Contents

Pr	Preface									
1	Intro	Introduction								
	1.1	Information Science	1							
	1.2	Software Crisis	2							
	1.3	Motivation	4							
	1.4	Cybernetics	5							
	1.5	Method	5							
	1.6	Example	7							
	1.7	Structure	8							
ı	Ва	sics	11							
2	Software Engineering Process 1									
	2.1	Waterfall Process	14							
	2.2	Iterative Process	14							
	2.3	Agile Methodologies	16							
	2.4	Extreme Programming	17							
	2.5	Method Maturity	19							
	2.6	Abstraction Gaps	19							
	2.7	Software Architecture	22							
3	Phys	sical Architecture	25							
	3.1	Process	26							
	3 2	Application Server	27							

viii Contents

	3.3	Databa	ase Server	28
	3.4	Presen	tation Client	30
	3.5	Web C	lient and Server	31
	3.6	Local F	Process	32
	3.7	Human	ı User	33
	3.8	Peer N	ode	34
	3.9	Remote	e Server	35
	3.10	Legacy	Host	36
	3.11	System	s Interconnection	37
	3.12	Scalabi	ility	39
	3.13	Mislead	ding Tiers	40
4	Logic	aal Arak	nitecture	43
4	4.1			45
	4.1	4.1.1	gm and Language	45
		4.1.2	Paradigm Overview	47
		4.1.3	Hardware Architecture	48
		4.1.4	Machine Language	51
		4.1.5	Assembly Language	51
		4.1.6	Structured- and Procedural Programming	51
		4.1.7	System Programming	57
		4.1.8	Typeless Programming	58
		4.1.9	Functional Programming	58
		4.1.10	Logical Programming	60
		4.1.11	Data Manipulation Language	61
		4.1.12	Markup Language	61
		4.1.13	Page Description Language	66
		4.1.14	Hardware Description Language	67
		4.1.15	Object Oriented Programming	68
	4.2	Patterr	1	79
		4.2.1	Architectural	81
		4.2.2	Design	97
		4.2.3	Idiomatic	103
		4.2.4	Framework	107
	4.3	Compo	onent Oriented Programming	109
		431	Inversion of Control	110

<u>Contents</u> ix

		4.3.2	Component Lifecycle
		4.3.3	Interface and Implementation
		4.3.4	Separation of Concerns
		4.3.5	Spread Functionality
		4.3.6	Aspect Oriented Programming
		4.3.7	Agent Oriented Programming
	4.4	Domai	n Engineering
		4.4.1	Tool & Material
		4.4.2	Generics
		4.4.3	Domain Specific Language
		4.4.4	Specification Language
		4.4.5	Generative Programming
		4.4.6	Model Driven Architecture
		4.4.7	Model and Code
	4.5	Knowle	edge Engineering
		4.5.1	Representation Principles
		4.5.2	Date and Rule
		4.5.3	$\mbox{Agent Communication Language} \ \dots \ $
		4.5.4	Semantic Web
	4.6	Conce	otual Network
		4.6.1	Ontos and Logos
		4.6.2	Applicability
		4.6.3	Two Level Separation
		4.6.4	Building Blocks
		4.6.5	Terminology
		4.6.6	Schemes
		4.6.7	Ontology
		4.6.8	Archetype
		4.6.9	Dual Model Approach
	4.7	Model	ing Mistakes
5	Exte	nded M	lotivation 161
	5.1	Idea	
	5.2	Recapi	tulation
	5.3	•	nch

x Contents

П	Co	ntribu	tion	171			
6	Statics and Dynamics						
	6.1	Virtual	l- and Real World	. 173			
		6.1.1	Mind and Body	. 173			
		6.1.2	Brain Regions	. 176			
		6.1.3	Cell Division	. 177			
		6.1.4	Short- and Long-Term Memory	. 178			
		6.1.5	Information Processing Model	. 180			
		6.1.6	Persistent and Transient	. 181			
	6.2	System	and Knowledge	. 182			
		6.2.1	Configurable or Programmable	. 182			
		6.2.2	Code Reduction	. 184			
		6.2.3	Base- and Meta Level	. 185			
		6.2.4	Reference- and Archetype Model	. 185			
		6.2.5	Common- and Crosscutting Concerns	. 186			
		6.2.6	Application and Domain	. 187			
		6.2.7	Platform Specific and -Independent	. 189			
		6.2.8	Agent with Mental State	. 189			
		6.2.9	Data Garden	. 190			
	6.3	Knowle	edge Management System	. 192			
		6.3.1	Hardware Connection	. 192			
		6.3.2	Memory	. 194			
		6.3.3	Processing	. 194			
		6.3.4	Lifecycle	. 196			
7	Kno	wledge :	Schema	199			
	7.1	Ū		. 199			
		7.1.1	Basic Behaviour				
		7.1.2	Conglomerate	. 201			
		7.1.3	Abstraction				
		7.1.4	Interaction	. 207			
		7.1.5	Intrinsic or Extrinsic Properties				
		7.1.6	Language				
		7.1.7	Quality and Quantity				
	7.2	Design	Reflections				

<u>Contents</u> xi

		7.2.1	Pattern Systematics
		7.2.2	Recommendation
		7.2.3	Model Metamorphosis
		7.2.4	Structure by Hierarchy
		7.2.5	Association Elimination
		7.2.6	Hierarchical Algorithm
		7.2.7	Framework Example
		7.2.8	Categorisation versus Composition
	7.3	Knowle	edge Representation
		7.3.1	Knowledge Ontology
		7.3.2	Schema
		7.3.3	Double Hierarchy
		7.3.4	Modelling Example
		7.3.5	Container Unification
		7.3.6	Universal Memory Structure
8	Stat	e and L	ogic 243
	8.1	A Chai	nging World
		8.1.1	Change follows Rules
		8.1.2	From Philosophy to Mathematics
		8.1.3	System
		8.1.4	Self Awareness
		8.1.5	Communication
	8.2	Transla	ator Architecture
		8.2.1	Interacting Systems
		8.2.2	Basic Patterns
		8.2.3	Placement
		8.2.4	Simplification
		8.2.5	Communication Model
	8.3	Knowle	edge Abstraction and -Manipulation
		8.3.1	Algorithm
		8.3.2	Operations
		8.3.3	Primitives
		8.3.4	Logic Manipulates State
		835	Without Capsules?

xii Contents

III Proof							
9	Cybernetics Oriented Language						
	9.1	Formal	lity	. 273			
	9.2	Definit	ion	. 274			
		9.2.1	Syntax	. 275			
		9.2.2	Vocabulary	. 276			
		9.2.3	Semantics	. 281			
		9.2.4	Tag-Attribute Swapping	. 283			
	9.3	Constr	ucts	. 284			
		9.3.1	State Examples	. 284			
		9.3.2	Logic Examples	. 289			
		9.3.3	Special Examples	. 293			
		9.3.4	Inheritance as Property	. 299			
		9.3.5	Container Mapping	. 300			
		9.3.6	Hidden Patterns	. 301			
	9.4	Compa	rison	. 301			
		9.4.1	RDF	. 302			
		9.4.2	OWL	. 303			
	9.5	Tool S	upport	. 305			
		9.5.1	Template Editor	. 305			
		9.5.2	Knowledge Designer	. 306			
		9.5.3	Model Viewer	. 310			
10	Cybe	ernetics	Oriented Interpreter	313			
	10.1	Archite	ecture	. 313			
		10.1.1	Overall Placement	. 313			
		10.1.2	Inner Structure	. 314			
		10.1.3	Pattern Merger	. 316			
		10.1.4	Kernel Concepts	. 317			
		10.1.5	Security	. 319			
	10.2	Function	onality in Detail	. 321			
		10.2.1	Process Launching	. 322			
		10.2.2	Lifecycle Management	. 322			
		10.2.3	Signal Checking	. 323			
		10 2 4	Signal Handling	323			

Contents xiii

		10.2.5	Operation Execution	324
		10.2.6	Model Transition	324
		10.2.7	Data Creation	325
	10.3	Implem	nentation	327
		10.3.1	Simplified C	327
		10.3.2	Corrected C	328
		10.3.3	Used Libraries	328
		10.3.4	Development Environment	329
		10.3.5	Error Handling	329
		10.3.6	Distribution and Installation	330
11	Res	Medicin	nae	331
	11.1	Project		331
		11.1.1	Free and Open Source Software	331
		11.1.2	Portals and Services	332
		11.1.3	Tools	333
		11.1.4	Contributors	334
	11.2	Analysi	is	335
		11.2.1	Requirements Document	335
		11.2.2	EHR & Co	335
		11.2.3	Episode Based	337
		11.2.4	Evidence Based	338
		11.2.5	Continuity of Care	339
		11.2.6	Core Model	339
	11.3	Standa	rds	341
		11.3.1	Overview	341
		11.3.2	Record Modelling	342
		11.3.3	Messaging and Communication	344
		11.3.4	Terminology Systems	347
		11.3.5	Further Standards	352
		11.3.6	Standards Development	355
		11.3.7	Implication	356
	11.4	Realisa	ition	357
		11.4.1	Student Works	357
		11.4.2	First Trial	359
		11.4.3	Knowledge Separation	360

xiv Contents

	11.4.4 Reimplementation	. 362
	11.4.5 Module Modelling	. 363
IV	Completion	367
12	Review	369
	12.1 Validation	. 369
	12.1.1 Distinction of Statics and Dynamics	. 370
	12.1.2 Usage of a Double-Hierarchy Knowledge Schema	. 372
	12.1.3 Separation of State- and Logic Knowledge	. 373
	12.2 Evaluation	. 374
	12.2.1 Knowledge Triumvirate	. 374
	12.2.2 Common Knowledge Abstraction	. 376
	12.2.3 Long-Life Software System	. 377
	12.3 Limits	. 378
13	Summary and Outlook	381
	13.1 Summary	. 381
	13.2 Future Works	
	13.3 Fiction	. 387
14	Appendices	389
	14.1 Abbreviations	
	14.2 References	
	14.3 Figures	
	14.4 Tables	
	14.5 History	
	14.6 Migration to CYBOL	
	14.7 Call for Developers	
	14.8 Abstract	
	14.9 Kurzfassung	
	14.10Licences	
	14.10.1 GNU General Public License	
	14.10.2 GNU Free Documentation License	
	14 11Index	479