COBYQA Reference

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CONTENTS

This page presents the framework of the method.

CHAPTER ONE

OPTIMIZATION SOLVER

1.1 Statement of the problem

We are interested in nonlinear constrained optimization problems of the form

$$\begin{array}{ll} \min & f(x) \\ \text{s.t.} & l \leq x \leq u, \\ & c_i(x) \leq 0, \ i \in \mathcal{I}, \\ & c_i(x) = 0, \ i \in \mathcal{E}. \end{array} \tag{1.1}$$

where the *objective function* f and the *constraint functions* c_i, with $i \in \mathcal{I} \cup \mathcal{E}$, are real-valued functions on $\mathbb{R}^n$, and $l \in \mathbb{R}^n$ and $u \in \mathbb{R}^n$ with $l < u$ are respectively referred to as the *upper bound* and *lower bound* on the *decision variable* $x \in \mathbb{R}^n$. We denote the cardinal numbers of $\mathcal{I}$ and $\mathcal{E}$ respectively $n_{\mathcal{I}}$ and $n_{\mathcal{E}}$.

The Lagrangian function $\mathcal{L} \colon \mathbb{R}^n \times \mathbb{R}^{n_{\mathcal{I}} + n_{\mathcal{E}}} \to \mathbb{R}$ for problem (1.1) is given by

$$\mathcal{L}(x, \lambda) = f(x) + \sum_{i \in \mathcal{I} \cup \mathcal{E}} \lambda_i c_i(x), \tag{1.2}$$

where $\lambda \in \mathbb{R}^{n_{\mathcal{I}} + n_{\mathcal{E}}}$ is referred to as the *dual variable*.

CHAPTER

TWO

LINEAR ALGEBRA

This part presents the linear algebra.

2.1 Geometry improvement of the interpolation set

2.2 Bound constrained truncated conjugate gradient

2.3 Convex piecewise quadratic programming

2.4 Linear constrained truncated conjugate gradient

2.5 Nonnegative least squares