

Modeling and Simulating the International Battle Space – Problems and Prospects of Hybrid Systems Acting on their Own

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ABSTRACT

Modern wargaming centers on highly technologically based modeling and simulation (M&S) of battlefields worldwide. In a fashion similar to an increasing reliance upon computers to diagnose and treat themselves (the output of machines often directing the course of a solution), M&S systems are being used to assess battlefield situations and provide suggested solutions. Far from being science fiction, a real possibility exists of an M&S-directed combatant's actions interacting with those of a combatant not using sophisticated M&S with the result being a conflict driven by a hybrid consciousness. Not unlike HAL in the movie *2001 A Space Odyssey*, tomorrow's global warfare systems could assume a life of their own, beyond the control of the persons initiating them. This paper will provide a real-life example of how synthetic war may be developing.

Keywords: Modelling and Simulation, Simulated Warfare, Wargames, International Battlespace, Hybrid Combat Systems,

BACKGROUND

Wars often arise over a conflict of belief systems not held up to critical thinking. These systems, while often having roots in philosophy, become ossified as ideologies. In more distant times, the participant's manner of thinking was directly linked to the exercise of combat. A belligerent more or less could rely upon the certainty of an opponent's thinking

behind the character of a battle. However, the conduct of war has been changing. Instead of individual soldiers and units relying upon relatively localized command structures, conflict is being coordinated into an internationally wide organic unit covering a territory known as the "international battle space" (IBS).

"Modeling and Simulation" (M&S), coupled with "interoperability", have become the watchwords of modern warfare [1], [2]. In response to calls for an integrated international command structure, numerous organizations both inside and outside various governments have responded with their versions of how best to understand and control the outcome of violent conflicts. At the present stage, one may describe the level of development of the mechanization of the IBS as a hybrid system, but where the prospect looms of a conflict with countries with technological expertise having their war management systems being further automated, and perhaps ultimately free of major human intervention. At a higher level, a second hybridization may occur, with a fully automatic war management scheme interacting with belligerents still constantly relying upon human input. We will examine briefly the evolution of circumstances leading to the current situation, describe a case example of programs that can introduce automated philosophy into warfare, and describe how the overall conduct of war may extend beyond the original intent of the combatants. It is at the point of complex development that factors possibly beyond the developer's control or knowledge enter the

picture, psychology being one major area of concern.

EVOLUTION OF TECHNOLOGICALLY INTEGRATED CONFLICT

Instruments and methods are referred to in the core of military thinking. Mechanical appendages are nothing new in conflict among humans. The range is from rock throwing dozens of millennia past to modern complex software directing instruments, such as unpeopled vehicles at great distances in a coordinated fashion.

New is the manner in which the thinking is directing combat. That is, instead of humans on their own mentally stepping through what is necessary to wage war, non-human devices are increasingly providing the decision-making. Perhaps since the dawn of organized warfare, opposing sides have looked to past successful battles as viable models for conducting future conflicts. From simple pictorial representations of elements in the environment, as in animals painted on cave walls millennia ago, to 21st century attempts to describe weather and predict outcomes based on those descriptions, we have sought to extrapolate from the past, represent it, and predict and control the future course of events. Board games, such as chess and go, have been thought of as medieval devices to model and simulate warfare [3].

With the advance of technology in the past century and a half, wargaming has become more formalized. German technology pitted against the rest of Europe in the midst of the industrial revolution meant the need for greater planning for combat with armies outfitted with sophisticated machines. The Prussians defeating the French in 1871 was a milestone that war planners used as a model for future technologically based wars [4].

Since the early nineties, at least, there has emerged a major trend towards automated warfare, taking the minutiae of decision-making out of the hands of humans and relegating it to

artificial systems. These are rapidly evolving into a single entity that holds out the spectre of global conflict assuming a life of its own.

AUTONOMOUS AUTOMATED SYSTEMS

Three automated systems are examined for their potential uses and implications for conflict resolution. Each of these is summarized below and then referenced in the context of a unit having the potential to act without human intervention in a conflict situation.

In my first example, individuals now, can be treated as sensors linked into a coordinating center and manipulated as a system [5]. The U.S. Army commissioned a contractor to integrate these “sensors” into a simulation, the Self-Learning Internet Module, which is designed to develop better human intelligence gathering and reinforce military presence. The manner and effective reportage by the participants is measured by a “hearts and minds” rating to indicate how they interact with the environment, given certain values [6]. Thus, we have a step towards integrating human psyche into modeling and simulation.

Example two is about more than fifty years of unpeopled aerial vehicles (UAV) being paradigms of remotely operated combat devices. Originally, the thinking came directly from human input, but even modern civilian airline technology now includes autopilots, and self-landing aircraft. Such is not an academic exercise, because at various levels, such as with the UAV, a prosthetic type situation exists and is being developed further by the U.S. military that could have worldwide implications. Devices can operate without human drivers. All of the control has been built into software that with a touch of a button launches a vehicle (not only aircraft, but any moving vehicle), drives it according to a selected route, conducts operations, and returns to any designated position [7]. Cruise missiles are other examples of self-guided devices that can destroy targets without human intervention after being launched [8].

My final and most involved example of a self-monitoring M&S system is one being adopted by the U.S. Department of Defense (DoD) and other departments. Not only can *Simajin*® and *Simanij* (software to manage the simulation) act as a “front-end” to any existing M&S system, but also the system can have a built in philosophy. A brief survey will refer to scope of these international battlespace M&S efforts by all three U.S. services.

According to RhinoCorps, Ltd. Developer of *Simajin*® and *Simanij*,

Simajin® is unconstrained in scope and detail and is capable of simulating:

- Force on Force (groups, masses of individuals acting collectively with and against others) down to single person level of detail (“1” vs none up through 100’s of 1000’s of entities)
- The mental aspects and actions of an individual (or group) based on decision making processes, standard operating procedures or responses based on experience, information and misinformation, perceptions [separated perceptions and reality], observations, etc.
- Strategies & Tactics, user defined tactics and plans – no organizational limits
- Sensors, Weapons and weapon effects to include CBRNE, Vehicles, Networks, Communication Architectures, Consumables and Expendables, etc.
- A wide range of time durations & geographical limits to include Boundaries (rivers, borders, etc.), Infrastructure (roads, buildings, networks), Environment (including weather), Terrain (including DTED), Curved/Flat Earth
- Transitions, e.g., peacetime to war to peacetime possible

Further, *Simajin* can:

- Handle any scale conflict intensity from peacetime civilian conflicts to global war
- Allow user control over any “fidelity and resolution” in representing physical reality
- Incorporate anything as a player – clouds, sensors (keeping in mind example 2, above), country, or even an ideal
- Attribute any quality to any player
- Relate cognition, semiosis, and existence by stimuli, responses, perceptions, decisions, status, and effects.

Perhaps most important, *Simajin* recognizes the difficulty in predicting human behavior and can shape it according to values. It can blend behavioral types with philosophies ranging from Sartre to Kant [9].

With these three examples ranging from the individual as sensor to a globalized model and subsequent simulation, we now arrive at the capability of fully integrating every component of society into an organism. Gustav LeBon in *The Crowd: A Study of the Popular Mind* in 1896 and Oswald Spengler in *Decline of the West* in 1926 maintain that societies could be regarded as organisms composed of smaller organic units. Now, we have the real possibility of societies becoming infused with a philosophy or ideology by being drawn into a simulation. With regard to the medical prostheses and computerized diagnostic tools as extensions of the body and mind, would a doctor follow the software having its own logic, even though it is counter-intuitive? If a major power chooses to involve a simulator in the conduct of a real war, the combatants perforce now face the consciousness contained by that simulator. So far, not much has changed in terms of the impetus for war, but we have on the horizon a possibility of a coupled or hybrid system -even the simulator, itself -assuming a “life of its own”. This will be discussed below, but it is

important to understand the potential scope of this scenario.

SCOPE OF THE BATTLESPACE AND FUTURE ACTIVITY WITHIN IT

The world has been divided by the United States into nine major regions, thus delineating the scope of potential international battlespace:

- [U.S. European Command](#)
- [U.S. Pacific Command](#)
- [U.S. Joint Forces Command](#)
- [U.S. Southern Command](#)
- [U.S. Central Command](#)
- [U.S. Northern Command](#)
- [U.S. Special Operations Command](#)
- [U.S. Transportation Command](#)
- [U.S. Strategic Command](#) [10].

All three U.S. services – Army, Navy, and Air Force - are engaged in integrating M&S software ultimately to “diagnose” the faults of wartime strategy and tactics and provide direction for future courses of action [11]. Major efforts have been underway to make all battlefield systems interoperable, not simply to make the technology work together, but to make all the participants in the global battlespace work together as an organism [12], [13]. In an article “Joint Vision 2020 Emphasizes Full-spectrum Dominance”, the U.S. Department of Defense states: “Full-spectrum dominance means the ability of U.S. forces, operating alone or with allies, to defeat any adversary and control any situation across the range of military operations [14].”

PROBLEMS

Two issues emerge from these developments. First, if it will be possible to front-end any M&S with a philosophy and the whole system is used to drive a war, what impact will that have on the war, itself, in terms of fulfilling those philosophical aims? There is, after all, the emergence from the interaction between the M&S (the software managing wartime technology infused with a very human

philosophy) and the ideology of war. Which could gain the upper hand - the thinking driving the simulator or the thinking driving the real situation? “Natural” wars do get beyond human control but eventually die out because of a weakened participant. However, what of a synthetic war that might get out of human control by operating from a feedback loop resulting in the system assuming life of its own, not unlike a cyborg? Note that outcomes of international simulations are expected to be in databases used to help analyze and guide real situations. I write of feeding the results of an actual battlefield situation into the simulator as a diagnostic, prognostic, and ultimately a “repair” tool (analogous to computer software that diagnoses and “fixes” itself without the intervention of dialog boxes). HAL in *2001, a Space Odyssey* and George Orwell’s *1984* perpetual war, are ingredients for automatized conflict in which all humans could play a submissive role. The Santa Fe Institute in New Mexico has been studying chaos dynamics for years, and it is well known that from a situation in which no immediately discernible pattern can be observed, one may emerge. Of course, the metaphysical question remains: what ultimately drives the system? A system cannot generate and maintain itself, as there must be an input outside the system [15]. Yet, once set in motion, a system of systems might feed upon an evolving philosophy or ideology.

Artificial intelligence infused with a philosophy coupled with technology and pitted against a “natural” war truly could result in a system having its own consciousness and orchestrating a perpetual combat. Such a scenario is not mere science fiction but is being developed various modeling and simulation units within the U.S. Department of Defense, a disconcerting development, at that, if the issue of ultimate control, philosophy, and direction is ignored. Simon *et al* made it clear that “. . . there is no sharp line between problem generation and problem solving [16].” Further, by including proper heuristics and laws, a computer can make scientific discoveries, such as empirical laws. Simon’s work demonstrates that his was

true even over a decade ago (1994). By introducing psychological and philosophical parameters into the conduct of conflict resolution, and allowing the self-annealing system also to self-organize, one may ask of consequences.

PROSPECTS

Future wars could be fought in an environment populated by automaton-based entities, infused with ideologies or philosophies reflecting the creators of those battlespace models. Nothing is remarkable in this statement, except for imagining the outcome of two cases. First, we consider the interplay between the thinking of a battlespace modeled and simulated accurately to reflect the reality, and the idealized model, the first tending towards ideology, and the second towards philosophy. Second, what of the outcome against a side with an M&S system fully managing one side's activities and an opponent without technological resources?

If what is being developed now continues, we face the prospect of a cyborg-type entity that would be the hybrid of a philosophy built into the simulator and an artificial ideology that drives the battlespace. War being driven by the powers that are may be unsettling enough, but if we add emergence (from the hybrid) into the equation, we are entering a world that truly may spin out of control, especially if the ones now controlling the conduct of wars blindly obey a simulator in the same way they blindly follow their ideologies. Herein lies the basis of contraindication for use.

In the organic society, peoples acting together behave as a single organism and such may be controversial, but there is a history to consider. Hobbes, in his 1660 *Leviathan*, a model of how societies presumably behave, wrote of the contract state, where humanity, in a state of nature, agreed to surrender all their freedoms to a sovereign. In turn, the sovereign would dictate what activity would be allowed by the subjects, those activities being known as "liberties". Are we to face the domain of a

cyborg as sovereign, a hybrid of a self-organizing system and the ultimate creators of that model? As further examples of this prospect, see: work on hybrid consciousness by the 2nd. International CAIA Research Conference [17].

CONCLUSION

Who should control the dynamics of a hybrid model depends upon the outlook of the citizenry, either by default or active intervention. As to the ideal decision maker, both Plato and Aristotle write of a "philosopher-king"; however, Plato restricts the domain of the ruling population much more than does Aristotle [18]. By arguing that a virtuous and informed citizenry should vote, Aristotle is saying in substance the same thing as Plato. Today, Aristotle might deem today's governing elites as a combination of an oligarchy (Plutocracy) in today's terms) and "extreme democracy" [19]. Power is concentrated, but the populace voting for it is, by in large, ignorant of the ways of politics. There are more hurdles to obtaining a professional license, a permission to act in an environment fewer lives are involved than in voting for persons who potentially have the ability to affect whole countries by what they do. Leonard Peikoff in his *The Ominous Parallels* discusses the consequences of such a combination, using Germany as an example [20]. While those advocating social and economic *laissez-faire* may talk of the importance of ego, they must address the integrity of that ego. Its context, the society as an organic unit must be discussed in the same manner. More poignantly, we should focus on the ethos of the "crowd" or society. The relationship is between individual and context is a dialectical one, one finding its identity in terms of the other.

Such is the backdrop against which modeling and simulation efforts are developed. To disregard the importance of philosophy or ideology underpinning a model potentially able to be the dominant one is to disregard the importance of how and why the sovereign

governs. The resulting emergence of a hybrid pouncing around in the international battlespace may not be to a civilized world's liking or expectations.

"All the world's a stage", but the reality of the end awaits us. For Aristotle and Eastern philosophers, it was the substratum of unity. For the originator of the Biblical myth of Genesis, it was eating from the "Tree of Knowledge". For Faust it was knowledge, itself. For Nietzsche, it was the abyss – perhaps entropy (yet, some are willing to peer and even jump into it). For us, what we think is knowledge embedded in an M& S entity could yield solution, turn on us, or be pure hubris.

REFERENCES

- [1] **Defense Modeling and Simulation Office (DMSO)**, <https://www.dmsomil/public/>, 2006.
- [2] **DISA**, <http://www.disa.mil/>, 2006.
- [3] **Chess**, http://en.wikipedia.org/wiki/Chess#Origins_of_chess, 2006.
- [4] **Wargaming**, http://en.wikipedia.org/wiki/Wargaming#History_of_wargaming, 2006.
- [5] **University of Southern California, Office of Technology Licensing**, <http://www.usc.edu/academe/otl/3746.htm> , 2006.
- [6] **Selective Focus**, http://www.ict.usc.edu/disp.php?bd=proj_games_slim_es3], 2006.
- [7] **DFCS**, http://www.wsmr.army.mil/capabilities/nr/testimg/range_control/dronetar.html, 2006.
- [8] **Cruise Missile**, http://en.wikipedia.org/wiki/Cruise_missile, 2006.
- [9] **RhinoCorps**, <http://www.rhinocorps.com/>, 2006.
- [10] **DoD at a Glance**, <http://www.defenselink.mil/pubs/almanac/>, 2006.
- [11] **Defense Modeling and Simulation Office (DMSO)**, <https://www.dmsomil/public/resources/links/>, 2006.
- [12] **Joint Interoperability Test Command (JITC)**, <http://jitic.fhu.disa.mil/>, 2006.
- [13] **Joint Vision 2020**, <http://www.dtic.mil/jointvision/jvpub2.htm>, 2006.
- [14] **U.S. Department of Defense (DoD)**, http://www.defenselink.mil/news/Jun2000/n06022000_20006025.html, 2006.
- [15] J. Horne, "Recursion of Binary Space as a Foundation of Repeatable Programs", **The 2nd International Conference on Cybernetics and Information Technologies, Systems and Applications** : CITSA, 2005.
- [16] P. Langley, Simon, G. L. Bradshaw, and J. M. Zytkow, **Scientific Discovery**, Cambridge, MA: The MIT Press, 1994, p. 312.
- [17] **CAIA**, <http://www.arch.utah.edu/people/faculty/julio/england98.pdf>, 2006.
- [18] Plato, *The Republic* Book IX in **The Collected Dialogues of Plato**, Edith Hamilton, ed., New York: Pantheon Books, 1961.
- [19] Aristotle, **Metaphysics** in **The Basic Works of Aristotle**, Richard McKeon, ed., Book I, Ch. 2, New York: Random House, Pub., 1941.
- [20] L. Peikoff, *The Ominous Parallels: The End of Freedom in America*, New York: Penguin-Putnam, Inc., 1982.