Asymmetric and Hybrid Operations under Spatial Grasp Paradigm

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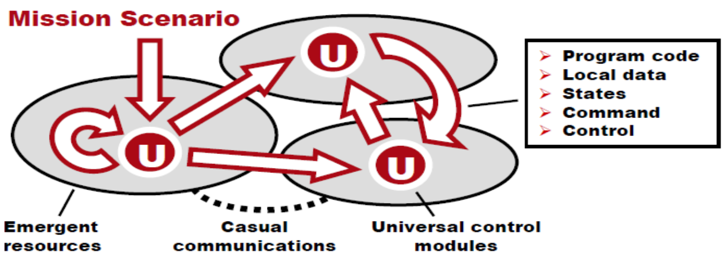
We are witnessing a dramatic change in the character of national and international conflicts, with dominance of asymmetric, unconventional and hybrid warfare. These engage not only traditional militaries but also economy, ecology, international relations, ethnicity, culture, religion, psychology, etc., and occupy both physical and virtual spaces. To withstand, dominate, and win in this dynamic and unpredictable world highly integral, holistic, solutions are needed rather than traditional interoperability principles trying to achieve the desirable whole starting from interacting parts.

Spatial Grasp Technology (SGT), stemming from [1-3], offers gestalt-inspired solutions in a variety of physical, virtual, and executive worlds, as well as their any combinations and integration. And all this within the same universal space-navigating-conquering-grasping-matching formalism working under unified control (symbolically depicted below).

Spatial Grasp Language (SGL), the core of this approach, differs fundamentally from traditional programming languages. Rather than working with information in a computer memory, it allows us to directly move through, observe, and make any actions and decisions in fully distributed environments, whether physical, virtual, executive or combined, with its top level recursive syntax following.

grasp → *constant* | *variable* | *rule* ({ *grasp*, })
constant → *information* | *matter* | *custom* | *special* |{ *grasp_* }
variable → *global* | *heritable* | *frontal* | *nodal* | *environmental*
rule → *movement* | *creation* | *echoing* | *verification* | *assignment* | *forwarding* | *branching* | *transference* | *timing* | *granting* | *type* | *usage* | *application* | { *grasp_* }

The language can be effectively implemented by a network of communicating SGL interpreters embedded into individual equipment of soldiers, robots, sensors, any other hardware and software units, allowing them to work jointly under the guidance of compact mission scenarios which can be created and updated on the fly. The scenarios can be injected from any human or robotic component and then in a super-virus mode colonize the whole system or parts needed via existing communications, setting its overall awareness and goal-driven behavior, as shown below (U symbolizing SGL interpreters), where different scenarios can cooperate or compete in distributed spaces.



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SGL can describe missions at any levels and their combinations—from top semantic with automatic assignment of runtime available resources and providing overall organization and management—to full details of internal system organization and explicit C2. The peculiarities of SGL and its networked implementation are oriented on highest mission integrity, survivability, and goal orientation, "by any means" including. This also takes into account possible mission execution by robotic components and their teams, allowing us to relax existing regulations established for human personnel—on the benefit of overall efficiency. Exemplary SGL solutions with their detailed explanations and peculiarities of distributed implementation are presented for the following researched and internationally reported areas.

ISR [4]. SGT can integrate distributed ISR facilities into flexible goal-driven systems operating under unified command and control, which can be automatic**.** These integrated systems can analyze and properly impact critical infrastructures, both native and adversary's, as well as create new infrastructures for a variety of purposes.

Military robotics [5]. SGT paves the way for unified transition to automated up to fully unmanned systems with massive use of advanced robotics. One of practical benefits may be effective management of advanced robotic collectives, regardless of their size and spatial distribution, by only a single human operator, due to high level of their internal self-organization and integral external responsiveness.

Human terrain [6]. SGT allows this new topic, originally coined in military, to be considered and used in a much broader sense and scale than initially planned, allowing us to solve complex national and international conflicts and problems by intelligent and peaceful, nonmilitary means, while fully obeying existing ethical standards.

Missile defense [7]. Providing flexible and self-recovering distributed C2 infrastructures it can, for example, effectively use distributed networks of cheap ground or low-altitude sensors to discover, trace and destroy multiple cruise missiles with complex routes, versus existing expensive high-altitude planes, drones, and aerostats.

Command and Control [8]. Description in SGL of semantic-level military missions is much clearer and more compact (up to 10 times) than if written in NATO-related Battle Management Languages (BML). This simplicity may allow us redefine the whole scenario or its parts at runtime when goals and environment change rapidly, especially for asymmetric situations and operations, also naturally engage robotic units.

Distributed interactive simulation [9]. The technology can be used for both live control of large dynamic systems and distributed interactive simulation of them (the latter serving as a look-ahead to the former), also any combination thereof, with watershed between the two changing at runtime.

SGT's previous variants had a number of trial implementations in different countries. It can be ported, on agreement, on any software or hardware platform within short time and by small group of system programmers. A new patent is being prepared, with broad market for the technology envisaged, especially in infrastructure protection and massive robotics.

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