

# Contents

<b>1</b>	<b>Motivation</b>	<b>1</b>
<b>2</b>	<b>Introduction</b>	<b>5</b>
2.1	Particle Simulations . . . . .	5
2.1.1	Particle Simulations in General . . . . .	5
2.1.2	Coulomb Solver . . . . .	5
2.1.3	Physical and Simulation Properties . . . . .	10
2.2	Visualisations . . . . .	14
2.2.1	What is a Visualisation? . . . . .	14
2.2.2	Why are Visualisations needed at all? . . . . .	14
2.2.3	Existing Visualisation Tools and Frameworks . . . . .	14
2.2.4	Demand for a new Framework . . . . .	19
<b>3</b>	<b>Realisation of the Framework</b>	<b>23</b>
3.1	General Aspects . . . . .	23
3.1.1	Choice of the Programming Language . . . . .	23
3.1.2	Project Documentation . . . . .	23
3.1.3	Build Environment . . . . .	24
3.2	The Data Model . . . . .	25
3.2.1	Modular Concept . . . . .	25
3.2.2	Storage Model . . . . .	29
3.2.3	Interfaces for Inter-Module Communication . . . . .	31
3.2.4	External Interfaces . . . . .	31
3.3	Concept of Multiple Views . . . . .	34
3.3.1	Why the View Concept is Needed . . . . .	34
3.3.2	Main Views . . . . .	35
3.3.3	Overlay Views . . . . .	37
3.4	Input Selection Via Operators . . . . .	42
3.4.1	Need of Data Subsets . . . . .	42
3.4.2	Selection Criteria . . . . .	43
3.4.3	Excursus: Propositional Calculus . . . . .	45
3.4.4	Implementation of Complex Expressions . . . . .	49
3.4.5	Definition of Operators in Input Files . . . . .	50
3.4.6	Developed Class Structure . . . . .	50
3.4.7	Optimising the Expressions . . . . .	54
3.5	Output Definition via Filters . . . . .	58
3.5.1	General Information . . . . .	58
3.5.2	Definition of Filters in Input Files . . . . .	58
3.5.3	Developed Class Structure . . . . .	61

3.5.4	Colour Spaces and Interpolation . . . . .	63
3.6	Data storage . . . . .	65
3.6.1	Expected Input Data . . . . .	65
3.6.2	Data Structure . . . . .	65
<b>4</b>	<b>Conclusion</b>	<b>69</b>
<b>5</b>	<b>Outlook</b>	<b>71</b>
	<b>Bibliography</b>	<b>73</b>
	<b>Appendices</b>	<b>I</b>
	<b>A Dependency Graph of the Modules</b>	<b>I</b>
<b>B</b>	<b>Example XML Files</b>	<b>III</b>
B.1	Input Configuration . . . . .	III
B.2	Further Configurations . . . . .	V
B.3	Views . . . . .	VI
B.4	Operators . . . . .	VII
B.5	Filters . . . . .	X
<b>C</b>	<b>Example Input Files</b>	<b>XIV</b>
<b>D</b>	<b>Requirements</b>	<b>XV</b>
<b>E</b>	<b>Tested Platforms</b>	<b>XVI</b>
<b>F</b>	<b>License</b>	<b>XVII</b>