

# ATM 교환기의 위치 선정 문제에 관한 연구

## (Algorithm for the ATM Switching Node Location Problem)

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### Abstract

We consider the development of integer programming models and algorithms for the ATM Switching node location problem. There are two kinds of facilities, hub facilities and remote facilities, with different capacities and installation costs. Each customer needs to be connected to one or more remote facilities at the same remote node and each remote facility need to be connected to a hub node. We are given a set of customers with their demand requirements, a set of candidate installation sites of facilities, and connection costs between facilities. We need to determine the locations to place facilities, the number of facilities for each selected location, the set of remote facilities which are connected to each installed hub node and the set of customers who are connected to each installed hub node via an installed remote node with minimum costs, while satisfying demand requirements of each customer.

We formulate this problem as a general integer programming problem and solve it with two different approaches. In the first model, we formulate this problem with path variables, To solve this model, we consider the integer knapsack polytope and derive valid inequalities. To solve this problem to optimality, we develop a branch-and-cut algorithm. In the second model, we decompose the problem of the first model into the master problem and subproblem, and formulate the master problem using tree variables. We develop a column procedure and solve the problem with a branch-and-price algorithm. Computational experiment shows that the first algorithm performs better than the second algorithm.

The results of this research can be used to develop optimization algorithms to solve conventional facility location problems and large scale integer programming problems.

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