

Contents

Part I Understanding and Defining Situations

1	Introduction	3
1.1	The Emerging Eco-system and a Motivating Application	4
1.1.1	Motivating Application: Asthma Risk-Based Recommendations	5
1.2	Difficulties in Handling Situations	5
1.2.1	Concept of Situation Is Ill Defined	6
1.2.2	Conceptual Situation Modeling: Abstractions Required	6
1.2.3	Data Representation, Unification, and Processing	6
1.2.4	Situation Evaluation at Scale	7
1.2.5	From Situations to Personalized Alerts	7
1.2.6	Rapid Implementation, Validation, Refinement, and Deployment	7
1.3	Contributions.....	7
1.4	Outline of the Book	9
	References.....	9
2	Understanding and Using Situations	11
2.1	Defining <i>Situations</i>	11
2.1.1	Previous Definitions	11
2.1.2	Proposed Definition	13
2.2	Problem of Situation Recognition	13
2.2.1	Data	15
2.2.2	Features	15
2.2.3	Situations	15
2.3	Situation-Aware Applications	16
2.4	Design Goals for Framework to Build Situation-Aware Applications.....	18
2.4.1	Expressive Power	20
2.4.2	Lower the Floor	20
2.4.3	Raise the Ceiling	20

- 2.5 Components Required for the Framework..... 21
 - 2.5.1 The Building Blocks 21
 - 2.5.2 Modeling Approach 21
 - 2.5.3 Rapid Prototyping Toolkit 22
- References..... 22
- 3 Related Work on Situation Recognition..... 25**
 - 3.1 Situation Awareness Across Research Areas 25
 - 3.1.1 GIS (Geographical Information Systems)..... 25
 - 3.1.2 Active Databases and Stream Processing 26
 - 3.1.3 Aviation and Military Applications..... 27
 - 3.1.4 Robotics and AI 27
 - 3.1.5 Linguistics 28
 - 3.1.6 Context-Based Systems 28
 - 3.1.7 Computational Social Science 28
 - 3.1.8 Media Processing and Applications 29
 - 3.2 Progress in the Field of “Concept Recognition”
from Multimedia Data 29
 - 3.3 Toolkit Support for Situations, Context,
and Data Analytic Applications..... 31
 - References..... 32
- Part II A Framework for Recognizing Situations**
- 4 Overall Framework for Situation Recognition: Overview 39**
 - 4.1 Design Features of the Framework 39
 - 4.1.1 Using Humans as Sensors..... 39
 - 4.1.2 Consider Space and Time as Fundamental Axes 40
 - 4.1.3 Support Real-Time Situation Evaluation 40
 - 4.1.4 Generate Personalized Actionable Situations 41
 - 4.2 Situation Modeling 41
 - 4.3 Situation Recognition 42
 - 4.3.1 Data Stream Selection..... 42
 - 4.3.2 Data Ingestion 43
 - 4.3.3 Data Unification 43
 - 4.3.4 Spatiotemporal Aggregation 43
 - 4.3.5 Situation Evaluation 44
 - 4.4 Situation Visualization, Personalization, and Alerts 45
 - References..... 46
- 5 Situation Modeling 47**
 - 5.1 Operators and Operands 48
 - 5.1.1 Operands 48
 - 5.1.2 Operators..... 49
 - 5.2 The Wizard for Modeling Situations..... 50

- 5.3 Enhancing and Instantiating the Model 52
 - 5.3.1 Refining the Model 52
 - 5.3.2 Instantiating the Model 52
- 5.4 Example: Modeling Epidemic Outbreaks 52
- References 55
- 6 Data Representation and Situation Recognition Operators 57**
 - 6.1 Data Representation 57
 - 6.1.1 Data Unification 57
 - 6.1.2 Spatiotemporal Aggregation 59
 - 6.2 Analysis (Situation Recognition Operators) 59
 - 6.2.1 Filter (Π) 60
 - 6.2.2 Aggregation (\oplus) 63
 - 6.2.3 Classification (γ) 64
 - 6.2.4 Characterization ($@$) 66
 - 6.2.5 Pattern Matching (ψ) 68
 - 6.2.6 Combining Operators to Create Composite Queries 71
 - 6.3 Personalization and Alerts 72
 - 6.4 Validating the Data Representation and Analysis Operators 73
 - 6.4.1 Application Scenario: Business Analytics 73
 - References 75
- Part III EventShop: An Open-Source Toolkit for Situation Recognition**
- 7 EventShop: System Architecture 79**
 - 7.1 System Design: Overview 80
 - 7.2 Data Ingestor 82
 - 7.2.1 Data Sources 83
 - 7.2.2 Iterators 84
 - 7.2.3 Handling Different Types of Data 85
 - 7.3 Stream Query Processor 87
 - 7.3.1 Query 88
 - 7.3.2 Operators 89
 - 7.4 Personalization and Alerts 95
 - 7.5 Discussion 96
 - References 96
- 8 Using EventShop 97**
 - 8.1 Getting Started 97
 - 8.1.1 System Requirements 97
 - 8.1.2 Launching EventShop Web Application 98
 - 8.1.3 Log In and Sign Up 98
 - 8.1.4 Application Layout 99

- 8.2 Register Data Sources Panel 99
 - 8.2.1 Controlling and Searching Data Sources 100
 - 8.2.2 Adding New Data Source 102
 - 8.2.3 Sample of Data Sources 105
- 8.3 E-mage Panel 106
 - 8.3.1 Visualizing Data Source E-mage 106
- 8.4 Create and Execute Query Panel 107
 - 8.4.1 Forming Queries Using Operators 107
 - 8.4.2 Registering Query 113
- 8.5 Query Graph Panel 114
 - 8.5.1 Visualizing Query Graph 115
- 8.6 Registered Queries Panel 115
 - 8.6.1 Executing Registered Queries 116
 - 8.6.2 Searching Registered Query 117
 - 8.6.3 Visualizing Output E-mage 117
- 8.7 Taking Actions 119
- 9 Case Studies: Using EventShop for Creating Multiple Situation Recognition Applications 121**
 - 9.1 Wildfire Recognition in California 121
 - 9.1.1 Created Models 121
 - 9.1.2 Satellite Data-Based Detector: Comparison with Ground Truth 122
 - 9.1.3 Final Performance: Comparison with Ground Truth 124
 - 9.2 Flood Evacuation in Thailand 125
 - 9.2.1 Created Situation Models 125
 - 9.3 Asthma/Allergy Recommendation System 128
 - 9.3.1 Created Model 129
 - 9.3.2 Results 130
 - 9.4 Discussion and Looking Back at the Design Goals 132
 - References 134
- 10 Research Directions: Challenges and Opportunities 137**
 - References 139



<http://www.springer.com/978-3-319-30535-6>

Situation Recognition Using EventShop

Singh, V.K.; Jain, R.

2016, XVII, 140 p. 79 illus., 75 illus. in color., Hardcover

ISBN: 978-3-319-30535-6