4.4. CLASSIFICATION OF METHODS FOR NONLINEAR CONSTRAINTS

Most of the "traditional" methods can be divided into two main categories. In the *transformation methods*, the constrained problem is transformed to be solved as a sequence of unconstrained optimization problems. In the *direct methods* the constraints are handled in an explicit manner.

Transformation methods or indirect methods:
• penalty and barrier function methods, SUMT
• Lagrangian methods

Direct methods:
• projection methods (a generalization of the projection methods for linear constraints: now preserving feasibility is much more difficult because of curved boundaries)
• general reduced gradient method (GRG-method)
• cutting plane methods, sequential linear programming methods for convex problems
• successive quadratic programming methods (SQP-methods), projected Lagrangian methods (these methods have also similarities with transformation methods)
• methods of feasible directions: e.g. Zoutendijk's method
• heuristic search methods: e.g. Complex method (modified from unconstrained polytope method), random search, bracketing techniques.

General advice:
Instead of using one universal method for a problem with many kinds of constraints, it is often worthwhile to use separate techniques for different types of constraints.
For example, linear constraints and so-called box-constraints $a_j \le x_j \le b_j$ could be treated appropriately.