1 Introduction

Our lives confront us with many opportunities for optimization. Intuitively, optimization refers to the class of problems that consists in choosing the best among a set of alternatives. Thus, one can identify the two following fundamental elements of an optimization problem: (i) ***Best*** which conveys a choice of criterion used to choose the solution and is usually expressed by means of a function that should be minimized or maximized, and (ii) ***Alternatives*** which refers to the set of possible solutions that must be satisfied by any candidate solution [1].

Despite the fact that there are many methods of solution for optimization problems, most of them need special attention and are difficult to solve using classical solution methods. In contrast to the latter approaches, heuristic and metaheuristic methods are generally not affected by the behavior of the optimization problem. This makes the algorithms more widely usable.

In this study, we deal with one of the fundamental problems in graph theory and combinatorial optimization, that is, the minimum weight dominating set problem (MWDS). For a given an undirected, vertex-weighted graph, the problem asks for a subset of the vertices of the graph such that the subset is a dominating set and the sum of the weights of its vertices is minimal. For any graph, a dominating set is a set of nodes such that each node of the graph either belongs to the dominating set or is adjacent to a node in the dominating set.
It has many applications in a variety of fields such as clustering in wireless networks, formation of a routing backbone and multi-document summarization in information retrieval [2].

This problem is known as an NP-hard and no efficient algorithm is known to solve it to optimality. Therefore, most existing techniques are based on heuristics for providing approximate solutions in a reasonable computation time.

We make a comparison between well-known greedy heuristics for the MWDS problem and we add two new modified greedy heuristics that are more competitive than the previous ones. Some of the latter can be used in future research as a construction procedure for an iterated greedy algorithm. Iterated greedy algorithms have recently received considerable attention regarding their potential for effectively solving a wide range of difficult combinatorial optimization problems. They are based on the simple idea of iteratively partially destroy the incumbent solution before a greedy heuristic is used to derive a complete

solution from the partially destroyed solution where the choice of the greedy heuristic has a great impact on the performance of the algorithm.

2 Chapter Outline

This rest of this dissertation is organized as follows:

Chapter 1 gives a brief overview of optimization problems that are involved in this study.

Chapter 2 is devoted to the minimum weight dominating set problem. First, we present some definitions related to graph theory. Then, the MWDS is explained in more details.

Chapter 3 reviews some greedy heuristics for the MWDS problem. This chapter begins by outlining what is meant by greedy paradigm. Next, the most important existing greedy heuristics in literature for the MWDS problem are described. Then, we discussed how some of these greedy heuristics can be modified to improve their performance.

In Chapter 4, we perform a comparison between the greedy heuristics and discuss the obtained results.