TABLE OF CONTENTS

DECLARATION	ii
ACKNOWLEDGEMENTS	iii
ABSTRACT	iv
TABLE OF CONTENTS	v
LIST OF FIGURES	ix
CHAPTER 1 : INTRODUCTION	1
1.1 Problem Description	2
1.2 Intelligent Multimedia Help System for Arithmetic (ARITHHELP)	4
1.2.1 Main Modules	5
1.2.1.1 The Learning Module	6
1.2.1.2 The Practice Module	6
1.2.1.3 The Help Module	6
1.2.2 Sub Modules	7
1.2.2.1 Beginner	7
1.2.2.2 Intermediate	7
1.3 Thesis Scope	7
1.3.1 Definition of Arithmetic	7
1.3.2 The Four Rules of Arithmetic	8
1.4 Thesis Objectives	9
1.5 Thesis Organization	9
CHAPTER 2 : USING MULTIMEDIA IN EDUCATION	11
2.1 Multimedia	11
2.2 Interactive Multimedia	12
2.2.1 Examples of Interactive Multimedia	13
2.2.1.1 Information Kiosk	13
2.2.1.2 Interactive Video	13
2.3 Hypermedia	13
2.4 Hypertext	14
CHAPTER 3 : LITERATURE REVIEW	17
3.1 A Review of Intelligent System	17
3.1.1 ISIS Tutor : An Intelligent Learning Environment (ILE) for CDS/ISIS Users	17 17
3.1.2 Intelligent Web-Based Help Desk System	19
3.1.3 Cased-Based Mode Management Tutor (CB-MMT)	21
3.2 Technology Education	22
3.3 Student Modeling Architecture	23
3.3.1 Differential Modeling	23
3.3.2 Perturbation Modeling	24
3.4 Reasoning Method	25
3.4.1 Rule-based Reasoning	25

3.4.2 Case-Based Reasoning 26

CHAPTER 4 : METHODOLOGY 29
4.1 Selection of Domain Knowledge 29
4.2 The Context using in ARITHHELP 30
4.2.1 An Initial Framework of Context for an ARITHHELP Design 31
4.2.1.1 Interactional Contexts 32
4.2.1.2 Environmental Contexts 32
4.2.1.3 Objectival Contexts 34
4.3 Reasoning Method 35
4.4 Selection of Implementation Tools 38
4.4.1 Authoring Environment 38
4.4.2 Price 39
4.4.3 Support for text, graphics, animation and sound 39
4.4.4 Extensible Architecture 39
4.4.5 Multimedia Application Environment 40
4.4.5.1 Text-Based Applications 40
4.4.5.2 Interactive Applications 40
4.4.5.3 Wide Area Applications 41

CHAPTER 5 : COMPONENT OF ARITHELP 42
5.1 Overview 42
5.2 The Expert Model 42
5.3 The Tutor and Helper Model 43
5.4 The Student Model 43
5.4.1 Student Modeling Architecture 48
5.4.2 Pedagogical Model 50
5.5 The Interface Model 50

CHAPTER 6 : ARITHELP DESIGN 51
6.1 Intelligent Interface 51
6.2 Interface Design 52
6.2.1 The Process of Designing Interface and Dialogue 52
6.3 Types of Screen 54
6.3.1 Main Screen 54
6.3.2 Sub Screen 55
6.3.3 Dialogue Screen 55
6.4 Screen Design 56
6.4.1 Main Page 56
6.4.2 Learn Page 57
6.4.3 Practice Page 58
6.4.4 Help Index Page 59
6.5 Interaction Methods 60
6.5.1 Menu Interaction 60
6.5.1.1 Drop-down Menu 60
6.6 Navigational in ARITHHELP 61
6.6.1 Navigation Tools 61
6.6.1.1 Punctual Aids 62
6.6.1.2 Structural Aids 63

6.6.2 Navigational Aids 64
6.6.2.1 Backtracking 64
6.6.2.2 Sneak Preview 64
6.7 ARITHHELP Feedback Format 65
6.7.1 Help 65
6.7.1.1 Tag Tips 65
6.7.2 Assistance Format 66
6.7.3 Empowering Format 66
6.7.4 Modeling 67
6.7.5 Coaching 67
6.7.6 Tutoring 67
6.7.6.1 Expository Tutor 67
6.7.6.2 Procedure Tutor 67
6.8 Devices 68

CHAPTER 7 : SYSTEM IMPLEMENTATION AND TESTING 69
7.1 ARITHHELP Features 69
7.2 ARITHHELP Structure 69
7.2.1 Knowledge Base 70
7.2.2 Working Memory 70
7.2.3 Inference Engine 70
7.2.4 Explanation Facility 70
7.2.5 User Interface 71
7.3 ARITHHELP Architecture 71
7.4 Tools for Implementing ARITHHELP 73
7.4.1 ToolBook II Instructor 74
7.4.2 PaintBrush 74
7.5 System Testing 75
7.5.1 Unit Testing 75
7.5.2 Integration Testing 75
7.5.3 System Testing 75

CHAPTER 8 : CONCLUSION 76
8.1 Problem and Solution 76
8.1.1 Difficulty in choosing a Software 76
8.1.2 Problems and solution during system implementation 76
8.2 System Strengths 77
8.2.1 Detailed Feedback 77
8.2.2 User Friendly 77
8.2.3 Fast Response 77
8.3 System Limitations 77
8.3.1 System Performance depend on the CPU speed 77
8.3.2 Software Limitation 78
8.3.3 Cost of multimedia hardware and Software 78
8.4 Future Enhancements 79
8.4.1 Implement over the Internet 79
8.4.2 Input Systems 79
8.4.3 Collaborative Helping 79
8.4.4 Improved interfaces, bandwidth and visual representation 79
8.5 Conclusion 80

REFERENCES 81

APPENDIX

APPENDIX A User Manual

LIST OF FIGURES

Figure 1.1: Human Problem Solving
Figure 2.1: Nodes and Links
Figure 3.1: Design of the Case-Based Mode Management Tutor
Figure 3.2: A Representation of a Differential Student Model
Figure 3.3: A Representation of the Perturbation or Buggy Student Model
Figure 3.4: Architecture of a Rule-Based System
Figure 3.5: The CBR Cycle
Figure 4.1: The Contexts of an ARITHELP
Figure 5.1: The Student Model in ARITHELP
Figure 5.2: A Representation of an Overlay Model Showing the Effects of Tutoring
Figure 6.1: Dialogue Diagram of ARITHELP
Figure 6.2: The Main Screen
Figure 6.3: An Example of a Sub Screen
Figure 6.4: An Example of Dialogue Screen
Figure 6.5: The Main Page
Figure 6.6: The Beginner's Learn Page Screen
Figure 6.7: The Beginner's Practice Page Screen
Figure 6.8: The Help Index Page Screen
Figure 6.9: An Example of a Drop-Down Menu
Figure 6.10: The Help Index Screen
Figure 6.11: The Intermediate Learn Screen
Figure 6.12: The Search Icon Tag
Figure 7.1: ARITHELP Problem Solving
Figure 7.2 : ARITHELP Architecture