Table of Contents

Ch	apter 1: Introduction	15				
1.1	What is an adaptive autonomous agent?	15				
1.2	Some basic concepts	17				
1.3	Focus of attention in learning					
Ch	apter 2: The Basic Framework	23				
2.1	Focus of Attention Methods. 2.1.1 Introduction	23 23 25 26				
2.2	The testbed microworlds	28 29 32				
Ch	apter 3: Goal-independent Learning	39				
3.1	Model of the learning system. 3.1.1 The sensory system: Items. 3.1.2 The motor system: Actions. 3.1.3 The knowledge base: Schemas. 3.1.3.1 What is a schema? 3.1.3.2 How are schemas created? The marginal attribution mechanism 3.1.3.2.1 Bare schemas. 3.1.3.2.2 Result spinoffs. 3.1.3.2.3 Context spinoffs. 3.1.3.2.4 Conjunctive contexts and results. 3.1.3.2.5 Summary of marginal attribution. 3.1.3.2.6 Synthetic items.	39 40 41 41 42 43 43 44 45 46 46				
3.2	Improving learning via focus. 3.2.1 The work of learning. 3.2.2 The basic learning algorithm. 3.2.3 The focused algorithm. 3.2.3.1 How has focus changed the computational effort? 3.2.3.2 Why were these parameters chosen?	48 48 51 52 53 55				

Table of Contents

3.3	Results	57 57					
3.3.1 Evaluation of the focused algorithm							
	3.3.1.1 Completeness	57					
	3.3.1.1.1 Manual evaluation methods	58					
	3.3.1.1.2 Automatic evaluation methods	59					
	3.3.1.1.3 Completeness results	61					
	3.3.1.2 Correctness	61					
	3.3.2 Comparison of the different strategies	62					
Ch	apter 4: Goal-dependent Learning	67					
4.1	Introduction	67					
4.2	Why goals?	68					
	4.2.1 Where do goals come from?	69					
	4.2.2 The relation of goals to planning	70					
4.3	General concepts	71					
	4.3.1 Goals	71					
	4.3.1.1 The structure of goals	72					
	4.3.1.2 Using goals for learning 7						
	4.3.2 Evaluating learning						
	4.3.2.1 Using chaining to evaluate learning	80					
	4.3.2.2 Should we learn during evaluation?	80					
	4.3.2.3 When to plan?	81					
	4.3.2.4 How to plan?	82					
	4.3.2.4.1 Chaining	82					
	4.3.2.4.2 Path metrics	83					
	4.3.2.5 Exceptional conditions while planning	87					
	4.3.2.5.1 Actions having "no effect"	87					
	4.3.2.5.2 Serendipity	87					
	4.3.2.5.3 Goal loops	88					
	4.3.2.5.4 Other ways to be stymied	89					
	4.3.2.6 Planning for learning versus planning for evaluation	90					
	4.3.2.7 Randomizing the world	91					
	4.3.2.8 Lobotomies	92					
	4.3.2.9 Scorecards	92					
4.4	Results	94					
	4.4.1 The work required for learning with goals						
	4.4.3 Competence	99					

Table of Contents

Cha	apter	5: Related Work	111
5.1	Related 5.1.1 5.1.2 5.1.3	d Work in Machine Learning	111 111 113 117
5.2	Related 5.2.1 5.2.2	d Work in Cognitive Science	121 121 124
Cha	apter	6: Conclusions	133
6.1	The eff	fectiveness of focus of attention	133
6.2	Future 6.2.1 6.2.2 6.2.3 6.2.4 6.2.5	work Generalization and abstraction Filtering Experimental strategy Goals Occasional defocusing	134 134 135 136 137 138
Ap	pendi	ix A: System Architecture	139
An	nendi	ix B: Implementation of Efficient Planning	147
- r)	B.1 B.2 B.3 B.4 B.5 B.6	Introduction	147 147 149 150 152 153
Bib	liogr	aphy	155