeling and simulation.

Defense Modeling and Simulation Sources on the Internet

http://www.dtic.mil/dtiwl/toc_ms.q.html

A collection of defense related modeling and simulation resources.

WAR GAMING RESOURCES AND EXERCISES

Swedish Defence Wargaming Centre (SDWC)

<http://www.fksc.mil.se/?lang=eng>

The Swedish Defence Wargaming Centre (SDWC) is an independent organization within the Swedish Armed Forces, which together with the Joint Forces Staff is included in the Joint Forces Command. The center supports tests and staff exercises with simulated courses of events in all phases of an armed conflict. In addition, SDWC takes part in the development of computer simulated planning methodology as well as directing experimental exercises within the frames for control of development requirements for C2 systems.

War Gaming Department, U.S. Naval War College

<http://www.nwc.navy.mil/wgd/>

The War Gaming Department is a component of the Center for Naval Warfare Studies. At the Naval War College, various gaming techniques are used to support a gaming schedule of approximately 50 games a year. These events support internal College needs and externally generated requests, which can come from various sources, including Defense and Navy departments, operational commands, and civilian agencies. War games are used to study a wide range of issues from space to anti-submarine warfare, from unconventional warfare to global war, from advanced technology to political-military relationships. Gaming participants can range from junior officers to four-star flag-rank officers and civilian equivalents.

College of Aerospace Doctrine, Research and Education, Home of AF Wargaming Institute

<http://www.cadre.au.af.mil/>

Home of “Connection” annual war game conference – military and civilian wargamers/ designers.

Wargame Developments Network

<http://www.users.dircon.co.uk/~warden/index.htm>

War game Developments (WD) is a group of like-minded war gamers that are dedicated to developing war games. It is a non-commercial organization, and its aims are to provide a forum for the exchange of new ideas and concepts and to develop both new and existing methods of recreating military conflicts.

The Complete Wargames Handbook

<http://www.hyw.com/Books/WargamesHandbook/Contents.htm>

Written by James Dunnigan, 1992/1997, a classic overview that includes designing war games, history of war games, and uses of war games.

Year 2000 introduction, wargame development in the 1990’s may be found at:

<http://www.hyw.com/Books/WargamesHandbook/Introduc.htm>

Wargaming Resources

<http://www.au.af.mil/au/aul/bibs/wargame/wgtoc.htm>

Listings by Air University Library, Maxwell AFB, AL; compiled by Stephen B. Chun, bibliographer. The resources are broken into many areas of interest:

- Game Theory
- Lanchester Theory & Equations
- Wargaming
- Bibliographies
- History
- Board Games & Famous Battles
- Politico-Military Gaming
- Models and Modeling

- Artificial Intelligence
- Scenarios
- Warrior Preparation Center

War Gaming - Thinking for the Future

<http://www.airpower.au.af.mil/airchronicles/apj/3sum90.html>

An article written by Lt Col David B. Lee, USAF, published in Airpower Journal.

EXERCISES

DefenseLINK list of Military Exercises and Deployments

http://www.defenselink.mil/other_info/deployments.html

US European Command (EUCOM) list of current and planned exercises

<http://www.eucom.mil/Directorates/ECPA/index.htm?http://www.eucom.mil/Directorates/ECPA/Exercises/main.htm&2>