SELF-HEALING AND SELF-RECOVERING SYSTEMS UNDER SPATIAL GRASP MODEL

(New book summary)

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Abstract. *Self-recovery, often mentioned as self-healing and remediation, is an extremely important superpower-like feature of large systems on national, international, and up to the global world levels. It may relate to critical infrastructures covering different areas of human activity, including prosperity, integrity, economy, evolution, and especially security. First of all, the book provides some basic definitions of self-healing and reviews a range of related publications on self-recovery infrastructures and networks, as well as the main network threats. It then investigates and shows how the developed Spatial Grasp model and technology, together with its recursive Spatial Grasp Language (SGL) and its networked interpretation can organize distributed infrastructures with networks of any volumes and topologies to behave in a really self-analyzing, self-healing, self-repairing, actually «immortal» manner. The proposed solution is universal and global, which means that an arbitrary network can effectively self-recover from any damages of nodes and links after any fragmentation into disjoint parts, even if only a single node remains alive. This self-analysis and self-recovery are performed in a fully distributed manner without any central resources, fitting networks that can constantly evolve in time and space. The offered holistic spatial solutions in SGL are extremely compact and clear in comparison with traditional models and languages, usually based on communicating parts or agents. The book relates the obtained solutions to the area of global networks which can cover the whole world, and hints on how to make the results more suitable for practical applications. Some specific solutions under SGT are provided for self-recovery of transport systems, recovery after pandemics, clearing massive debris around the Earth, self-recovering security infrastructures, biological and psychological self-healing, as well as other areas of application.*
Keywords: *critical infrastructures, large distributed networks, network self-analysis and self-recovery, Spatial Grasp Technology, Spatial Grasp Language, global networks, self-healing security systems, transport, space debris, pandemics, security infrastructures.*

• Book contents

Chapter 14: Conclusions

References

• Main book figures

Figure 1 — Parallel recursive world coverage

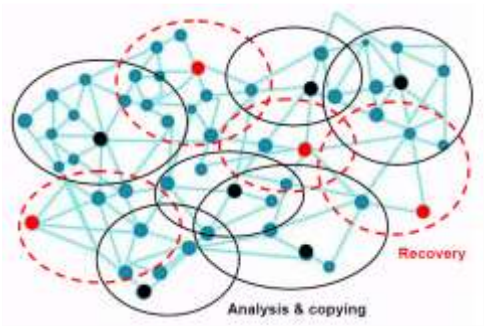

Figure 2 — Cooperative self-analysis and self-recovery

• Single sentence book summary

The book describes a range of applications of the developed and patented Spatial Grasp Model and Technology for effective management, self-healing and self-recovery of large distributed dynamic systems in important areas of human activity.

• This book is a sequel to the following patent and previous books

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2. Sapaty P.S. Mobile Processing in Distributed and Open Environments. New York: John Wiley & Sons, 1999.
3. Sapaty P.S. Ruling Distributed Dynamic Worlds. New York: John Wiley & Sons, 2005.
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8. Sapaty P.S. Spatial Grasp as a Model for Space-based Control and Management Systems. CRC Press, 2022.
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• Competing book titles

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4. Ruban I., Kovalenko A., Levashenko V. Advances in Self-healing Systems Monitoring and Data Processing. Springer; 1st edition. March 3, 2022.
5. Lynn C.D. Transcendental Medication: The Evolution of Mind, Culture, and Healing. Routledge; 1st edition. April 28, 2022.
6. Petrenko S. Developing a Cybersecurity Immune System for Industry 4.0. River Publishers; 1st edition. September 1, 2022.

7. Hasson-Ohayon P., Lysaker H. The Recovery of the Self in Psychosis (The International Society for Psychological and Social Approaches to Psychosis Book Series). Routledge; 1st edition. 2021. June 18.
8. Madry S. Space Systems for Disaster Warning, Response, and Recovery (Springer Briefs in Space Development). Springer; 2015th edition.
9. Cambron G.K. Global Networks: Engineering, Operations and Design. Wiley-IEEE Press; 1st edition. 2012. November 5.
10. Sassen S. Global Networks, Linked Cities. Routledge; 1st edition. 2016. April 15.
11. Root H.L. Network Origins of the Global Economy: East vs. West in a Complex Systems Perspective. Kindle Edition. Cambridge University Press. March 19, 2020.

• Relation to the competitive books

The current book offers a universal distributed control and management technology which effectively covers and solves the main problems addressed to in the mentioned books.

• Expected book limits

Word count: 100 000, figures: 90, reviewed references: 200.

• The latest published papers directly related to this book project

1. Sapaty P.S. Global and International Security under Spatial Grasp Paradigm. *International Relations and Diplomacy*. 2024. Vol. 12, N 2. P. 72–85. DOI: https://doi.org/10.17265/2328-2134/2024.02.004. URL: https://www.davidpublisher.com/index.php/Home/Article/index?id= 50834.html.
2. Sapaty P.S. Spatial Networks as Models for Organoid Cultures and Brain Research. *Mathematical machines and systems*. 2024. N 1. URL: http://www.immsp.kiev.ua/publications/articles/2024/2024_1/01_24_Sapaty.pdf.
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4. Sapaty P.S. Self-Recovering Infrastructures and Networks under Spatial Grasp Paradigm. *Theoretical Hypotheses and Empirical results*: Proc. of the 7th International Scientific Conference. Oslo, Norway, 2024. July 11–12. P. 96–112. DOI: https://doi.org/10.5281/zenodo.12741275. URL: https://ojs.publisher.agency/index.php/THIR/issue/view/91/222.
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