

Managing Multidimensional International Conflicts With Spatial Grasp Technology

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The paper describes international conflicts as complex confrontations where global actors clash over multiple, often overlapping, interests related to such areas and dimensions as security & military, economy & geopolitics, social & cultural, cyber & information and others, with reviewing different ideas and existing publications in them. It also briefs the developed Spatial Grasp Technology (SGT) and its Spatial Grasp Language (SGL) oriented on creation, investigation, and management of large distributed systems of different natures, while providing examples of SGL programming in both physical and virtual worlds. Main ideas and organization of the multidimensional management project, currently in the development, are discussed. An example of multidimensional conflict management using interacting physical, economic, transport, and virtual dimensions is provided in SGL with practical solutions covering four and three communicating dimensions. The planned further research in this area is outlined too. Different versions of SGT were successfully tested on numerous applications in different countries, and its latest version, especially suitable for multidimensional management, can be quickly implemented on any existing software or hardware platforms.

Keywords: multidimensional world, international conflicts, Spatial Grasp Technology, Spatial Grasp Language, distributed network operations, collective spatial solutions, global integrity and security

1. Introduction

Multidimensional international conflicts are complex, protracted crises involving state and non-state actors, combining military action with economic, cyber, and ideological struggles. These conflicts often involve shifting alliances and multi-aligned actors, making them difficult to resolve. The aim of this paper is to explain and investigate the fundamental multidimensional nature of international conflicts, and to analyze potential capability of the developed universal spatial model and technology for effective management of such conflicts.

The rest of the paper describes the following: The nature of multidimensional international conflicts (Section 2); Security & military dimension (Section 3); Economic & geopolitical dimension (Section 4); Social & cultural dimension (Section 5); Cyber and information dimension (Section 6); Spatial Grasp Model and technology basics (Section 7); Examples of Spatial Grasp Language (SGL) programming (Section 8); Multidimensional management project details (Section 9); Example of multidimensional conflict management (Section 10); Further research on international conflicts (Section 11); and Conclusions (Section 12). References mention existing works in the multidimensional crisis area, also previous publications on Spatial Grasp Technology (SGT) and SGL.

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2. About Multidimensional International Conflicts

Multidimensional international conflicts are complex confrontations where global actors clash over multiple, often overlapping, interests such as power, resources, and ideology. Unlike traditional warfare, these modern disputes manifest across several “dimensions” or layers simultaneously, making them exceptionally difficult to resolve through standard diplomacy. Managing multidimensional international conflicts requires integrating various disciplines—including economics, psychology, and law—to address the complex web of state and non-state actors. More ideas from the related publications are as follows.

The review presents the leading conceptualizations and approaches in the field of conflict resolution. The starting point of discussion is the understanding that the field of conflict resolution is shaped by the shifting structure of global politics and the changes that have occurred in conflicts in the international arena (Schiff, 2020).

This examines the development of multidimensional approaches to ending conflict including UN peace operations, and the roles of intragovernmental organizations and NGOs in addressing the local, regional, and global issues that create and impinge upon “intractable” conflicts in the post-cold war era of global dislocation (Richmond, 2002).

It aims to identify what is distinctive about conflict transformation theory and practice, as well as its key dimensions. We need such a theory of conflict transformation if we are to have an adequate basis for the analysis of conflicts, as well as for devising appropriate responses to them and evaluating the effects of these responses (Miall, 2004).

Risk management is a topic that conjures up mind-numbing images. A key takeaway from the recommendations of the UN-World Bank is the urgent need to jettison narrow managerial and technocratic view of risk management toward a more dynamic, sophisticated, and ambitious view of risk that ought to place it at the very core of how humanitarian and development practice can achieve better outcomes (Hammond & Hyslop, 2018).

Political and financial investments in non-military tools are decreasing, which in turn reduces holistic conflict management options. The paper maps existing debates about the future of global conflict management, combining expert insights with a review of the broader literature. It aims to set the stage for a forthcoming series of regional meetings on the same topic (Baldwin, 2025).

The following core dimensions of modern international conflicts will be analyzed in detail:

- Security & Military;
- Economic & Geopolitical;
- Social & Cultural;
- Cyber & Information.

3. Security & Military Dimension

It focuses on protecting a state from foreign aggression, war threats, and internal, transnational risks to personnel, infrastructure, and information, and also involves leveraging military capabilities, defense alliances, and strategic deterrence to maintain stability. Some related ideas and publications are as follows.

Quantum technologies are advancing rapidly from experimental research into strategic defense and security applications fundamentally altering how information is sensed, shared, and secured. Ground- and satellite-based quantum key distribution networks are promising virtually unbreakable communication (Krelina, 2025).

This describes military activities and invitations of observers, lower thresholds for notifiable and observed military activity, annual calendars for planned notifiable military activities, constraining provision prohibiting

activities with more than 40,000 troops, as well as verification of military activities (Organization for Security and Co-operation in Europe, n.d.).

This advances the argument that security integration in the European Union is a result of the influence of certain knowledge-based networks or epistemic communities. Given that EU member-states consistently resist integration in areas that are central to traditional state sovereignty, security integration presents a puzzle (Cross, 2013).

Of the more than 140 major cases of armed violence recorded since World War II, only relatively few have been ended through the mediation of the United Nations. Moreover, there is no single case in which the United Nations were absolutely instrumental in the prevention of an armed conflict (Berkhof, 2009).

BAE Systems' latest deployable networking product NetVIPR provides intelligent and secure military communication networks linking everything from small reconnaissance drones to combat vehicles, fighter jets, aircraft carriers and military commands (as in Figure 1) (Simpson, 2022).

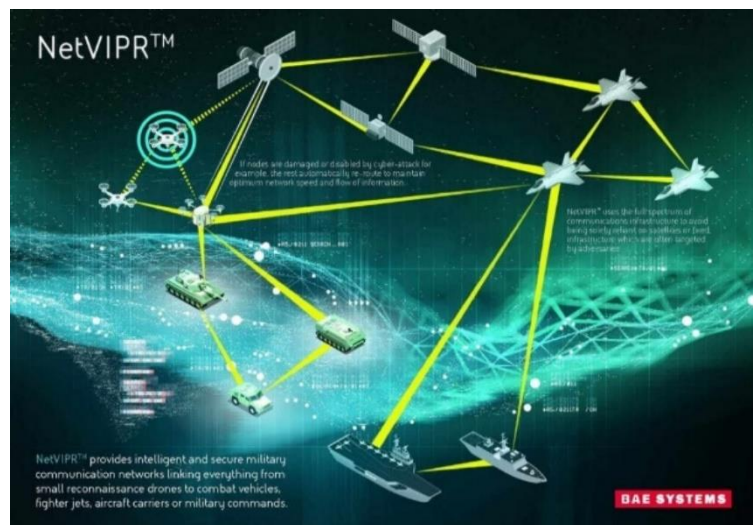


Figure 1. An example of BAE Systems network.

4. Economic & Geopolitical Dimension

It involves complex global supply chains and the influence of middle powers who may have multiple, fluid alignments based on pragmatic interests. These dimensions are increasingly intertwined, where states use economic tools to achieve strategic power. This shifts focus from purely military strength to managing supply chains, technology, and financial systems to exert influence. Some related ideas and publications are as follows.

Geo-economics refers to the use of economic tools by states to achieve strategic and political goals where influence is exercised through trade, investment, sanctions, control over resources, technology, and financial systems rather than direct military force. As global interdependence has grown, economic power has become a key instrument of statecraft (Chaturvedi, 2026).

For many, it is logical to associate the term “economics” with geopolitics as economics is very frequently presented as the key to understanding numerous geopolitical situations. It is well known, for example, that wars are often fought to take control of petroleum resources or fertile land (Giblin, 2013).

In an increasingly interconnected world, the rise of security of supply and demand on the energy policy agendas of many countries is on top of the growing environmental concerns, and the functioning of domestic energy markets appears less prominent (Aoun, Lojanica, & Mathieu, 2015).

This investigates the economic effects of geopolitical risk (GPR) shocks with a focus on non-linear transmission mechanisms, and also shows that larger positive shocks have a disproportionately greater impact, pointing to the existence of an amplification channel driven by rising uncertainty (Brignone, Gambetti, & Ricci, 2025).

This explores the BACI-CEPII database using the network analysis starting from the visualization of the World Trade Network, and then defines and describes the topology of the network, both in its binary version and weighted version (as in Figure 2) (De Benedictis et al., 2014).

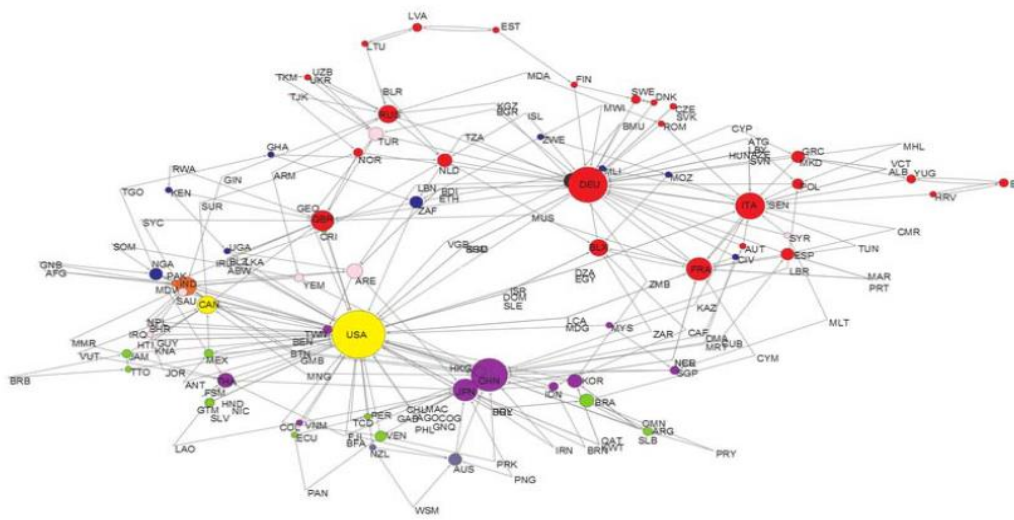


Figure 2. The Network of World Trade in goods.

5. Social & Cultural Dimension

Conflicts are often rooted in differences in values, identity politics, and historical relationships. The social and cultural dimension encompasses the shared values, beliefs, norms, and behaviors that shape human identity, social interaction, and community life. It includes art and infrastructure, as well social justice, human rights, and communication styles, which dictate how communities operate. Some related ideas and publications are as follows.

This research synthesis was conducted which correlated national self-ratings of affect balance and subjective well-being with cultural characteristics like individualism, masculinity, uncertainty avoidance, power-distance national scores, socioeconomic development, and climate (Basabe et al., 2010).

Value systems of different cultures have been of interest for many decades. The very thing which makes a “culture” or the pillars of what is often referred to as “values” is ever-changing across the globe, as cultures and societies become more reachable and transparent in accordance with the latest technologies (Diab-Bahman, 2024).

Technological advancements dramatically transformed consumers’ travel behavior. Social media has been identified as the most notable and popular digital platform which appeals to consumers from different cultures, mindsets, and demographics. Culture may stimulate individuals’ attitudes and subsequent behavior (Sharmin et al., 2021).

Historically, persons have made free use of stereotyped characterizations of groups other than their own and of individuals from such groups. The recent development of survey methodology has made it possible to summarize the extent to which the qualities of particular groups are endorsed by the group members (Smith & Bond, 2020).

Social Network Analysis (SNA) is not a formal theory in social science, but rather an approach for investigating social structures (like in Figure 3), which is often referred to as structural analysis. The difference between SNA and traditional social research is that the latter focuses mostly on individual properties (Zhang, 2010).

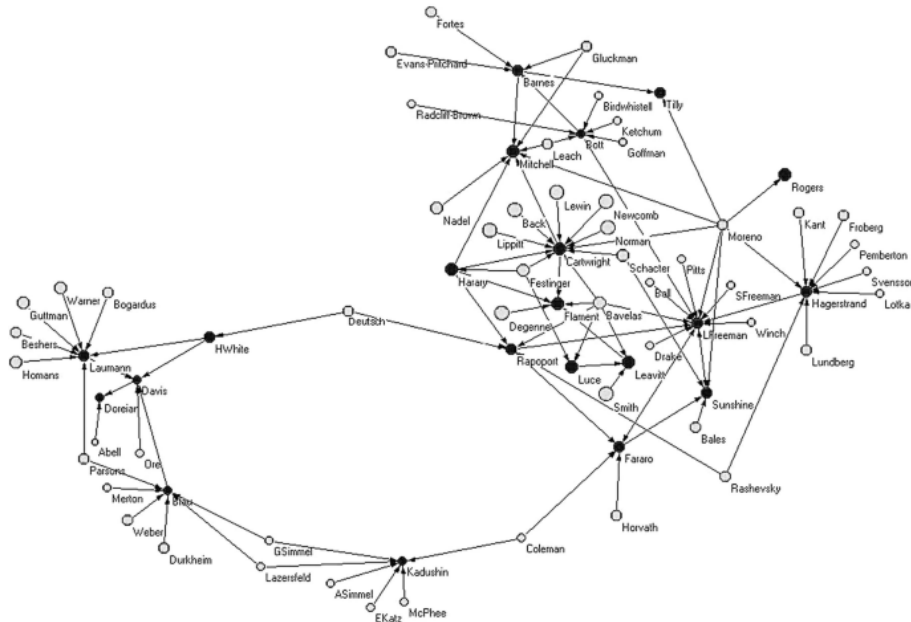


Figure 3. An example of social network structure.

6. Cyber & Information Dimension

Modern warfare includes non-physical dimensions like cyberattacks and social media-driven polarization. The Cyber & Information Dimension combines IT infrastructure, digital networks, and content, acting as a 5th domain warfare focused on manipulating data and perception. It merges cyber operations with propaganda to disrupt infrastructure and influence, where threats are increasingly complex. Some related ideas and publications are as follows.

The accelerated technological advances in the field of communications and information systems have produced profound changes in society. The possibility of remote control of cyber infrastructures, both in peacetime and in conflict, has generated a new type of infrastructure for the national defense system (Cioacă, Rațiu, & Coman, 2019).

The Commission on Critical Infrastructure Protection is established to assess the scope and nature of the vulnerabilities of, and threats to, critical infrastructures, and to recommend a comprehensive national policy and implementation strategy for protecting from physical and cyber threats (League, 1997).

Cyber hygiene forms the foundation for a robust cyber defense strategy, enabling organizations to protect their systems, data, and people from increasingly sophisticated threats. This means maintaining risk awareness among staff, keeping systems updated and hardened, and utilizing protective technologies (Wallis, 2025).

Cyber security and space security are merging due to increased digitalization of space infrastructure and operations. Non-kinetic counterspace capabilities such as cyber operations are an attractive alternative to kinetic weapons due to their ability to avoid hazardous debris and operate below the threshold of armed conflict (Helene & Monsen, 2024).

There is a shortcut to the network of actors involved in international cyber security capacity to collect information on international cyber security capacity building projects. This can essentially simplify the task of visualizing the community network (as in Figure 4) (CyberCapacity, n.d.).



Figure 4. A simple community network example.

7. Spatial Grasp Model and Technology Basics

General Issues

Within Spatial Grasp Model and Technology (SGT) (Sapaty, 1993; 1999; 2005; 2017; 2018; 2019; 2021; 2022; 2023; 2024a; 2024b; 2025a; 2025b; 2025c; 2025d; 2025e; 2025f; 2026), a high-level operational scenario expressed in recursive Spatial Grasp Language (SGL), starting in any world point or points, *propagates, covers, and matches the distributed environment in parallel wavelike mode* as symbolically shown in Figure 5. Such propagation can result in returning and analyzing the reached states and data (which may be arbitrarily remote) to be used for launching more waves, also jointly in both cases.

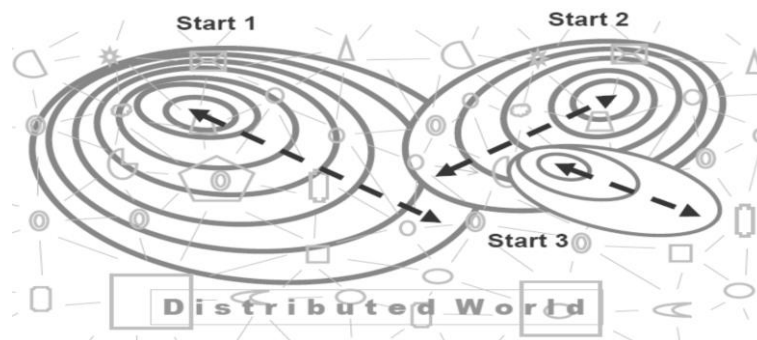


Figure 5. Parallel recursive world propagation and coverage.

The distributed worlds this model is effectively covering, conquering and managing may be of different types: *Physical World (PW)*, considered as continuous and infinite where each point can be identified and accessed by physical coordinates; *Virtual World (VW)*, which is discrete and consists of nodes and semantic links between them; and *Executive World (EW)*, consisting of active doers, which may be humans or robots, with advanced communication possibilities between them. Different kinds of combinations of these worlds can also be possible within the same SGT formalism.

Spatial Grasp Language (SGL)

The SGL allows for organizing direct space presence and operations with unlimited powers and parallelism. Its universal recursive organization, with operational scenarios called *grasp*, can be expressed just by a single formula:

$$\textit{grasp} \rightarrow \textit{constant} \mid \textit{variable} \mid \textit{rule} (\{\textit{grasp},\})$$

The *rule* expresses certain action, control, description or context accompanied with operands, which can be any *grasps* too. Other top SGL details can be expressed as:

$$\begin{aligned} \textit{constant} &\rightarrow \textit{information} \mid \textit{matter} \mid \textit{custom} \mid \textit{special} \\ \textit{variable} &\rightarrow \textit{global} \mid \textit{heritable} \mid \textit{frontal} \mid \textit{nodal} \mid \textit{environmental} \\ \textit{rule} &\rightarrow \textit{type} \mid \textit{usage} \mid \textit{movement} \mid \textit{creation} \mid \textit{echoing} \mid \\ &\textit{verification} \mid \textit{assignment} \mid \textit{advancement} \mid \textit{branching} \mid \\ &\textit{transference} \mid \textit{exchange} \mid \textit{timing} \mid \textit{qualifying} \end{aligned}$$

The rules, starting in certain points, can organize navigation of the world sequentially, in parallel, or any combinations thereof. They can result in the same application points or cause movement to other world points with obtained results left there or returned. The final points reached can become starting ones for other rules. The rules, due to recursive language organization, can form arbitrary operational infrastructures expressing sequential, parallel, hierarchical, centralized, up to fully decentralized and distributed algorithms. This model and technology can effectively investigate and manage any distributed spaces and systems, with multiple individual or interacting SGL scenarios freely propagating throughout the multidimensional universe. The latter potentially consists of numerous individual or interlinked worlds W_i (as symbolically shown in Figure 6), each ranging from individual physical points or virtual nodes to large continuous spaces or complex networks.

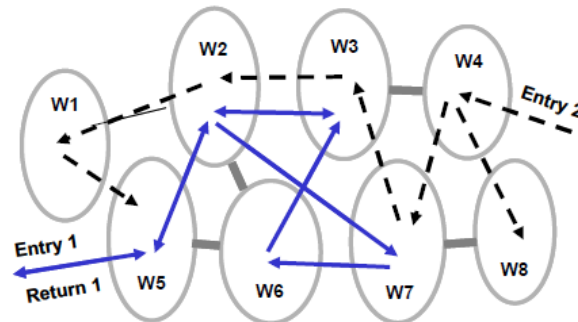


Figure 6. Parallel space coverage and propagation in multiple worlds.

SGL Interpreter Organization

The SGL interpreter consists of specialized modules working with specific data structures, serving SGL scenarios, also organizing exchanges with other interpreters for distributed scenarios. Communicating SGL interpreters can be in arbitrary number of copies effectively integrated with other existing systems and communications, representing altogether *powerful spatial engines* operating without central resources or control. As backbone and nerve system of the distributed interpreter, its self-optimizing *Spatial Track System* provides hierarchical command and control, as well as remote data and code access. It supports spatial variables, which can be mobile, and merges distributed control states for making decisions at different organizational levels. This spatial infrastructure, effectively supporting global integrity of distributed solutions, is automatically distributed between active components (humans, robots, computers, smart-phones, satellites, etc.) during SGL scenario self-evolution in space and time.

8. Examples of SGL Programming

We are providing here only very few SGT application examples, just to hint on how they may look in SGL, with many others reflecting solutions of numerous tasks in terrestrial, celestial, and virtual environments can be easily found in existing SGT-based publications, including (Sapaty, 1999; 2005; 2017; 2018; 2019; 2021; 2022; 2023; 2024a; 2024b; 2025a; 2025b; 2025c; 2025d; 2025e; 2025f; 2026).

Collecting Zone Coordinates

The following scenario, starting in some point near the distributed area (say, a lake), collects and outputs its border coordinates, as in Figure 7.

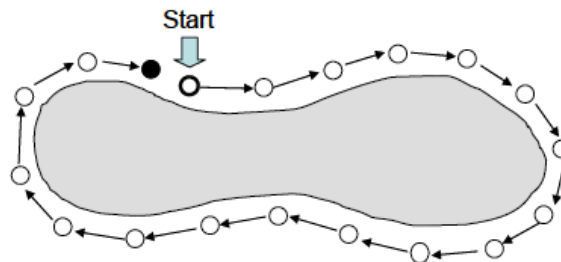


Figure 7. Collecting coordinates around the region.

```
frontal(Coord = start, Step = ..., Near = ...);
go(Coord);
repeat(
  go(right, Step, Near); append(Coord, WHERE);
  if(distance(Coord[1], WHERE) <= near, done(output(Coord))))
```

Tracking Mobile Object

The following self-evolving spatial scenario tracks and controls complex object propagating via distributed network of radar stations, as in Figure 8.

```
hop(all_nodes); frontal(Object);
whirl(
  Object = search(aerial, new));
repeat(
  loop(visibility(Object) > threshold);
  max_destination(hop(all_neighbors); visibility(Object)))
```

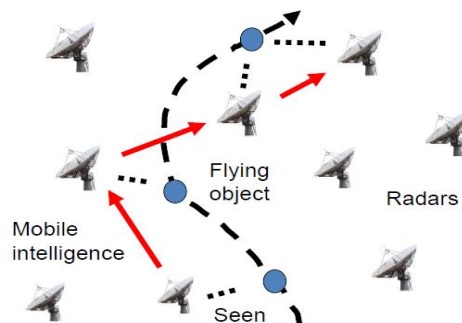


Figure 8. Distributed objects tracking by radar stations.

Discovering and Processing Cliques

Finding maximum cliques with specific types of links (like x, y, z) between their nodes (here with three or more nodes) is as in Figure 9.

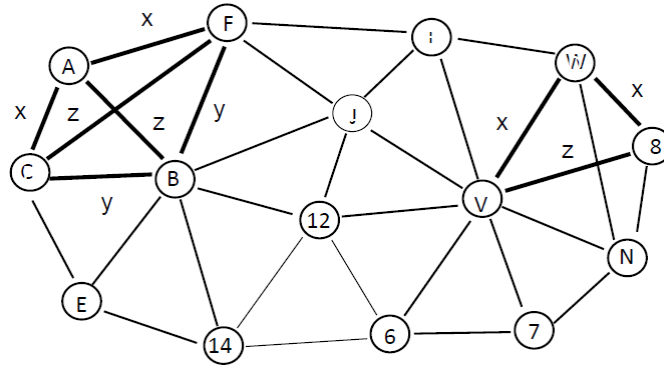


Figure 9. Cliques with certain types of links between their nodes.

```

hop_nodes(all); frontal(Clique = NAME, Links = (x, y, z));
repeat(hop_links(Links); not_belong(NAME, Clique);
yes(and_parallel(hop(links(Links), nodes(Clique)))));
if(PREDECESSOR > NAME, append(Clique, NAME), blind));
count(Clique) >= 3; output(Clique)
Result will be: (A, B, C, F), (8, V, W).
    
```

Network changes by removing specific clique links (as in Figure 10a) can be done by:

```
hop_nodes(Clique); unlink(Links, nodes(Clique)).
```

Network changes by removing all clique nodes (as in Figure 10b) can be provided by:

```
hop_nodes(Clique); remove(current).
```

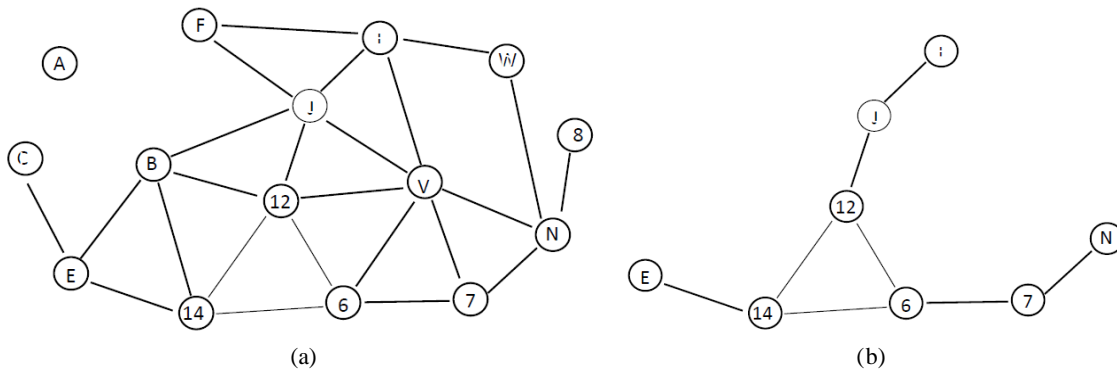


Figure 10. Removal of clique elements: (a) all internal links, (b) all clique nodes.

9. Multidimensional Management Project

The general view of this project organization is depicted in Figure 11, which consists of spatial dimension sections (as D1, D2, D3, many more may be engaged), organization of intra-dimensional solutions (1), inter-dimensional operations and exchanges (2), and over-dimensional global control and optimization (GCO) (3). Different dimensions are exhibited as potentially multidimensional structures themselves (symbolically as 3D

cylinders), which may be more general than their traditional representations in existing publications like overlaying 2D planes, as these may reflect very complex both physical and virtual world components. The drawings of multiple D_i as spatially intersecting and overlapping structures may happen to be appropriate too. Currently different international dimensions are being investigated under SGT and SGL, with orientation on finding useful and effective practical solutions both inside them and in their multidimensional combinations and integration.

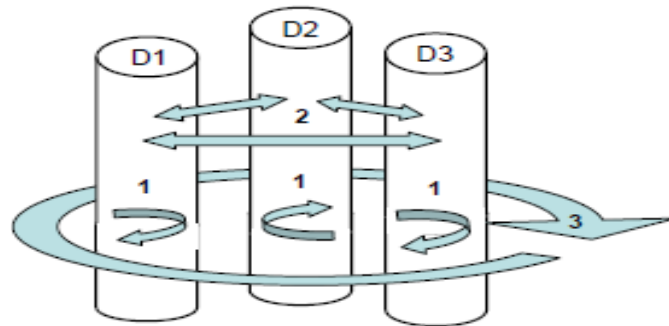


Figure 11. Multidimensional management system project

The following examples show how to enter different dimensions in this project, investigate and solve problems in them, and how the solutions found can influence operations and results in other dimensions, altogether benefitting the whole system organization, improvement, and management.

Entering particular dimension: enter (security).

Entering different dimensions in parallel: enter (security, economy, social, ...).

Simultaneously entering all registered dimensions: enter (all).

These movements can originate from the central GCO office, or directly from the already reached physical coordinates or nodes inside certain dimensions. After reaching these points, we can operate the needed scenarios from them, like follows:

```
enter(geography); move(coord_1, ..., coord_m); <operate>
```

```
enter(security); hop(node_1, ..., node_n); <operate>.
```

But if staying in a particular node or coordinate in some dimension, and eager to directly transfer your activity into same (or similar) point (or points) in other dimensions (if such exist) and operate there too, possibly in parallel (thus avoiding the return to GCO), you may use special through-dimensional operation shift as follows.

```
<staying in a node or coordinate>; shift(economy, social, ...); <operate>.
```

10. Example of Multidimensional Conflict Management

In Figure 12, a symbolic conflict situation is depicted with its management from one of the conflict sides (other side potentially capable of having similar organization), using four-dimensional model which includes physical conflict dimension, economy dimension, transport dimension, and virtual & control dimension (later mentioned in short as physical, economy, transport, and virtual).

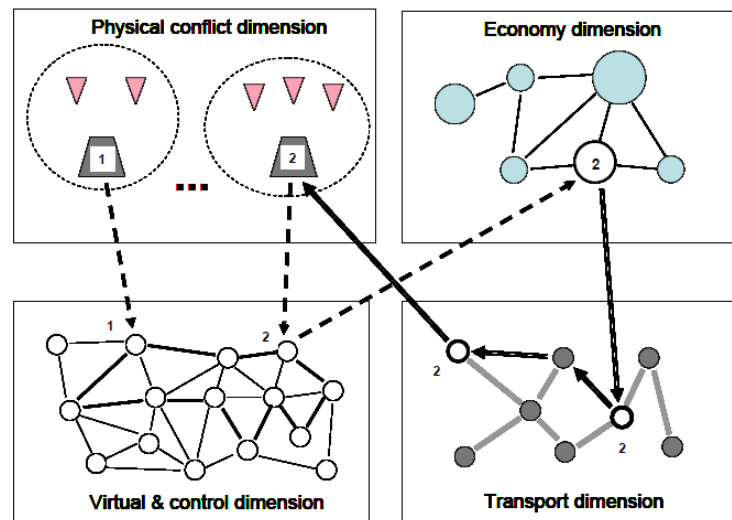


Figure 12. Conflict management with four dimensions.

It is supposed that in physical dimension there are own units (as numbered in Figure 12) which oppose adversary units (symbolically as attacking triangles) discovered at a certain distance, with their numbers counted. This view is transferred to the virtual dimension that assesses the global situation and decides which units may need the additional hardware support from the economy dimension (say, those opposing maximum number of enemy units seen). Then this decision is transferred into economy dimension which, having production of different defense and security equipment, finds the company or storage mostly corresponding to the chosen physical unit demands (represented by its type and additional equipment needed, say, reflecting the number of opposing adversaries). Then the prepared physical package is transferred to the nearest transport network point, from which, after first finding the suitable road or air path to the chosen conflict unit, it is physically delivered via this path to the mentioned unit and processes there. All these activities in the four-dimensional universe can be expressed in SGL as follows.

```

sequence(
  (enter(Physical);
  hop_all(own_units);
  frontal(Situ) = append(NAME, WHERE, TYPE, count(opposite_seen));
  Situ[4] >= threshold;
  enter(Virtual);
  hop(Situ[1]); nodal(Request) = Situ),
  (enter(Virtual);
  max_destination(hop_all(info); nonempty(Request); Request[4]);
  frontal(Demand) = Request;
  enter(Economy);
  max_destination(hop(all); correspond(ORIENTATION, Demand[3,4]));
  frontal(Product = prepare_from(PRODUCTS, Demand[3,4]), Point = WHERE);
  enter(Transport);
  move_to(min_destination(hop(all_joints); distance(WHERE, Point)));

```

```

frontal(Path) = repeat(hop_first(roads); append(Path, NAME);
if(near(WHERE, Demand[2]), stop(Path));
repeat(Next = withdraw(first, Path); nonempty(Next); move(road, Next));
enter(Physical);
move(Demand[2]); apply(Product))

```

In the above scenario, the virtual dimension is engaged just for determining the units to be strengthened first in the current situation, but in general it can cover global assessment, planning, and conflict management (including its prevention), with numerous and various intelligent functions possible. But in emergent situations for quickly supporting the fighting units, the solutions can be produced even without the virtual dimension, in direct cooperation between physical, economy and transport dimensions, as in Figure 13 and the related SGL scenario following. The virtual dimension can also be engaged for subsequent or more general solutions.

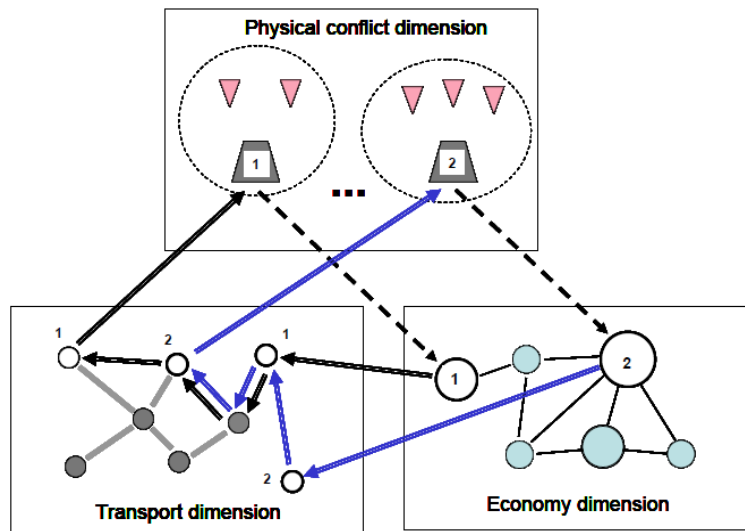


Figure 13. Conflict management with three dimensions.

```

enter(Physical);
hop_all(own_units);
frontal(Situ) = append(NAME, WHERE, TYPE, count(opposite_seen));
Situ[4] >= threshold;
enter(Economy);
max_destination(hop(all); correspond(ORIENTATION, Situ[3,4]));
frontal(Product = prepare_from(PRODUCTS, Situ[3,4], Point = WHERE);
enter(Transport); COLOR = Situ[1];
move_to(min_destination(hop(all_joints); distance(WHERE, Point)));
frontal(Path) = repeat(hop_first(roads); append(Path, NAME);
if(near(WHERE, Situ[2]), stop(Path));
repeat(Next = withdraw(first, Path); nonempty(Next); move(road, Next));
enter(Physical);
move(Situ[2]); apply(Product)

```

We have shown examples of very simple, actually elementary, cases for multidimensional crisis-related

situations. But the years of experience of using SGT and SGL for solving numerous and very complex problems in distributed terrestrial, celestial, and virtual environments can give us the real hope for their effective use in the area of multidimensional crisis management too. The obtained solutions can provide high integrity, self-recovery after any damages, and even a sort of consciousness in very complex situations (Sapaty, 2024a; 2025a).

11. Further Research on International Conflicts

More detailed analysis of international conflicts and their causes is being planned as continuation of the current work (especially in relation to Peace and Conflict Studies (2025)), which may include: different interests driving conflict like territorial gains, resource acquisition, dominance and power, historical animosities, prestige and national pride; theories of conflict evolution (balance of power, institutional mechanisms, modern legal frameworks); the nature of conflict (latent conflict, overt conflict, identified vs. unidentified conflict); the impact of international conflict (human cost, economic repercussions, global instability); and changing nature of conflict (military advancements, focus on developing nations).

The planned investigation of current international conflicts, especially their multidimensional nature, may include: US-Israel-Iran War (2026-ongoing), Russia-Ukraine War (2022-ongoing), Israel-Palestine/Gaza (ongoing), Syrian Civil War (2011-present), India-Pakistan Conflict (ongoing), Sudan Conflict (2023-present), South China Sea Disputes (ongoing), and others. These conflicts often feature complex combinations of direct violence, proxy forces, economic sanctions, and territorial disputes. The extended list of such conflicts can be found in Wikipedia (n.d.). With the advent of globalization, many conflicts now also encompass economic, environmental, and human development concerns, creating a more complex and multifaceted landscape. This transformation is driven by transnational decision-making structures and global interdependence, necessitating a deeper understanding of the changing nature of conflict (State, Society and Public Administration, 2025).

12. Conclusions

The paper highlights the necessity to analyze and explain fundamental nature of international conflicts as interaction, intersection, and integration of different security, social, cultural, geopolitical, and other dimensions. It also confirms the suitability of the developed SGT-SGL paradigm for investigating and modifying different conflict dimensions, also their holistic integration and management, where effective operations for networked dimensions can be organized in parallel and fully distributed mode. And the solutions in SGL may be simpler and more compact (up to a hundred times) than with traditional models and languages, as already tested and mentioned in Sapaty (1999; 2005; 2017; 2018; 2019; 2021; 2022; 2023; 2024a; 2024b; 2025a; 2026). They can self-spread in extremely flexible and self-controlled super-virus mode, *providing the international world with powerful security and self-recovery features*. The latest SGL version can be quickly implemented in traditional environments and recommended to different local and global institutions, UN including.

References

- Aoun, M.-C., Lojanica, M., & Mathieu, C. (2015, June 4). The new dimensions of geopolitics. D. Sherwood, (Ed.). Published by Cligendael International Energy Program (CIEP) and Institut français des relations internationales (IFRI). Retrieved from <https://www.ifri.org/en/external-articles/new-dimensions-geopolitics>
- Baldwin, G. (2025, October). Pursuing peace on a shoestring: Conflict management in an increasingly complex world. SIPRI Research Policy Paper. Retrieved from https://www.sipri.org/sites/default/files/2025-10/rpp_2025_10_ngcm_dakar.pdf
- Basabe, N., Páez, D., Valencia, J., Gonzalez, J. L., Rimé, B., & Diener, E. (2010). Cultural dimensions, socioeconomic development, climate, and emotional hedonic level. *Cognition and Emotion*, 16(1), 103-125. doi:10.1080/02699930143000158

- Berkhof, G. C. (2009, May 21). Maintaining international peace and security: The military dimension. Published online by Cambridge University Press. Retrieved from <https://www.cambridge.org/core/journals/netherlands-international-law-review/article/abs/maintaining-international-peace-and-security-the-military-dimension/A0BF03F809C1B5EF3CBA1B3DAB1FF39D>
- Brignone, D., Gambetti, L., & Ricci, M. (2025). Geopolitical risk shocks: When size matters. Revised May 2025, Working Paper Series, European Central Bank. Retrieved from <https://www.ecb.europa.eu/pub/pdf/scpwps/ecb.wp2972~6da32f928b.en.pdf>
- Cioacă, C., Rațiu, A., & Coman, M. (2019). An analysis of the cyber dimension in hybrid operations. *Review of the Air Force Academy*, 17(2), 29-38. doi:10.19062/1842-9238.2019.17.2.4
- Chaturvedi, M. (2026). Geo-economics and geopolitics: Interconnected dimensions of global power. Retrieved from https://www.linkedin.com/posts/2521973_geoeconomics-geopolitics-globalpower-activity-7426452596967530496-7YbI
- Cross, M. K. D. (2013). The military dimension of European security: An epistemic community approach. *Millennium Journal of International Studies*, 42(1), 45-64. doi:10.1177/0305829813497821
- CyberCapacity. (n.d.). Mapping the cyber security capacity building network: It just got easier. Retrieved from <https://cybercapacity.org/mapping-the-cyber-capacity-building-network-a-new-approach/>
- De Benedictis, L., Nenci, S., Santoni, G., Tajoli, L., & Vicarelli, C. (2014). Network analysis of world trade using the BACI-CEPII dataset. *SSRN Electronic Journal*, 14(3-4), 287-343. doi:10.2139/ssrn.2374354
- Diab-Bahman, R. (2024). Dimensions of culture available to purchase. Book Chapter. Leeds: Emerald Publishing Limited. Retrieved from <https://doi.org/10.1108/978-1-83549-326-720241003>
- Giblin, B. (2013). Economics and geopolitics: A relationship worth (re)considering. Translated from the French by JPD systems. In *Hérodote* 2013/4 No. 151, Publisher La Découverte. doi:10.3917/her.151.0003
- Hammond, D., & Hyslop, D. (2018, March 22). Understanding multidimensional risks to prevent conflict. Published on Development for Peace. Retrieved from <https://blogs.worldbank.org/en/dev4peace/understanding-multidimensional-risks-prevent-conflict>
- Helene, I., & Monsen, L. (2024). *The cyber dimension of space systems—An analysis of offensive cyber operations targeting space infrastructure*, FFI-Report. Retrieved from <https://www.ffi.no/en/publications-archive/the-cyber-dimension-of-space-systems-an-analysis-of-offensive-cyber-operations-targeting-space-infrastructure-8137164344218050358>
- Krelina, M. (2025, July). Military and security dimensions of quantum technologies: A primer. Stockholm, SIPRI. Retrieved from <https://doi.org/10.55163/ZVTL1529>
- League, S. (1997, December 8). Critical infrastructure protection—The cyber/information dimension: Report on national infrastructure coordination initiatives. *Proceedings 13th Annual Computer Security Applications Conference*. Retrieved from <https://www.semanticscholar.org/paper/Critical-Infrastructure-Protection-the-cyber-report-League/f8c378f47a35268de2f0c5f5a7a74f911ddb300b>
- Miall, H. (2004). Conflict transformation: A multi-dimensional task. In *Transforming ethno-political conflict: The Berghof handbook* (pp. 67-89). Berlin, Germany: VS Verlag für Sozialwissenschaften. ISBN:978-3-8100-3940-8
- Organization for Security and Co-operation in Europe. (n.d.). Political-military dimension. Retrieved from <https://cdn.osce.org/sites/default/files/f/documents/6/4/14050.pdf>
- Peace and Conflict Studies. (2025, September 4). Understanding international conflict and its causes.
- Richmond, O. P. (2002). A third generation of multidimensional approaches to ending conflict. In *Maintaining order, making peace* (pp. 140-180). Global Issues. London: Palgrave Macmillan. Retrieved from https://doi.org/10.1057/9780230289048_6
- Sapaty, P. S. (10.11.1993). A distributed processing system, European Patent N 0389655. European Patent Office.
- Sapaty, P. S. (1999). *Mobile processing in distributed and open environments*. New York: John Wiley & Sons.
- Sapaty, P. S. (2005). *Ruling distributed dynamic worlds*. New York: John Wiley & Sons.
- Sapaty, P. S. (2017). *Managing distributed dynamic systems with spatial grasp technology*. New York: Springer.
- Sapaty, P. S. (2018). *Holistic analysis and management of distributed social systems*. New York: Springer.
- Sapaty, P. S. (2019). *Complexity in international security: A holistic spatial approach*. Leeds: Emerald Publishing.
- Sapaty, P. S. (2021). *Symbiosis of real and simulated worlds under spatial grasp technology*. New York: Springer.
- Sapaty, P. S. (2022). *Spatial grasp as a model for space-based control and management systems*. Boca Raton: CRC Press.
- Sapaty, P. S. (2023). *The spatial grasp model: Applications and investigations of distributed dynamic worlds*. Leeds: Emerald Publishing.
- Sapaty, P. S. (2024a). *Providing integrity, awareness, and consciousness in distributed dynamic systems*. Boca Raton: CRC Press.
- Sapaty, P. S. (2024b, June 29). *Spatial networking in the united physical, virtual, and mental world*. New York: Springer.

- Sapaty, P. S. (2025a). *Self-healing and self-recovering systems under the spatial grasp model*. Leeds: Emerald Publishing Limited.
- Sapaty, P. S. (2025b). Managing multidimensional international world with spatial grasp model. *International Relations and Diplomacy*, 13(5), 257-269. doi:10.17265/2328-2134/2025.05.003
- Sapaty, P. S. (2025c). Spatial management of multidimensional international world. *International Relations and Diplomacy*, 13(6), 352-364. doi:10.17265/2328-2134/2025.06.003
- Sapaty, P. S. (2025d). Self-recovering networks under spatial grasp technology. *Mathematical Machines and Systems*, 1, 32-41. doi:10.34121/1028-9763-2025-1-32-41
- Sapaty, P. S. (2025e). Spatial grasp model for distributed management and its comparison with traditional algorithms. *International Relations and Diplomacy*, 13(3), 164-179. doi:10.17265/2328-2134/2025.03.004
- Sapaty, P. S. (2025f). Spatial management of distributed dynamic worlds. *Crisis, Stress, and Human Resilience: An International Journal*, 7(1), 94-108.
- Sapaty, P. S. (2026, April). *Distributed management with spatial grasp model*. New York: Springer Nature.
- Schiff, A. (2020, October). From conflict management to multidimensional conflict resolution. *Strategic Assessment*, 23(4), 140-152. Retrieved from https://www.researchgate.net/publication/346080425_From_Conflict_Management_to_Multidimensional_Conflict_Resolution
- Sharmin, F., Sultan, M. T., Wang, D. K., Badulescu, A., & Li, B. Q. (2021). Cultural dimensions and social media empowerment in digital era: Travel-related continuance usage intention. *Sustainability*, 13(19), 10820. Retrieved from <https://www.mdpi.com/2071-1050/13/19/10820>
- Simpson, S. (2022, August 19). New military communications network released, advancing unmanned systems through strategic collaboration. Retrieved from <https://www.unmannedsystemstechnology.com/2022/08/bae-systems-release-new-military-communications-network-netvipr/>
- Smith, P. B., & Bond, M. H. (2020). Cultural dimensions theory. In V. Zeigler-Hill and T. K. Shackelford (Eds.), *Encyclopedia of personality and individual differences* (pp. 970-976). Cham: Springer. Retrieved from https://doi.org/10.1007/978-3-319-24612-3_2093
- State, Society and Public Administration. (2025, March 20). The changing nature of conflict in a globalized world. Retrieved from <https://pubadmin.institute/state-society-and-public-administration/changing-nature-of-conflict-globalized-world>
- Walles, G. (2025, January 15). Cyber hygiene: The four dimensions of cybersecurity. Retrieved from <https://netnordic.com/insights/cyber-hygiene-the-four-dimensions/>
- Wikipedia. (n.d.). List of ongoing armed conflicts. Retrieved from https://en.wikipedia.org/wiki/List_of_ongoing_armed_conflicts
- Zhang, M. (2010). Social network analysis: History, concepts, and research. In B. Furht (Ed.), *Handbook of social network technologies and applications* (pp. 3-21). New York, NY: Springer. Retrieved from https://doi.org/10.1007/978-1-4419-7142-5_1