Enhancing the DBSCAN and Agglomerative Clustering Algorithms to Solve Network Planning Problem

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Abstract- **With existing telephone networks nearing saturation and demand for wire and wireless services continuing to grow, telecommunication engineers are looking at technologies that will deliver sites and can satisfy the required demand and grade of service constraints while achieving minimum possible costs. The city data is given as a map of streets, intersection nodes coordinates, distribution of the subscribers' loads within the city and the location of base station in mobile network in this city. The available cable sizes, the cost per unit for each size and the maximum distance of wire that satisfied the allowed grade of service. NetPlan (Network Planning package) is developed in the spirit of DBSCAN and Agglomerative clustering algorithms. In this paper we studied the problem of congestion in Multi Service Access Node (MSAN) due to the increasing the number of subscribers which cause degradation in grade of service and in some time impossible to add new subscribers. The NetPlan algorithm is introduced to solve this problem. This algorithm is Density-based clustering algorithm using physical shortest paths available routes and the subscriber loads. In other hand decreasing the cost also is our deal in this paper so in the second phase in clustering process we modify the agglomerative algorithm that merge the neighboring cluster which satisfying certain condition. Experimental results and analysis indicate that the combination to algorithms was effective, leads to minimum costs for network construction and make the best grade of service.**

Keywords- DBSCAN Clustering algorithm, Agglomerative Clustering Algorithm, Network Planning, Spatial Clustering algorithm

I. INTRODUCTION

The Telephone Network Planning is considered an important process introduced by Telecommunication Company and which need more effort and accurate plan from telephone network engineers. One of the difficult tasks which are facing them is determining the best place and numbers of Multi Service Access Node (MSAN).

MSAN is one of the dominant access delivery methods and comes in modular units which may be equipped with line cards supporting a number of services, differing capacities, ranging from a few dozen lines up to thousands of lines.

After determining the place of each MSAN the wires are branching from them in two ways the first one is from the main switch to each MSAN and the second one is from MSAN to the subscribers. The kind of wires which is using to communicate between main switch and MSAN is an optical fiber cable. Optical fiber has large advantages over existing copper wire in long-distance and high-demand applications. Copper cable is a type of cabling that is used for telephone communications from MSAN to the subscriber. When the congestion in MSAN is occur mobile tower is working as auxiliary tool with maximum 100 subscribers.

Clustering technique will be used for helping engineers to improve the network planning by determining the place of MSAN. Clustering is one of the most useful tasks in data mining process. There are many algorithms that deal with the problem of clustering large number of objects. The different algorithms can be classified regarding different aspects. These methods can be categorized into partitioning methods [1, 2, 3], hierarchical methods [1,4,5], density based methods [6,7,8], grid based [9, 10, 11] methods, and model based methods [12,13]. The clustering task consists of separating a set of objects into different groups according to some measures of goodness that differ according to application. The application of clustering in spatial databases presents important characteristics. Spatial databases usually contain very large numbers of points. Thus, algorithms for clustering in spatial databases do not assume that the entire database can be held in main memory. Therefore, additionally to the good quality of clustering, their scalability to the size of the database is of the same importance [14]. In spatial databases, objects are characterized by their position in the Euclidean space and, naturally, dissimilarity between two objects is defined by their Euclidean distance [15].

In many real applications the use of direct Euclidean distance has its weaknesses [16]. The Direct Euclidean distance ignores the presence of streets and paths that must be taken into consideration during clustering.

The process of network planning is divided into two sub problems: determining the location of the switches and

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