CONTENTS

LIST OF FIGURES				
LIS	т о	F TABLES	xi	
\mathbf{PR}	EFA.	CE	xiii	
1	PRELIMINARIES			
	1.1	Interval Arithmetic	3	
	1.2	Interval Linear Systems	18	
	1.3	Derivatives and Slopes	26	
	1.4	Automatic Differentiation and Code Lists	36	
	1.5	Interval Newton Methods and Interval Fixed Point Theory	50	
	1.6	The Topological Degree	66	
2	SOFTWARE ENVIRONMENTS			
	2.1	INTLIB	71	
	2.2	Fortran 90 Interval and Code List Support	78	
	2.3	Other Software Environments	102	
3	ON	PRECONDITIONING	113	
	3.1	The Inverse Midpoint Preconditioner	115	
	3.2	Optimal Linear Programming Preconditioners	120	
4	VERIFIED SOLUTION OF NONLINEAR			
	SYS	STEMS	145	
	4.1	An Overall Branch and Bound Algorithm	146	
	4.2	Approximate Roots and Epsilon-Inflation	150	

	4.3	Tessellation Schemes	154
	4.4	Description of Provided Software	159
	4.5	Alternate Algorithms and Improvements	167
5	OP	TIMIZATION	169
	5.1	Background and Historical Algorithms	170
	5.2	Handling Constraints	177
	5.3	Description of Provided Software	199
6	NC	N-DIFFERENTIABLE PROBLEMS	209
	6.1	Extensions of Non-Smooth Functions	210
	6.2	Use in Interval Newton Methods	218
7	US	E OF INTERMEDIATE QUANTITIES IN	
	\mathbf{TH}	E EXPRESSION VALUES	227
	7.1	The Basic Approach	227
	7.2	An Alternate Viewpoint – Constraint Propagation	230
	7.3	Application to Global Optimization	230
	7.4	Efficiency and Practicality	232
	7.5	Provided Software	233
	7.6	Exercises	234
RE:	FEI	RENCES	235
INT)EX		255