Simulation Team
Initiatives

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DIPTEM
University of Genoa
Simulation Team

Simulation Team is a Network of Universities, Research Centers and Companies operating in synergy, with affiliates worldwide, devoted to develop Innovative Solutions involving M&S.
The professional courses have been organized since 2000 for WorldWide professionists, in Italian, French and English, focusing on the following subjects:

- PM: Project Management
- M&S: Modeling & Simulation
- HLA: High Level Architecture
- VV&A: Verification, Validation and Accreditation
- RCM: Reliability Centered Maintenance

The courses include lecturing and exercises; teachers are world-wide experts from major excellence centers (i.e. Boston College, Genoa University, NASA, DMSO, National Center for Simulation, SAIC, Aegis Technologies, California State University, Riga TU, UCF, McLeod Institute of Simulation Science).
Simulation Technology Transfer

Since 2000 Simulation Team - MISS DIPTEM organises Professional Courses:

• Project Management
• Modelling & Simulation
• High Level Architecture
• Verification, Validation & Accreditation
• Reliability Centered Maintenance

The Lecturers included experts from major excellence centres (i.e. Boston College, University of Genoa, NASA, DMSO, National Center for Simulation, SAIC, Aegis, California State University, Riga TU, UCF, McLeod Institute of Simulation Science).

The course attendance (PM ~60, M&S 15, HLA 20, VV&A 10) included Companies (i.e. Piaggio Aero Industries, Alenia Aeronautica, Alenia Marconi, SIA, Fincantieri, COOP) and Academia (Pol.Torino, TU Delft, Univ.Marseille, Pol.Milano, Univ.Firenze, Univ.Bari, Univ.L’Aquila, etc.).
Project: PANDORA

PANdemic Dynamic Objects Reactive Agents

- PANDORA addresses the dynamics of the spreading of a Pandemic and experiments are on-going on H1N1 influenza A virus by a joint simulation project involving USA, European and Australian R&D Centers (MISS DIPELEM, Dartmouth College, CRiCS).

- PANDORA proposes to use an evidence-based approach whereby statistical data (census) and ethnographic surveys are source for the model and integrated with Human Factors representing the psychological and social parameters impact on people behaviors and their reaction to containment measures and policies.

- PANDORA evaluates the efficacy and cost benefit of various mitigation strategies such as school closures, target anti-viral prophylaxis and other mitigation measures, level of absenteeism, and its impact on commerce, industry, economy and functioning of society as well as population attack rate, risks related to specific groups and on flows across State borders.
Project: **RATS**

*Riots, Agitators & Terrorists by Simulation*

RATS is a demonstrator based on PIOVRA (*Polyfunctional Intelligent Operational Virtual Reality Agents*) **Intelligent Agents for simulating Riots, Civil Disorders as well as Agitators and Terrorists actions within Urban Scenarios considering different entities and influence of Human Factors such as:**

- **Paramilitary Forces**
- **Terrorists**
- **Warlords**
- **Police Forces**
- **Firefighters**
- **Health Care**
- **Military Units**
- **NGOs**
- **Governmental Entities**
- **Population**
- **Protesters**
- **Ethnic Groups**
Project: PIOVRA

Polyfunctional Intelligent Operational Virtual Reality Agents

PIOVRA was sponsored by European Defence Agency and developed in cooperation with Italian and French MoDs. PIOVRA aims included:

• Development of a new Generation of CGF able to simulate “Intelligent” behavior and Human Factors, filling up the gap between user requirements and current available CGF performances

• Use of PIOVRA intelligent CGF as effective models integrated within HLA Federation for:
  – Training
  – Operation Planning
  – Operation Support

• To guarantee the possibility to Define/Configure PIOVRA CGF using Libraries and Effective Paradigms in order to guarantee Accreditation, Effectiveness and Usability of PIOVRA developments
CIPROS is a modular approach for Civil Protection that integrates GIS and Simulation. CIPROS generates Crisis Dynamic Web Sites for supporting training and information share. CIPROS includes simulation of:
- Explosions
- Hazardous Material Fallout
- Flooding

CIPROS support definition and management of different Alert Level and Threats Classification as well as evacuation Procedures for Population and people with impediments.
MESA is an integrated environment to perform simulation and risk analysis in ports and maritime sector.

MESA is devoted to support port organizations, entities and operators in Emergency & Environmental Management.

MESA is a modular system based on combined simulators running on PC and providing direct output also on WWW servers.
Project: SIBILLA

Simulation of an Intelligent Board for Interactive Learning and Lofty Achievements

SIBILLA Games provides the opportunity to play interactively a competitive/cooperative Game in a distributed environment where different Intelligence Agencies operate concurrently. SIBILLA simulates terrorist actions and prevention measures as well as Intelligence activities. SIBILLA addresses the Homeland Security Issues and their related training.
This research is looking forward to develop innovative tools for analysis and optimization of risk related to evolution supply chain management. ASPID proposes an innovative use of modelling for evaluating the impact on the supply chain of different aspects such as international competition, know-how diffusion in new areas, critical events and disasters.
The project concentrated in developing simulation models to support Security in Ports in term of Risk Assessment, Training, Security Solution Analysis, etc. The initiative is modeling ports, terminals, operative procedures, regulations & policies. The model was successfully applied to evaluate the impact of ISPS, MTSA and SCI evolution in large container terminals.

A demonstrator is available on:

www.liophant.org/projects/secsim
The project concentrated in developing models for Risk Analysis related to Security in Rail Environments. The project develop emergency management and event simulators as well as model devoted to identify medium and long term effects in term of costs, resources and impact on the overall environment. The project was developed in cooperation with Institutes in North America and focused on terrorist attack issues.
Project: TRAMAS - Katrina Like

Transportation Management & Simulation

Katrina Like is a Joint Venture for demonstrating the possibility to model a National Crisis and to Simulate a Wide Emergency; the project successful demonstrated the simulation of an Hurricane impact on the transportation layer of Louisiana State considering traffic, cargo, evacuation activities etc.
Project: MOSCA

Modelling Supply Chain Attack

MOSCA project is devoted to the development of models for estimating the impact of attacks or disasters affecting supply chain of consumer goods; MOSCA includes dynamic impact of events on consumer emotions as well as effectiveness of countermeasures.
Project: APIS

APIS is an intelligent decision support system for Service Division of Construction and Engineering Companies. APIS combines different modules:

- Service Model
- Inventory Optimizer
- Scheduling Optimizer
- Overall Resource Optimizer
- Metrics & Key Performance Indexes
LEXIS project integrates Layout Optimization based on Genetic Algorithms, Modeling & Simulation and Virtual Reality for supporting the development of a new large Production Facility for an Aerospace Industry.
Project: Greenlog
Green Logistics Simulator

Greenlog is a web framework combining simulation and analysis techniques for self evaluating the Supply Chain Environmental Impact. The GreenLog models have been developed by DIPTEM for supporting its Joint Venture on Green Logistics under coordinated by Assologistica and involving several major production, logistics and distribution companies in Italy.
Project: PEDES

PEDESTrian Simulation

Simulation of pedestrian flows for public transportation. Integration with Human Behavior Models
The ST-RT1 is a containerized solution for simulating Heavy Haul Vehicles, Trucks, Heavy Vehicles interacting in Ports and Logistics Centers. ST-RT1 is a solution that combines distributed real-time simulation using HLA and biomedical devices for measuring the stress level of the drivers and operators. ST-RT1 container is movable worldwide and ready to operate within few minutes from the arrival in site and can be effectively used for training and R&D for vehicle manufacturers and Logistics Operators.
Distributed Virtual Maritime Environment

A Platform Independent Distributed Environment for Maritime Applications

DIS
HLA

C/C++
Java

Procedure Design, Risk Analysis, Re-Engineering and Distributed Training

Distributed, Cooperative Planning and Management

Distributed Operation Control
Project: CALYPSO

Carrier Life cYcle Period Simulation & Optimization

CALYPSO project investigated methodologies and techniques devoted to analyze the Life Cycle of the New Italian Carrier Cavour. CALYPSO included development of Tools for comparing costs, operations and performances of different Carriers.
Project: ACASO

Advanced Carrier Acquisition and Operation cost Simulation & Optimization

ACASO is a system for design new Vessel by simulating their performances in relation to their operative profiles and maintenance policies. The system estimates the unknown characteristics of the new Vessel Systems by applying advanced AI techniques (genetic algorithms) and evaluating different hypotheses and scenarios.
Project: CYBERSAR-PortainerSim

Cyber Infrastructures for R&D in Sardinia - Portainer Simulator

Portainer Simulator based on DIPTEM® Engine (COCODRIS™). The System is devoted to Support Training as well as R&D by integration with Biometric Measure Devices.
The Placra (Platform Crew Animation) model was developed in CG in order to reproduce the crew activities on Oil Platform from Petrobras. Placra simulates crew movements generated by functional requirements (3D Motion, MultiLayer and infrastructure operations).
Project: DESU-BUMATRAS

Development Support for Front End Design in Bulk Material Transhipment System

Support to the development of a Stochastic Discrete Event Simulator devoted to investigate Bulk Material Terminal and Transhipment Systems.
Project: VIP-STRALO

Virtual Prototype by Simulation in Transportation and Logistics

VIP-STRALO goal is the creation of innovative solutions based on Interoperable simulators for SBDVP (Simulation Based Design and Virtual Prototyping) applied to Logistics, Transportation and Automation Sectors.

VIP-STRALO involves the creation of two interoperable demonstrators:
• LOCRAS: Logistics Crane Simulator
• FEBO: Federation of Boats
Project: VISION
Virtual Ship Simulation

DIPTEM, as reference point in Distributed Simulation and HLA in Italy, was in charge as responsible for defining VV&A procedures in VISION Project devoted to create a Virtual Ship using HLA.
Project: NIAG SG-60

Simulation Based Design And Virtual Prototyping (SBD & VP)

The NIAG SG-60 is devoted to evaluating the effectiveness of SBDVP on Ship Design

The results of the SG60 Study include analysis of Virtual Prototype VV&A procedures, Simulation Based Acquisition impact in terms of saving, costs, resources

The Virtual Ship Life Cycle

VISION: CONCEIVE, DESIGN, BUILD, TEST, TRAIN, AND OPERATE A WEAPONS SYSTEM IN A COMPUTER BEFORE CUTTING METAL
Project: FLODAF2001

FLODAF 2001 is an evolution of FLODAF project; this suite includes a Scenario Generator and a Simulator for analyzing the Data Fusion performances over complex Air-Naval scenarios including ships, submarines, missiles, airplanes and helicopters.
Project: WSS&S

Weapon System Service & Simulation

This Simulator is devoted to re-engineer Weapon System Logistics and Service. The Simulator is operating in Taranto Base to support the service planning of Torpedo, Missile, Rocket Launchers and Naval Gun Systems.

The simulator is a web-based stochastic simulator and supports the concurrent service management; the model is object-oriented and the implementation allows to operate directly with regular browsers without any special requirements in term of platform or plug-ins.
Project: ROSES

Reaction to Oil Spill Emergency and Simulation

The project is devoted to create an Oil Spill Simulator for CETENA including countermeasure models.

The Simulator was validated in relation to historical data available from previous cooperations (i.e. MESA, Kuwait University, etc.) and existing databases (i.e. Istituto Idrografico Italian Navy) in order to guarantee the result fidelity.

Roses reproduces both the oil spill physical phenomena and the countermeasures actions in order to provide estimations about risks, policy effectiveness and standing operating procedures.
Project: SAFETY FIRST

Training & Design for Ship Handling

The simulator includes a complete virtual reproduction of Genoa Harbor and it’s devoted to the design and training of Harbor Technical Services Operators (Pilots, Tugs & Boat Men).

This simulation system is designed in order to be portable for cooperative training on web server just using regular browser with specific plug-in.

- Full Interactive Real-Time for Training
- Faster than Reality for Procedure Design
- Virtual Environment of Genoa Port on a PC

Developed in 1996
The project supports the simulation of Maritime traffic in a wide area (i.e. Mediterranean Sea) by using Object Oriented Models.

SESTANTE allows to compute the flows and delays related to strategic investments over ports or maritime lines.
Project: POSEIDON

*Port Simulation Environment for Design of Operation and Network*

This Project involves a web based, stochastic & combined (discrete & continuous) simulator.

The implementation is made by using Java, the demo is available at:  
http://st.itim.unige.it/liophant/projects/poseidon

Multedo Oil Terminal - Genoa

- Vessel Traffic System
- Tankers
- Docks
- Pilot Boat
- Tugs
- Mooring Men Boats
Project: ProSim 2000

Project Management Simulation System

The project is a joint venture between Genoa University and Fincantieri, the major Italian Ship Yard Construction Company.

The project was tested in relation to their new generation of commercial ships: fast ferries for the car deck systems involving impact of R&D and prototyping issues.

ProSim has been already successfully applied to traditional ship construction problems for military ships and now is fully integrated with existing Project Management Software.
FRINE is a modular approach for supporting inventory management, purchasing and outsourcing planning in telecommunication production industry.

FRINE includes: Frine Sim a detailed simulator for evaluating different scenarios, Frine ANN an intelligent forecast system based on Artificial Neural Networks and Commercial Data Fusion and a Frine Metrics for on-line performances measuring and controlling.
Project: SITRANET

Simulation for Training & Education in Transportation

SITRANET is a project sponsored by EC, devoted to creating three simulators as training equipment for crane operators based on Virtual Reality. The Simulators includes:

- Special Crane Simulator
- Contstacker Simulator
- Truck Simulator

The project technology leadership is assumed by DIPTEM. The SITRANET Simulator validation and verification involved over hundreds professional truck drivers and crane operators.
RESET
River Equal Ship Simulation in Extensive Training

RESET is a project, devoted to creating a Federation for supporting training in river navigation and logistics. The Simulators includes:

- Barges
- Tanks

The RESET Federation includes the river dynamics for reproducing the maneuvering in condition affected by different streams, variable deep.
INNOVARE

Sviluppo Intermodale Novara e Vercelli Abilita' Risorse Umane - Equal

INNOVARE is a project, devoted to creating a Federation for supporting cooperative and competitive training in hinterland terminals. The Simulators includes:

- Reachstacker Simulator
- Truck Simulator
- Transtainers

The INNOVARE Federation is centered on the Rail Terminal Simulation and CM operations.
Project: VAED

Virtual Aided Engineering & Design

VAED is a joint cooperation between Genoa University and Ansaldo for the development of Distributed Synthetic Environment for Power Plant Design.

A prototype has been developed and used for supporting design of Burners, Piping, DCS of a Gas Turbine in joint project with Siemens. A set of demonstrators has been implemented and tested to support Project Management applied to these projects.
**Project: COUGAR**

Controller & Organizer for Ultimate Government of Availability and Reliability

COUGAR is the innovative system for the Service and Maintenance of complex systems (i.e. Helicopters). The system is designed to satisfy the requirements connected with the maintenance management of helicopters taking care of both pre-planned and emergency actions.
Project: PUMA

PUMA is the innovative system for re-organizing Gas Turbine Service in Ansaldo Energia. The system allows to manage resources, spare parts, internal/external warehouses, shipping and scheduling of all the maintenance operation for over 50 power plants distributed world-wide.
Project: **WOLVES**

*Warehouse Organization & Logistics Virtual Environment Simulation*

WOLVES focuses on Inventory Management & Warehouse Control in an advanced framework integrating ERP, AI, Forecasting, and dynamic planning.

WOLVES was applied to industrial cases such as a medium size production enterprise & a large mass transportation company; the results obtained was very successful reducing inventory to 50%.
Project FUSE
Fuzzy Logic Schedule Analyzer

FUSE is a package operating on PC integrated in Office Suite for Supporting Planning and Management of Power Plant Service.
FUSE analyzes different scenarios providing quantitative measures of the critical issues including: contractual aspects, technical regulations, resource constraints, user needs, etc.
FUSE properly reproduce the different parameters in order to support operative planning.
Project: LEM

Logistics Evaluation Model

LEM Project is a joint venture among Ford, Boston College, LSC & Genoa University for Developing a Web Based Support System for Supply Chain management.

Tests using LEM beta_modules have been carried out successfully on over 70 logistics centers.
Project: J20

J20 allows to experience in a Web Based Environment a New Product Development by working in Cooperative Teams (Engine, Avionics Cell) representing different Joint Ventures competing for the Project a New Advanced Fighter.

The Exercise has been extensively tested in Distributed Environment for Professional and Academic Courses.
Project: WORM & WASP

WORM is a simulator of freight rail operations for estimating service quality and costs.

WASP is a data mining system and smart performance analyzer directly integrated in railways information system.

WASP & WORM are integrated to operate as DSS for ASA Logistics Div. in Italian Railways.
Project: **SOFRA & ATARDPL**

*Cleaning & Garbage Collection*

The projects SOFRA focuses on Street cleaning in an urban context and use a combination of Genetic Algorithms and Simulation in order to optimize mission planning considering all the constraints; the approach guarantees +30% in quality of the service without additional investments just based on mission re-organization.

The ATARDPL is based on SOFRA concept and it is devoted to Garbage Collection planning (i.e. plastic, glass) in Environmental Town Management and provided improvements in term of cost saving (10% reduction).
San Paolo 2000 is the integration of simulation with architectural techniques for functional design and analysis of urban areas and buildings.

The system reproduce the Savona Downtown with the restoring project of this building using VRML 2.0 for exploitation of the results in the public community by WWW; it’s possible to navigate in the scenario and to watch the interactions of simulated cars and people.
Project: Alippo

Virtual Prototyping for Automotive Production & Design

Alippo Project is the development of a Model for integrating Design and Production Environment in Automotive Component Industry. The system connects the Product Design provided by CAD systems (i.e. CATIA) with the Production Processes using Simulation.

Alippo simulates the production system considering the changes and valorizes the design changes in terms of Work in Process, Warehouse Saturation, Effective Productivity etc.
Project: TRAMAS 4.0A

Transportation Management & Simulation for Transportation Managers

TRAMAS 4.0A is a tailored release devoted to organize Business Games for Education of Managers in Small Medium Size Transportation Enterprises. The project was successfully applied in several courses sponsored by Italian Transportation Department.
Project: TRAMAS

Transportation Management & Simulation

Tramas is devoted to analyze complex scenarios involving transportation over a wide geographic area. The simulator considers Costs, Times, Constraints, as well as all the major factors:

- Traffic
- Weather
- Road Saturation
- Logistics Processes
- Size Constraints
- Time Constraints
Project: DISPOS

DISPOS is a suite devoted to certify availability and reliability in complex postal Production Lines characterized by multiple operative configuration. DISPOS integrates historical data with a priori analysis based on simulation. The systems include references to the international regulations (i.e. CQA UNI 9910, FEM 9.221, NASA TM4628A, DR01-3 DR01-27 NASA LeRC r4, MIL-STD-1388-2B, MIL-STD-49506)
Project: MACACO

Modelling Air Craft Analysis for Construction process and Organization

MACACO is a solution for improving production of executive planes in Aerospace Industry. The project involved data collection and analysis, modeling and simulation, experimental analysis as well as development of Intelligent systems based on AI for identify source of risks for plane due deadline.
The WILD project involves the development of a Federation composed by Simulators, Scheduling Systems and ERP.

WILD Federation reproduces the supply chain and supports on-line distributed management and control among customers, main contractors, suppliers.
The project is devoted to optimize the fleet management of ships for chemical products in a wide geographic area.

The project integrates simulation, planning scheduling and optimization methods based on Artificial Intelligence Techniques.
CHARME is a set of modules developed by DIPTEM/Liophant as dynamic reference for VV&A (Verification, Validation and Accreditation) of LOGOS Decision Support System for Fleet Management (Planning, Scheduling & Simulation) in large chemical industries. CHARME uses chaos theory approach in application to real stochastic logistics networks.
Project: MASC & DICO-SAP

Modeling & Analysis for Satisfaction of Customers
DIPTEM-COOP SAP

MASC is a system for Statistical Analysis, Modeling & Simulation applied to big-distribution chains.

The Project is carried out in cooperation with the major Italian company in this area.

The final target is to improve the customer satisfaction acting on policies, operating procedures, resources & equipment; the system is fully integrated with company ERP (SAP R/3) and benefits of similar experiences carried out other companies (i.e. Genoa Mass Transportation Company).
The EFESTO project is focusing on the creation of models for Business Process Re-Engineering integrating simulation techniques. The system allows to integrate PowerPoint™, Access™ and Excel™ with simulation and to distributed the results directly in HTML format in Intranet managing hierarchical process structure.
Project: AVICUNICOLO

*Project for Logistic Platform devoted to White Meat Fresh Products*

The project is devoted to the architecture definition, system development and testing for a new logistics platform integrated in a large supermarket supply chain. The system was implemented in SAP R/3 Retail 4.6®.
Project: NOL

New Opportunities for Logistics

The project is focusing in logistics solution consulting and analysis for CCNO, a Consortium providing Logistics, Administration and IT services to Retail Networks in North Italy.
The project is focusing in redesign logistics solutions for distribution of fresh food with special attention to Meat and Fish. The project focused on logistics with special attention to platform, infrastructures, processes and distribution policies and procedures.

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POA NG is a project for developing a new system for inventory management of shopping centers in large retail chains. The system optimize the different inventory management models based on a stochastic simulation approach and it is currently operative directly implemented in SAP R/3.
Project: RIO
Renovating Intelligent Operations

RIO is an innovative solution developed in a Web Framework for supporting Operation Control in Wide Supermarket Networks. RIO allows both to control store and department performances (sales, customers, goods, productivity, workload) as well as to predict their behavior for improving the performances.
6EFFE project is a strategic project sponsored by COOP Liguria and National Departments for designing and experimenting new flexible work solution in supermarkets. DIPTEM was in charge of model development and general architecture design.
The EPEO project is devoted to analyze existing structures and to support process re-engineering and reorganization in Business Division of Big Companies geographically distributed. EPEO applies the state of art in Modelling and Simulation and other techniques for Process Identification, Mapping and Quantitative Analysis.
Project: HOSSIAN

Hospital Simulation Analyzer

HOSSIAN is a tool developed to support resource planning in Hospital by integrating simulation and AI (Artificial Intelligence). The system has been successfully applied to the personnel and equipment scheduling in a Surgery Division composed by 6 operative rooms.
Project: TEZNAME

Tactics Evaluation & optimiZatioN for Analysis in Medical Environment

TEZNAME is a tool for analyzing Hospital Departments Management considering the detail of each resource, individual and/or procedure. The system has been successfully applied to Laboratory Re-engineering to compare different investments and policy/organization alternatives.
LOGIS is a Leonardo project sponsored by European Community in order to develop Long Distance Tutorial Network in "Logistics Information System", Based on WEB Technologies. Besides the training, an interesting exploitation of the results of the research is related to the transfer of these techniques to Small - Medium size Enterprises.
IEPAL is a Co-funded project sponsored by European Community and US Department of Education, to live an academic & industrial training, to compare European and US way of living and working. A goal of this project will be the integration & exchange of different culture, the application of Web instrument and mobility to learn to cooperate. It is a Great Opportunity for engineering students and their curriculum to experiment in the new millennium Transatlantic Experiences in Enterprises and Universities working on Projects in World-Wide Distributed Teams focusing on the Advances in Modeling & Simulation for Logistics and Supply Chain Management.
LSCM project is devoted to develop a Master Program for new Managers in Logistics and Supply Chain Modelling. The project involves several Universities Internationally for creating this new initiative.
Conclusions

The Simulation Team is acting at international level as a reference point between users and providers in simulation area. The integration of experts, technicians is providing very good results on real case studies and complex projects.

An active area of development is related to distributed simulation and web-based modeling for extending the impact and exploitation of these proposed systems.

Every year Simulation Team, MISS and Liophant organize major Conferences and International Workshops focusing on application of Modelling & Simulation. For instance the I3M2009 was in Tenerife Spain, strong involvement in tracks of SCSC2009 in Istanbul, special track in AMS2009, Bandung, as well as special speeches in I/ITSEC09

www.liophant.org/conferences

There is a constant interest in fostering joint cooperation and exchanges with international Excellence Centers working on simulation.

In 2010 Simulation Team people are in charge as General Chair of WAMS in Brazil as well as of Summersim in Canada and I3M in Morocco: these last two conferences represent 2 of the 4 major scientific events worldwide in simulation
References

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