



SPACE
IS THE
SHADOW
OF
TIME

CHANGE OF TIME DUE
TO SCALE CHANGES OF
A QUANTIZED SCALING

MICHAEL ZECH

Berichte aus der Physik

Michael Zech

Space is the Shadow of Time

Change of Time due to Scale Changes of a Quantized Scaling
and Alternative Geometric Representations of the Equations of
Special and General Relativity

Shaker Verlag
Düren 2024

Bibliographic information published by the Deutsche Nationalbibliothek

The Deutsche Nationalbibliothek lists this publication in the Deutsche Nationalbibliografie; detailed bibliographic data are available in the Internet at <http://dnb.d-nb.de>.

Copyright Shaker Verlag 2024

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior permission of the publishers.

Printed in Germany.

ISBN 978-3-8440-9387-2

ISSN 0945-0963

Shaker Verlag GmbH • Am Langen Graben 15a • 52353 Düren

Phone: 0049/2421/99011-0 • Telefax: 0049/2421/99011-9

Internet: www.shaker.de • e-mail: info@shaker.de

Book

Varying scales of spatial distance, as known from redshift, are applied to time and analyzed by including physical action and quantized scaling. This leads to a modified Planckian constant h/c representing a force as well as to unit scale values for space and for time which are solely mathematically justified. Furthermore, the relationships between the special and general theories of relativity are described by means of irreducible basic mathematical building blocks and vividly represented geometrically. Relationships between algebra and geometry/topology are applied to both theories of relativity. Thus, the relationships of the special theory of relativity, in contrast to the Minkowski diagram, are geometrically figured as space and time proportions of a point of the invariant unit circle, as a 1-dimensional manifold. The proportions are complementary and dimensionless, the limits are pairs of 0 spheres. On this basis, the recognizability of worlds with different speeds of light is geometrically described and discussed. Geometric patterns can be interpreted both, as entanglements or as the emergence of dimensions. The Schwarzschild equation of general relativity, which describes the effect of a central mass, can basically be reduced to a hyperbola. The presented geometric representation of the general theory of relativity leads to a connection between the differential change of the spatial distance proportion and the differential change of the time proportion. For this is the definition of proper time by means of a guide-field according to Max von Laue and a variable speed of light. The lemniscate, as an inversion of a hyperbola on the unit circle, is interpreted physically. By this inversion, the interior and exterior of the unit circle can be mapped to itself in a transformation via reciprocal radii. The point of view of an observer is thus transformed from being located at the center of a coordinate system to infinity. The inversion circle itself becomes the event horizon. The interior of the unit circle becomes a black hole with a potential field, the center of which is without change of state, without time and without space. The present as an infinitesimal state change, past, future, entropy and time direction are discussed.

Table of contents

1	Scale Changes for Space and for Time	1
1.1	Conclusion from the Analysis of Transit-Time-Distance Scale Differentiating of Space and Time	2
1.2	Change of the Time Scale and Change of the Path Scale	5
1.3	Change of Scale and Origin of the Universe	13
1.3.1	Redshift Due to Change in Scale	13
1.3.2	Electromagnetic Radiation and Scale Change	14
1.4	Infinite Distance and Infinite Duration in Time	14
1.5	Double Logarithmic Representation	16
1.6	Quantum of Action of Relative Velocity	21
1.7	Waves as a Function of a Conformal Time and a Co-Moving Distance Dimension 26	
1.7.1	Unit-Wave	34
1.7.2	Phase Displacement	37
1.7.3	Superposition of Phase-Shifted Waves	38
1.7.4	Result	39
1.8	Scaling the Scales of a Coordinate System by Quantum	40
1.8.1	Squaring the Hyperbola	40
1.8.2	Scaling a Coordinate System by Quantum	43
1.8.3	Scaling by Planck's Quantum of Action	43
1.8.4	Scaling with Accelerated Relative Movement	44
1.8.5	Scaling in the Propagation of Waves	44
1.8.6	Scaling in Case of a Gravitational Action	44
2	Special Theory of Relativity – Alternative Graphical Representation of the Relationships between the Speed of Light, Relative Velocity, Lengths and Proper Time ...	47
2.1	Length and Time Dilations of SRT	47
2.1.1	Introduction	47
2.1.2	Einstein's Basic Assumptions about the Emission of a Signal	48
2.1.3	Equations of SRT	52
2.1.4	Relative Velocity Limits	58
2.2	Alternative Graphical Representations of SRT Equations	62
2.2.1	Direction of Action	62
2.2.2	Pythagorean Theorem	62
2.2.3	SRT – Graphical Representations as a Mathematical Irreducible Circle Group 62	

2.2.4	Discussion of Spacetime Unit Circles	64
2.2.5	Spacetime Unit Circle versus Minkowski Diagram and Light-Cone	66
2.2.6	Limit Considerations of the Graphically Descriptions of SRT with Null-Spheres.....	69
2.2.7	Optional Limit Value Considerations by Bijective Mapping.....	70
2.2.8	Change in Relative Velocity and Orientation	72
2.2.9	Features of Inversion on the Circle and its Physical Interpretation	73
2.2.10	Geometrical Relationships Between Separate Unit Circles of SRT	74
2.2.10.1	Two Separate and Isolated Unit Circles	74
2.2.10.2	Physical Interpretation of the Inside and Outside of the Unit Circle	75
2.2.10.3	Two Separate Unity Circles that Tangential Touch Each Other at One Point	76
2.2.10.4	Two Intersecting Unit Circles.....	77
2.2.10.5	Intersecting Circles of Different Diameters.....	78
2.2.10.6	Circle Within the Unit Circle, Mirrored at the Unit Circle.....	79
2.2.10.7	Tangent Circles of Different Diameters – Geometric Interpretation of Entanglement and Emergence of Dimensions	81
2.2.10.8	Run-through Sense of Inverted Circles of Different Diameters	84
2.2.10.9	Physical Interpretation of Simultaneously Existing Worlds with Different Speeds of Light	84
2.2.11	Variable Speed of Light and Redshift	87
2.2.12	Unresolved Issues of the Geometric Description of SRT	89
2.2.13	The SRT Described by Determinant of Square Matrix.....	92
2.2.14	Relative Velocity.....	93
2.2.14.1	SRT as Description of the Relative Movement of Massless Measuring Points	93
2.2.14.2	The SRT when Considering Masses Located at the Measuring Points ...	94
2.2.14.3	Measuring Points Versus Mass Points	98
2.3	The Equation of Classical SRT, Described by e-Functions.....	99
2.4	Speed of Light as Limit versus Event Horizon	104
2.5	Lorentz Factor and Variable Speed of Light.....	104
2.6	Spin Dilation and Cosserrat Continuum	106
2.7	Continuity of Space	107
2.8	Optical Perception.....	107
2.9	Conclusions	113
3	Alternative Graphical Description of the Equations of the GRT	117
3.1	Distinctions of Geometric Descriptions Between SRT and GRT.....	117
3.2	Congruence of SRT and GRT Equations.....	119

3.3	Equation of GRT in Polar Coordinates According to Max v. Laue and the Alternative Geometric Representation of the Schwarzschild Radius	120
3.4	Graphical Representation of the Equation of GRT	128
3.4.1	Time Duration and Distance	131
3.4.2	Time Duration and Distance as Series Development and the Role of Random According to the Law of Small Numbers (Two-Thirds Law)	136
3.4.3	Gravitational Field	138
3.4.3.1	Approximation of the World Line by a Hyperbola. Physical Significance of the Curvature of the Vertex as the Source Point of Time and Space.....	138
3.4.3.2	Radius of Curvature at the Vertex of the Hyperbola and Gravity	144
3.4.3.3	Change of Space and Change of Time	148
3.4.4	Space and Time as a 1/f Spectrum - Double Logarithmic Representation of Space- and Time-Proportions as a Straight Line	151
3.4.5	Structure of the Black Hole - from the Point of View of Infinity.....	152
4	'Generation' of an Additional Dimension at Energetic Barrier c	156
5	Wave Equation Based on Bernoulli Lemniscate Function	159
6	Alternative Models of Spacetime	161
6.1	Standard Model and GRT	161
6.2	Is Mathematics a Suitable Method for Describing State Changes?	161
6.2.1	Kruskal-Szekeres Coordinates.....	164
6.3	Various Current Mathematical Methods.....	165
6.4	Dimensionless Mathematical Equations.....	166
7	Transverse Dilation	167
8	The Speed of Light as an "Absolute" Frame of Reference	169
9	Annihilation and Pair Generation, Matter and Antimatter.....	169
10	Past, Infinitesimal Present, Future	171
11	Appendix	179
11.1	Basics of Geometric Mirroring on the Unit Circle.....	179
11.2	Hyperbola in a Coordinate System Rotated by -45°	181
11.3	Properties of the Function $y = 1/x$	183
11.4	Hyperbolas as Interference Patterns	185
11.5	Lemniscate and Hyperbola.....	188
11.6	Cassini Curves Versus Potential Lines of Two Equal Point Charges	193
11.6.1	Interpretation of the Cassini Potential Curves.....	197
11.7	Interpretation of the Rotation of a Distance as a Wave.....	198
11.7.1	Conclusions and Physical Analogies.....	201
11.8	Real Number Plane Versus Gaussian Number Plane	203