

Lockstepping Conditions of Growth Processes - Some Considerations Towards their Quantitative and Qualitative Nature from Investigations of the Logistic Curve

Lockstepping
Conditions of
Growth
Processes

B. Heiden &
B.
Tonino-Heiden

Content

Introduction

Lockstepping
Conditions of
Growth
Processes

Conclusion
and Outlook

Bibliography

FH-Prof. Mag. DI Dr. Bernhard Heiden, MBA
&
Mag. Bianca Tonino-Heiden

Studiengang Wirtschaftsingenieurwesen (WING) & Maschinenbau (MB),
FH-Kärnten

09/01-02/2022 Hybrid

IntelliSys²⁰²²
1-2 September 2022



1 Content**2** Introduction**3** Lockstepping Conditions of Growth Processes**4** Conclusion and Outlook

Lockstepping
Conditions of
Growth
Processes

B. Heiden &
B.
Tonino-Heiden

Content

Introduction

Lockstepping
Conditions of
Growth
Processes

Conclusion
and Outlook

Bibliography

Introduction

Motivation and Introduction:

- Fundamental theorem in quantum theory that measurement is influenced by the observation.
- Growth Processes seem to go on continuously or stepwise as a function of perspective. Is there a context?

Aim and goal:

- Investigation of general variable intrinsic boundaries in connection with general growth processes.

Lockstepping
Conditions of
Growth
Processes

B. Heiden &
B.
Tonino-Heiden

Content

Introduction

Lockstepping
Conditions of
Growth
Processes

Conclusion
and Outlook

Bibliography

I Lockstepping Conditions of Growth Processes

Axiom

One captures (observes) the steps and in reality it is a growth process.

Axiom

The observance of a lockstep is related (mainly) to a critical growth factor k and with regard to the x -axis variable in the logistic S -curve function.

Axiom

The stepping factor Y_0 is valid in a range of a starting and finishing step. If it exceeds the steep growth curve over a critical value, Y_0 is switching qualitatively.

Axiom

Fractals grow with lockstepping.

Axiom

Paradigms may be ordered according to the grades of observability or back-coupling processes along the logistic growth curve.

Axiom

The borders (see Fig. 1,3) may be approached more accurately by the population of a designed cybernetic (observation-action) network of the intermediate golden box regime of the logistic curve.

Lockstepping III

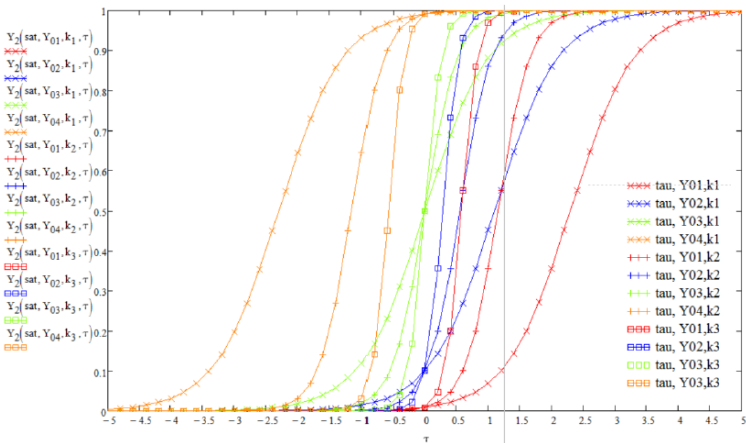


Figure 1: Logistic Curve: $Y_{01} = 1:1$; $Y_{02} = 1:5$; $Y_{03} = 2$; $Y_{04} = 4$; $k_1 = 2$; $k_2 = 4$; $k_3 = 8$; Sat = 1.

Lockstepping IV

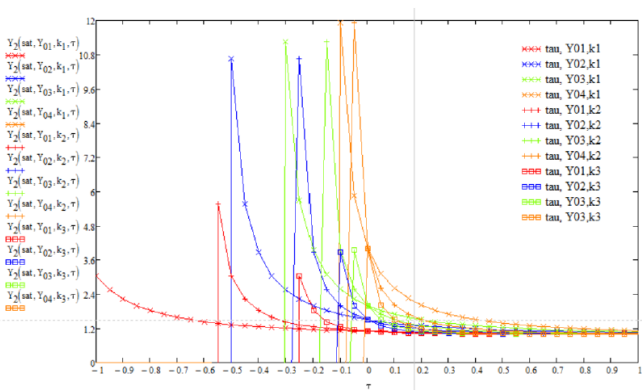


Figure 2: Logistic Curve: $Y_{01} = 0:01$; $Y_{02} = 0:1$; $Y_{03} = 0:5$; $Y_{04} = 0:99$; $k_1 = 2$; $k_2 = 4$; $k_3 = 8$; Sat = 1.

Lockstepping V

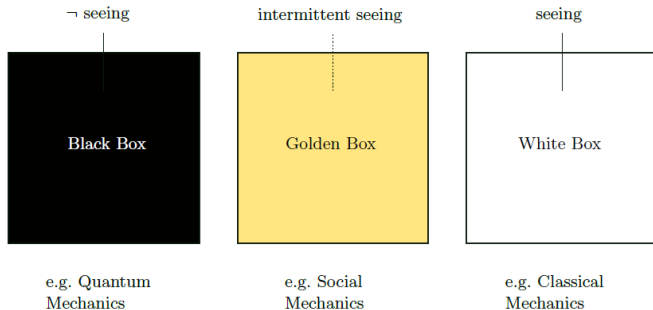


Figure 3: Black Box, Golden Box, White Box - as a universal model of lockstepping towards an unknown, osmotic and fully transparent paradigmatic. This corresponds to the logistics curve in Fig. 1 from the left to the right, or with regard to lockstepping, to intransparent, opaque and translucent viewpoints.

Lockstepping
Conditions of
Growth
Processes

B. Heiden &
B.
Tonino-Heiden

Content

Introduction

Lockstepping
Conditions of
Growth
Processes

Conclusion
and Outlook

Bibliography

Conclusion and Outlook

Conclusion and Outlook I

Lockstepping
Conditions of
Growth
Processes

B. Heiden &
B.
Tonino-Heiden

Content

Introduction

Lockstepping
Conditions of
Growth
Processes

Conclusion
and Outlook

Bibliography

Conclusion:

- We have explained the inherent fundamental lockstepping principle, of growth processes
- Relation given to bifurcation mechanism
- Possibly order increase by growth processes
- For this Six Axioms introduced

Outlook:

- Investigate further applications of the given principles
- Computer simulations: Bifurcation Analysis, Social Mechanics, Dynamics
- Find Measures to Describe and improve measurement accuracy by cybernetics means of higher order interconnectivity

Thank you cordially for your attention!



**FH-Prof. Mag. DI Dr. Bernhard Heiden¹, MBA & MMag.
Bianca Tonino-Heiden**

¹Professor for Production Engineering

E-Mail: b.heiden@fh-kaernten.at

PS.: The presentation can later also be found at:

<http://www.dr-heiden.com/Vortraege.htm>

- [Ban22] Jagdish Chand Bansal. *Drone Swarm: Concept, Challenges, and Future - Keynote Talk*. ICDSA 2022 Conference, Online on Virtual Platform (Google Meet), Kolkata, India, Mar. 26, 2022. URL: <https://www.icdsa22.scrs.in/page/program-schedule> (visited on 04/01/2022).
- [Che+14] Bihuan Chen et al. "Uncertainty handling in goal-driven self-optimization – Limiting the negative effect on adaptation". In: *Journal of Systems and Software* 90 (Apr. 2014), pp. 114–127. DOI: 10.1016/j.jss.2013.12.033.

- [Fle05] Peter Fleissner. *Einführung in die Sozialkybernetik - Erster Teil der Unterlagen zum Seminar Mathematische Modellbildung und Simulation Sommersemester 2005*. Institut für Gestaltungs- und Wirkungsforschung Fakultät für Informatik, TU WIEN, 2005.
- [Göt06] Johann Götschl. “Selbstorganisation Ein Denksystem für Natur und Gesellschaft”. In: ed. by Milos Vec, Marc Thorsten Hütt, and Alexandra Freund. Böhlau Verlag, Köln, 2006. Chap. Selbstorganisation: Neue Grundlagen zu einem einheitlicheren Realitätsverständnis, pp. 35–65.
- [Hei+19] Bernhard Heiden et al. “Orgiton Theory”. 2019. unpublished.

- [Hei06] Bernhard Andreas Heiden. “Development of a coagulation coefficient measurement device (CMD) for the measurement of the coagulation coefficient of nanoparticles in the size range from 10 to 1000 nm”. PhD thesis. Graz, University of Technology, 2006.
- [Hei27] W. Heisenberg. “Über den anschaulichen Inhalt der quantentheoretischen Kinematik und Mechanik”. In: *Zeitschrift für Physik* 43.3-4 (Mar. 1927), pp. 172–198. DOI: 10.1007/bf01397280.
- [HL18] Bernhard Heiden and Ulrich Leitner. “Additive Manufacturing – a system theoretic approach”. In: *ICAT 2018, Maribor*. Ed. by Igor Drstvenšek. 10.-11. Oct. Ljubljana: Interesansa - zavod, 2018, pp. 136–139. ISBN: 978-961-288-789-6.

- [HT21] Bernhard Heiden and Bianca Tonino-Heiden. “K. Arai et al. (Eds.) Key to Artificial Intelligence (AI), Proceedings of Intelligent Systems Conference (IntelliSys) 2020 in Advances in Intelligent Systems and Computing”. In: (2021). Springer Nature Switzerland AG, pp. 647–656. DOI: 10.1007/978-3-030-55190-2_49.
- [HT22a] Bernhard Heiden and Bianca Tonino-Heiden. “Emergence and Solidification-Fluidisation”. In: *LNS 296*. Intelligent Systems Conference (Intellisys) 2021, Amsterdam, The Netherlands, fully virtual conference, 2-3 September 2021. Ed. by Kohei Arai. Lecture Notes in Networks and Systems. Springer Nature Switzerland AG, 2022, pp. 1–10. DOI: 10.1007/978-3-030-82199-9_57.

- [HT22b] Bernhard Heiden and Bianca Tonino-Heiden. *Philosophical Studies - Special Orgiton Theory / Philosophische Untersuchungen - Spezielle Orgitontheorie (English and German Edition) (unpublished)*. 2022.
- [Hüt06] Marc Thorsten Hütt. “Was ist Selbstorganisation und was nützt sie zum Naturverständnis? Eine Einführung”. *austrian*. In: *Selbstorganisation: Ein Denksystem für Natur und Gesellschaft*. Ed. by Milos Vec, Marc Thorsten Hütt, and Alexandra Freund. Böhlau Verlag, Köln, 2006, pp. 91–105.

Bibliography VI

Lockstepping
Conditions of
Growth
ProcessesB. Heiden &
B.
Tonino-Heiden

Content

Introduction

Lockstepping
Conditions of
Growth
ProcessesConclusion
and Outlook

Bibliography

- [Kau93] Stuart A. Kauffman. *The Origins of Order - Self-Organization and Selection in Evolution*. Oxford University Press, New York, 1993.
- [KS09] Georg Kneer and Markus Schroer, eds. *Handbuch Soziologische Theorien*. VS Verlag für Sozialwissenschaften, 2009. 564 pp. ISBN: 3531152319.
- [Lie08] Lillian R. Lieber. *The Einstein Theory of Relativity 2008 - A Trip to the Fourth Dimension*. Philadelphia: Paul Dry Books, 2008. 350 pp. ISBN: 978-1-58988-044-3.

- [Lot25] Alfred J. Lotka. *Elements of Physical Biology*. Williams and Wilkins Company, 1925. 495 pp. URL: <https://archive.org/details/elementsofphysic017171mbp/page/n3/mode/2up> (visited on 01/16/2022).
- [Lot98] Alfred J. Lotka. *Analytical Theory of Biological Populations*. Springer US, Oct. 31, 1998. 256 pp. ISBN: 0306459272. URL: https://www.ebook.de/de/product/5229364/alfred_j_lotka_analytical_theory_of_biological_populations.html.
- [Man91] Benoît B. Mandelbrot. *Die fraktale Geometrie der Natur*. Birkhäuser Verlag, Basel Boston Berlin, 1991.

- [NM21] Mirna Nachouki and Riyadh A. K. Mehdi. “Particle Swarm Model for Predicting Student Performance in Computing Programs”. In: *Lecture Notes in Networks and Systems*. Springer International Publishing, Aug. 2021, pp. 84–96. DOI: [10.1007/978-3-030-82196-8_7](https://doi.org/10.1007/978-3-030-82196-8_7).
- [Oza03] Masanao Ozawa. “Universally valid reformulation of the Heisenberg uncertainty principle on noise and disturbance in measurement”. In: *Physical Review A* 67.4 (Apr. 2003). DOI: [10.1103/physreva.67.042105](https://doi.org/10.1103/physreva.67.042105).

- [RD79] S.J. Rooker and C.N. Davies. “Measurement of the coagulation rate of a high knudsen number aerosol with allowance for wall losses”. In: *Journal of Aerosol Science* 10.2 (Jan. 1979), pp. 139–150. DOI: 10.1016/0021-8502(79)90063-6.
- [Ros+21] Louis Rosenberg et al. “From Swarms to Hyperswarms: A New Methodology for Amplifying Group Intelligence”. In: *Proceedings of the Future Technologies Conference (FTC) 2021, Volume 1*. Springer International Publishing, Oct. 2021, pp. 239–251. DOI: 10.1007/978-3-030-89906-6_17.
- [SO05] Alexander Soldov and Valery Ochkov. *Differential Models*. Springer Verlag, 2005.

- [THA21] Bianca Tonino-Heiden, Bernhard Heiden, and Volodymyr Aliexsieiev. “Artificial Life - Investigations about a Universal Osmotic Paradigm (UOP)”. In: *Intelligent Computing, LNNS. Computing Conference 2021*, 15.-16. July 2021. Ed. by K. Arai. Vol. 285. Virtual / London: Springer Nature, 2021, pp. 595–605. DOI: 10.1007/978-3-030-80129-8_42.
- [Vik13] Kenneth Cukier Viktor Mayer-Schönberger. *Big Data*. Redline, 2013. 297 pp. ISBN: 3868815066.
- [Vil+16] M. Villari et al. “Osmotic computing: A new paradigm for edge/cloud integration”. In: *IEEE Cloud Computing* 3 (2016), pp. 76–83.

- [Vol90] Vito Volterra. *Leçons sur la théorie mathématique de la lutte pour la vie*. Paris: J. Gabay, 1990. ISBN: 2876470667.
- [von09] Ludwig von Bertalanffy. *General System Theory*. Revised Edition. New York: George Braziller, 2009.
- [Zie09] Andreas Ziemann. "Systemtheorie". In: *Handbuch Soziologische Theorien*. VS Verlag für Sozialwissenschaften, 2009, pp. 469–490. DOI: 10.1007/978-3-531-91600-2_22.