

# Contents

<b>Foreword</b>	<b>xiii</b>
<b>Abstract</b>	<b>xv</b>
<b>Agradecimientos</b>	<b>xvii</b>
<b>Acknowledgements</b>	<b>xix</b>
<b>1 Introduction</b>	<b>1</b>
1.1 The Semantic Heterogeneity Problem . . . . .	1
1.2 Motivation of the Thesis . . . . .	3
1.3 Contributions . . . . .	4
1.4 Outline of the Thesis . . . . .	6
1.5 Publications . . . . .	7
<b>2 Semantic Interoperability</b>	<b>9</b>
2.1 About Ontologies . . . . .	9
2.1.1 Origins . . . . .	10
2.1.2 Ontologies in Computer Science . . . . .	11
2.1.3 Formal Approaches for Ontologies . . . . .	14
2.1.4 Ontologies in the Semantic Web . . . . .	20
2.1.5 Some Words about Ontology Engineering . . . . .	22
2.2 Ontology Matching . . . . .	23
2.2.1 A Formal Approach for Semantic Alignment . . . . .	24
2.2.2 Ontology Matching Techniques . . . . .	25
2.2.3 Matching Systems . . . . .	27
2.3 The Case of Multiagent Systems . . . . .	30
2.4 Summary and Concluding Remarks . . . . .	31
<b>3 A Formal Framework for Situated Semantic Alignment</b>	<b>33</b>
3.1 Situated Semantic Alignment . . . . .	33
3.2 The Logic of Situated Semantic Alignment . . . . .	35
3.2.1 A First Example: the Magic Box . . . . .	38
3.3 Approaching the logic of SSA . . . . .	41
3.3.1 An Example with Robots . . . . .	46

3.4	Summary and Concluding Remarks . . . . .	49
<b>4</b>	<b>I-SSA: Interaction-Situated Semantic Alignment</b>	<b>51</b>
4.1	Introduction . . . . .	51
4.2	A Running Example: the Blackjack Game . . . . .	52
4.2.1	Blackjack Rules . . . . .	52
4.2.2	Why Blackjack? . . . . .	54
4.3	Interaction Models . . . . .	54
4.4	I-SSA Insights . . . . .	56
4.4.1	I-SSA Principles . . . . .	59
4.4.2	Global Interaction . . . . .	60
4.4.3	What is Shared? . . . . .	61
4.4.4	What is not Shared? I-SSA Assumptions and Goals . . . . .	62
4.5	I-SSA Formalisation . . . . .	63
4.5.1	Interaction Models Revisited . . . . .	63
4.5.2	The Communication Product . . . . .	64
4.5.3	Semantic Alignment through the Communication Product . . . . .	68
4.6	I-SSA Dynamics . . . . .	70
4.6.1	The Alignment Protocol . . . . .	70
4.6.2	The Matching Mechanism . . . . .	73
4.6.3	Semantic Alignment through the Matching Mechanism . . . . .	77
4.7	I-SSA as a Particular Case of SSA . . . . .	79
4.8	Summary and Concluding Remarks . . . . .	80
<b>5</b>	<b>I-SSA Implementation and Experimentation</b>	<b>83</b>
5.1	Introduction . . . . .	83
5.2	Experiment Design . . . . .	84
5.3	Execution and Evaluation . . . . .	87
5.4	Statistical Analysis . . . . .	88
5.5	Summary and Concluding Remarks . . . . .	94
<b>6</b>	<b>A Case Study: Travel Reservation</b>	<b>99</b>
6.1	Introduction . . . . .	99
6.2	Online Travel Reservation . . . . .	100
6.3	The Travel Reservation Scenario . . . . .	102
6.3.1	Interaction Models and Ontologies for Travel Reservation . . . . .	102
6.4	I-SSA Solution . . . . .	110
6.5	Comparison with other Techniques . . . . .	116
6.6	Summary and Concluding Remarks . . . . .	118

<b>7 General Conclusions and Further Work</b>	<b>123</b>
7.1 Theoretical Implications . . . . .	124
7.2 Practical Implications . . . . .	125
7.3 Philosophical Implications . . . . .	125
7.4 Further Work . . . . .	126
<b>A Channel Theory</b>	<b>129</b>
A.1 Channel Theory Terms . . . . .	129
A.2 Channel Theory Theorems . . . . .	131
<b>B Travel Ontologies</b>	<b>133</b>
<b>Bibliography</b>	<b>145</b>