

Contents

| | |
|--|----|
| CHAPTER I Introduction | 1 |
| CHAPTER II Literature Review | 5 |
| CHAPTER III Theoretical Framework | 10 |
| Mathematical formulation of the problem..... | 10 |
| Relaxation of an optimization problem | 11 |
| The subgradient method of optimization..... | 12 |
| Decomposition | 14 |
| The Knapsack Problem..... | 14 |
| The Generalized Assignment Problem..... | 15 |
| CHAPTER IV Methodology..... | 16 |
| Lagrangean Relaxation for the CPMP | 16 |
| First Approach: Lagrangean Heuristic for the Capacitated P-Median Problem..... | 17 |
| Second Approach: Cluster Median Improvement Heuristic | 19 |
| CHAPTER V Computational Experience..... | 23 |
| CHAPTER VI Conclusions and future work | 35 |
| References..... | 36 |

Figure Index

| | |
|--|----|
| Figure 1 The Lagrangean heuristic pseudo code..... | 18 |
| Figure 2 Pseudo code for the Cluster Median Improvement heuristic..... | 20 |
| Figure 3 The updated pseudo code adding the CMI heuristic. | 22 |

Table Index

| | |
|--|----|
| Table 1. Results of the Lagrangean Heuristic and the CMI Heuristic for the Class α instances..... | 25 |
| Table 2. Results of the Lagrangean Heuristic and the CMI Heuristic for the Class β instances. | 27 |
| Table 3. Results of the Lagrangean Heuristic and the CMI Heuristic for the Class γ instances. | 28 |
| Table 4. Results of the Lagrangean Heuristic and the CMI Heuristic for the Class Δ instances..... | 30 |
| Table 5. Lower bounds of the Lagrangean Heuristic, the CMI Heuristic and linear Relaxation for Instances of class α and β | 32 |
| Table 6. Lower bounds of the Lagrangean Heuristic, the CMI Heuristic and linear Relaxation for Instances of class γ and Δ | 33 |