

Determining Initial Bound by “Ray-method” in Branch and Bound Procedure

Anett Rácz*

Abstract

In this paper we present an algorithm for determining initial bound for the Branch and Bound (B&B) method. The idea of this algorithm is based on the use of “ray” as introduced in the “ray-method” developed for solving integer linear programming problems [11], [12]. Instead of solving an integer programming problem we use the main idea of the ray-method to find an integer feasible solution of an integer linear programming problem along the ray as close to an optimal solution of the relaxation problem as possible. The objective value obtained in this manner may be used as an initial bound for the B&B method. It is well known that getting a “good bound” as soon as possible can often significantly increase the performance of the B&B method.

Keywords: integer programming, branch and bound, ray-method, initial bound

1 Introduction

It is well known that the performance of the B&B method mainly depends on the following three main factors:

- the rule used to choose the “branching” variable,
- the strategy used for generating binary search tree and
- the value of the initial bound.

Generally speaking, while the branching variable and strategy determine the size of the binary tree to be generated, getting a “good” bound as soon as possible can dramatically reduce the size of the tree to be considered, since the bound is used to prune those parts of the tree where the value of the objective function cannot be better than the bound.

Numerous efforts have been made in the past decades to investigate the general properties and behavior of the B&B method, e.g. [3, 6, 7, 13, 14, 16, 17, 18], to improve its computational efficiency, e.g. [4, 8, 9, 10, 15], to maximize its performance in different computational environments, see for example [5, 19], etc.¹

*Department of Applied Mathematics and Probability Theory, Faculty of Informatics, University of Debrecen, 4032 Debrecen Egyetem tér 1., Hungary, E-mail: anett.racz@inf.unideb.hu

¹The list of the relevant literature is so long, that in the framework of the current paper there is not enough space even to begin to cover all of the relevant items.