

# Table of Contents

<b>1</b>	<b>Model Problem and Its Discretization</b>	1
1.1	Conservation Laws	1
1.2	Finite Volume Methods	6
<b>2</b>	<b>Multiscale Setting</b>	11
2.1	Hierarchy of Meshes	11
2.2	Motivation	13
2.3	Box Wavelet	17
2.3.1	Box Wavelet on a Cartesian Grid Hierarchy	17
2.3.2	Box Wavelet on an Arbitrary Nested Grid Hierarchy	19
2.4	Change of Stable Completion	22
2.5	Box Wavelet with Higher Vanishing Moments	24
2.5.1	Definition and Construction	24
2.5.2	A Univariate Example	26
2.5.3	A Remark on Compression Rates	29
2.6	Multiscale Transformation	29
<b>3</b>	<b>Locally Refined Spaces</b>	33
3.1	Adaptive Grid and Significant Details	34
3.2	Grading	36
3.3	Local Multiscale Transformation	44
3.4	Grading Parameter	47
3.5	Locally Uniform Grids	52
3.6	Algorithms: Encoding, Thresholding, Grading, Decoding	55
3.7	Conservation Property	60
3.8	Application to Curvilinear Grids	62
<b>4</b>	<b>Adaptive Finite Volume Scheme</b>	73
4.1	Construction	73
4.1.1	Strategies for Local Flux Evaluation	75
4.1.2	Strategies for Prediction of Details	77
4.2	Algorithms: Initial data, Prediction, Fluxes and Evolution	82

<b>5</b>	<b>Error Analysis</b> .....	89
5.1	Perturbation Error .....	90
5.2	Stability of Approximation .....	93
5.3	Reliability of Prediction .....	97
<b>6</b>	<b>Data Structures and Memory Management</b> .....	113
6.1	Algorithmic Requirements and Design Criteria .....	113
6.2	Hashing .....	115
6.3	Data Structures .....	118
<b>7</b>	<b>Numerical Experiments</b> .....	123
7.1	Parameter Studies .....	123
7.1.1	Test Configurations .....	124
7.1.2	Discretization .....	126
7.1.3	Computational Complexity and Stability .....	127
7.1.4	Hash Parameters .....	131
7.2	Real World Application .....	133
7.2.1	Configurations .....	133
7.2.2	Discretization .....	134
7.2.3	Discussion of Results .....	136
<b>A</b>	<b>Plots of Numerical Experiments</b> .....	139
<b>B</b>	<b>The Context of Biorthogonal Wavelets</b> .....	151
B.1	General Setting .....	151
B.1.1	Multiscale Basis .....	152
B.1.2	Stable Completion .....	153
B.1.3	Multiscale Transformation .....	154
B.2	Biorthogonal Wavelets of the Box Function .....	157
B.2.1	Haar Wavelets .....	157
B.2.2	Biorthogonal Wavelets on the Real Line .....	158
	<b>References</b> .....	163
	<b>List of Figures</b> .....	169
	<b>List of Tables</b> .....	171
	<b>Notation</b> .....	173
	<b>Index</b> .....	179

Adaptive Multiscale Schemes for Conservation Laws

Müller, S.

2003, XIV, 188 p. 1 illus., Softcover

ISBN: 978-3-540-44325-4