

TABLE OF CONTENTS

CHAPTER 1	INTRODUCTION	1
	References	7
CHAPTER 2	FORMULATION OF THE PROBLEM	8
	References	11
CHAPTER 3	WELL-KNOWN METHODS FOR THE SOLUTION OF NONLINEAR LEAST SQUARES PROBLEMS	12
3.1	Solution of nonlinear least squares problems with the help of universal minimizing methods	12
3.2	Solution of nonlinear least squares problems with the help of special minimizing methods	18
3.3	Comparison of special minimizing methods with universal minimizing methods concerning the solution of nonlinear least squares problems	25
	References	29
CHAPTER 4	A NEW METHOD FOR THE SOLUTION OF NONLINEAR LEAST SQUARES PROBLEMS	31
4.1	Requirements for a method for the solution of nonlinear least squares problems	31
4.2	Derivation of a new method for the solution of nonlinear least squares problems	33
4.3	The problem of the selection of the column vectors for the matrix \underline{D}_1^k	44
4.4	Criteria for the selection of the column vectors for the building up of the matrix \underline{D}_1^k	53
4.4.1	Selection of the vectors for the building up of the matrix \underline{D}_1^k according to the criterion "maximal change of the slope"	54
4.4.2	Selection of the vectors for the building up of the matrix \underline{D}_1^k according to the criterion "maximal angle"	58
4.4.3	Comparison of the criteria "maximal change of the slope" and "maximal angle"	62
4.5	The condition of the matrix $(\underline{D}_1^k)^T \underline{D}_1^k$	64
4.6	Conditions for finishing the iteration	72
4.7	A procedure for the one-dimensional search	76
	References	80
CHAPTER 5	APPLICATION OF THE NEW METHOD FOR THE SOLUTION OF THE LINEAR LEAST SQUARES PROBLEM	82
CHAPTER 6	THE PROBLEM OF THE CHOICE OF A STARTING POINT \underline{x}^0	88
CHAPTER 7	APPLICATIONS OF THE PROPOSED METHOD FOR THE SOLUTION OF NONLINEAR LEAST SQUARES PROBLEMS	91
7.1	Formulation of the problems	91
7.2	Specification of the functions $f_i(\underline{x})$	95
7.2.1	Functions $f_i(\underline{x})$ for the fit of a magnitude and phase angle plot	95

7.2.2	Functions $f_i(x)$ for the fit of a step response	100
7.2.3	Functions $f_i(x)$ for the fit of an impulse response	106
7.2.4	Functions $f_i(x)$ for the determination of a control function	108
7.3	Numerical examples	115
7.3.1	Utilized methods	115
7.3.2	Example 1	117
7.3.3	Example 2	126
7.3.4	Example 3	131
	References	139
Appendix A	Some properties of the matrix $\underline{D}^T \underline{P} \underline{D}$	141
	References	143
Appendix B	Some facts from linear algebra	144
	References	146
Appendix C	The solution of the equation $\underline{D}_{n-1}^k \underline{C}^k = \underline{0}$	147
	References	147
Appendix D	The solution of the system of linear equations $\underline{D} \underline{r} = \underline{e}$	148
	References	152
Appendix E	A remark concerning the solution of nonlinear least squares problems with the help of the Moore-Penrose pseudoinverse	154
	References	156
Appendix F	The singular value decomposition	157
	References	158