Using Clustering Technique M-PAM in Mobile Network Planning

LAMIAA FATTOUH IBRAHIM
MANAL HAMED AL HARBI
Department of Computer Sciences
Faculty of Computer and Informations Technology King AbdulAziz University
Jeddah, Saudi Arabia

Abstract: Network planning is a key importance to obtain a good functionality, price and quality of services of a network. With the rapid development in mobile network we need effective network planning tool to satisfy the need of customers. However, deciding upon the optimum placement for the base stations (BS's) to achieve best services while reducing the cost is a complex task requiring vast computational resource. This paper addresses antenna placement problem or the cell planning problem, involves locating and configuring infrastructure for mobile networks by modified the original Partitioning Around Medoids PAM algorithm. M-PAM (Modified-Partitioning Around Medoids) has been proposed to satisfy the requirements and constraints. PAM needs to specify number of clusters (k) before starting to search for the best locations of base stations. The M-PAM algorithm uses the radio network planning to determine k. We calculate for each cluster its coverage and capacity and determine if they satisfy the mobile requirements, if not we will increase (k) and reapply algorithms depending on two methods for clustering. Implementation of this algorithm to a real case study is presented. Experimental results and analysis indicate that the M-PAM algorithm when applying method two is effective in case of heavy load distribution, and leads to minimum number of base stations, which directly affected onto the cost of planning the network.

Key-words: clustering techniques, network planning, cell planning and mobile network

1. Introduction

Data mining is an expanding area of reasearch in artificial intelligence and information management. The objective of data mining is to extract relevant information from databases containing large amounts of information. Typical data mining and analysis tasks include classification, regression, and clustering of data, determining parameter dependencies, and finding various anomalies from data[1].

The network planning process has to consider a variety of constraints including: policy of administrations, planning objective, etc, there is no universal method that is applicable to all network planning problems. Due to the complexity of this process artificial intelligence (AI) [1], clustering techniques [2] - [5], Ant-Colony-Based algorithm [2], [6] has been successfully deployed in wire network planning. Tabu Search TS [7], [8] and genetic algorithm (GA) [9] been successfully deployed in mobile network planning.

Cellular telephony is designed to provide communications between two moving units, called mobile stations (MS's), or between one mobile unit and one stationary unit, often called a land unit [10]. A service provider must be able to locate and track a caller, assign a channel to the call, and transfer the channel from base station to base station as the caller moves out of range. Each cellular service area is divided into regions called cells. Each cell contains an antenna and is controlled by a solar or AC power network station, called the base station (BS). Each base station, in turn, is controlled by a switching office, called a mobile switching center (MSC). The MSC coordinates communication between all the base stations and telephone central office. Cell planning is challenging due to inherent complexity, which stems from requirements concerning radio modeling and optimization. Manual human design alone is of limited use in creating highly optimized networks, and it is imperative that intelligent computerized technology is used to create appropriate network designs[11].