MANAGEMENT OF CONTEXTUAL INFORMATION TO ENHANCE MOBILE COMMERCE APPLICATIONS: ISSUES, FRAMEWORK, AND APPROACHES

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用於增強移動商務應用的環境資訊管理技術：
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ABSTRACT

We are witnessing the tremendous growth in the adoption of mobile commerce applications that strive to provide various services to mobile users. However, these applications are plagued by the inherent hardware limitations of the mobile platforms. In view of this problem, researchers and practitioners are now in attempt to utilize the widely studied personalization techniques in mobile service recommendation because personalization, which arranges products in coherence to individual user's preference, is acknowledged to be a prospective remedy. One of the biggest challenges in such task is that conventional personalization techniques generally make decisions and conduct reasoning based on historical demographic and preference information. Therefore, nowadays' personalization techniques have difficulties in reflecting the dynamic aspects of a user on the move, and this situation motivates researchers to incorporate user's contextual information into mobile commerce applications.

However, primitive contextual information is hard to be directly used because of its characteristics of being inaccurate and temporal. This dissertation addresses the issues of managing contextual information by proposing a conceptual framework and indicating necessary processes for transferring primitive contextual information into usable knowledge. Towards this goal the framework adopts the process view of Knowledge Management and proposes major processes of managing contextual information, including collection, preprocessing, integration, modeling and representation. The framework intends to enable the procedure of transforming data and information to knowledge.

In addition, the dissertation identifies three important research problems in terms of the preprocessing, modeling and utilizing contextual information, including: (i) similarity search (ii) repetitive pattern discovery (iii) extracting rules and using for prediction. For the first problem this dissertation presents a time series similarity measuring approach for quantifying the relevance of two contextual scenarios characterized by time series. Meanwhile, this approach effectively tackles the innate inaccuracy and irregularity in primitive contextual time series. For the second problem, we propose a pattern mining approach which outperforms conventional *k*-motif in that it does not rely on the precise predefining of pattern length and it can aggregate underlying patterns from extracted motifs. This method can be used to identify repetitive patterns from user's contextual time series. Regarding the third problem, we elaborate an approach for predicting mobile user's activity via the discovering, selecting and matching of multidimensional sequential rules, which show much stronger prediction ability than conventional single dimensional rules. The associated processes (discovering, selecting and matching) can be viewed as a way of conducting knowledge modeling and matching in the Context Information Management Framework. These three proposed approaches are evaluated using both synthetic and real-world data.

The proposed framework serves as a guideline for managing contextual information. Furthermore, the proposed approaches constitute contributions to problems involving temporal data, such as those arise in the enabling of context-awareness for real-world mobile commerce application.

CONTENTS

ABSTRACT i

ACKNOLEDGEMENTS iii

CONTENTS iv

LIST OF FIGURES viii

LIST OF TABLES x

Chapter 1 Introduction 1

1.1 Background 1

1.1.1 Mobile Commerce Applications 1

1.1.2 Contextual Information 3

1.1.3 Enhancing MC applications with Context 4

1.2 Research Problems and Objectives 6

1.3 Scope of Work 8

1.4 Research Methodology 9

1.5 Roadmap 10

Chapter 2 Contextual Information Management 13

2.1 Introduction 13

2.2 Data, Information, Knowledge and KM 16

2.3 KM Framework for Contextual Information 21

2.3.1 Framework Architecture 21

2.3.2 Data/Information/Knowledge Collection 23

2.3.3 Data Preprocessing 25
2.3.4 Information Integration 28
2.3.5 Information/knowledge Modeling 31
2.3.6 Knowledge Representation 33
2.3.7 Knowledge Storage and Utilization 34
2.4 Discussion 36
Chapter 3 Measuring the Relevance of Contextual Time Series 38
3.1 Introduction 39
3.2 Related Works and Motivations 41
3.3 Distance between Inaccurate Data 43
3.3.1 Distance on Interval Number Description 43
3.3.2 Extension to Fuzzy Interval data 49
3.4 Interval Described Sequences Matching 50
3.4.1 Dealing with the Differences of Scales and Baselines 50
3.4.2 Similarity between Sequences 53
3.4.3 Searching for Longest Similar Subsequences 55
3.5 Relevant Sequences 57
3.6 Experimental Results 59
3.6.1 Experiment on Intel Context Dataset 60
3.6.2 Experiment on Fuzzified Intel Context Dataset 62
3.6.3 Experiment on Paramecium/Didinium dataset 65
3.7 Business Scenario and Conclusion 66
Chapter 4 Discovering Patterns from Contextual Time Series 69
4.1 Introduction 69

4.2 Literatures and Motivations 71
4.3 Motif Concatenation 74
4.4 Motif Aggregation 81
4.5 Experimental Results 83
4.5.1 Experiment on Synthesized Data 84
4.5.2 Experiment on Real Contextual Time Series 87
4.5.3 Experiment on Randomized Contextual Time Series 88
4.6 Business Scenario and Conclusion 89
Chapter 5 Context Based Prediction 93
5.1 Introduction 94
5.1.1 Background and Motivation 94
5.1.2 The Overview of Our Approach 97
5.1.3 Contributions and Organization 99
5.2 Literature Review 100
5.3 Learning Rules from Multidimensional Sequence 106
5.3.1 Problem Formulation 106
5.3.2 The Mining Algorithm 112
5.4 Rule Selection 114
5.4.1 Rule Reduction 115
5.4.2 Rule Ranking by Predictiveness 119
5.5 Generating Prediction by Rule Matching 121
5.6 Evaluation 123
5.6.1 Data Description 124
5.6.2 Measures and Experiment Setup 126

5.6.3 Experiments 127
5.6.4 Discussions 135
5.7 Conclusion 137
Chapter 6 Summary 140
6.1 Contributions of the Dissertation 140
6.2 Future Directions 141
References 144