



Smart simulation for decision support at headquarters

IST-160 BIG DATA and ARTIFICIAL INTELLIGENCE for MILITARY DECISION MAKING

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MASA Group Description

MASA Group is a French company (SME) with more than 20 years of experience in decisional Artificial Intelligence and the application of Artificial Intelligence behaviors and doctrines in training simulation solutions.

MASA develops several products, including:

- **SWORD**, a complete wargame solution with automated forces for highlevel training and analysis
- **Direct AI,** a software development kit (SDK) used to produce rich Artificial Intelligence based behaviors for products and applications.



MASA Group: SME expanded internationally



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Simulation SWORD

Simulation

- Light yet powerful: thousands of units on a single laptop
- Fully customizable equipment & behaviors; delivered ready-to use including a generic database of ~ 300 missions / 200 Units, can be different for Red and Blue side
- Easy to deploy and maintain
- Compliant with inter-operability standards: DIS/HLA 15.16e, BML, KML, WISE, RSS...

Constructive

- Trainees never see (or touch) the training system
- The simulation involves simulated people operating simulated systems

Aggregate

• SWORD does not represent single entities (such as a single soldier or tank) but entity aggregates (such as platoons). Single entities are not represented, but they exist and are taken into account by the simulation engine

Automatic

- Units adopt a realistic and doctrine-compliant behaviour
- The simulation is built around an artificial intelligence engine. Direct AI has a high degree of automation
- This automation reduces considerably operational costs

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Doctrine-based mission resolution

Units are commanded by missions, not basic actions as in classical « push-button » simulations



SWORD Simulation Architecture



Terrain

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Direct AI → SWORD

- **Direct AI** is a middleware software used to design and implement rich AI-based behaviors for products and applications.
- **Direct AI** brings applications and products to life. It allows modeling, design, and development of rich behaviors through AI software agents that think and act, with any degree of autonomy, within a software product or application environment.
- **Direct AI** provides a solution to the problem of deciding what to do next.



Direct AI Decision-Making



https://masasimulation.files.wordpress.com/2017/12/direct-ai-white-paper-2017.pdf



SWORD Functional Architecture

- **SWORD** contains all the required tools to realize all the phases needed in an exercise:
 - AUTHORING, to customize the data available for any exercise
 - PREPARATION, to create the initial state of an exercise
 - GAMING, to actually play the exercise
 - AFTER ACTION REVIEW (AAR), to replay and analyse an exercise





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Decision Process Model

Decision Phase	Decision Step			
Intelligence	Data gathering			
Intelligence	Problem Recognition			
Design	Model Formulation			
	Model Analysis			
Choice	Evaluation			
	Selection			
Implementation	Presentation of Results			
	Task Planning			
	Task Tracking			
Learning	Outcome-Process Link Analysis			
	Outcome-Process Link Synthesis			



Enhancing Situation Awareness







Enhancing complex tactical situation awareness by giving meaning to the data gathered over the terrain





Take advantage of the low level AI layer used by SWORD simulation



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Unit Management

- **Reports sorting** and automated warnings adapted to the context
- **Operational/logistical** state dynamic calculation
- Mission feasibility check
- **Dynamic** geographic sustainment coverage
- **Times/Duration** availability warnings



Overview of Tactical Situation

Terrain Occupation



Perception Capacities

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Overview of Tactical Situation

Direct Fire Capacities



Local Force Ratio







Overview of Tactical Situation

- **Tactical Line Automatic** Generation
 - Forward Line of Own Troops (FLOT)
 - Limit Of Advance (LOA),
 - Line of Contact (LC)

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Overview of Expected Effect

Overview of Tactical Situation: Supply/Support Management



Fire Support Duration Calculation for a Unit

Support Duration for Supported Units



What if & Wargaming

- **Evaluate the current plan** using the current knowledge of the enemy or simulating alternative options (hence "What-if")
- **Provide a bird's eye view** of the situation (red and blue units)
- **User controls** friend and enemy sides
- Analyze current situation by:
 - Creating alternate, plausible situations
 - Changing the order of battle
 - Modifying the position and state of units
 - Adjusting enemy scenario



Example of tactical lines (FEBA) generated automatically from the simulated situation





Conclusion

Analysis of user needs, classified by Headquarter Cell

		Situation synthesis	Future maneuver	Direct fire	Indirect Fire	Logistic	4D/Com	Engineering
Unit management	Reports sorting & Warnings							
	Operational/logistical state							
	Mission feasibility check							
	Geographic sustainment coverage							
	Time/duration indicators							
Summary of tactical situation	Occupying the terrain							
	Local force ratio							
	Maneuver synthesis							
	Tactical line and maneuver summary							
Support/supply management								
What if								



Headquarter







Thank you

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