Using of Clustering and Ant-Colony Algorithms CWSP-PAM-ANT in Network Planning

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Abstract

Network planning is a key importance to obtain a good functionality, price and quality of services of a network. The CWSP-PAM-ANT (Clustering with Shortest Path-PAM and ANT-Colony algorithms) system starts by divide the city map into clusters. For each cluster determine the location of switch node and finally connect each subscriber to this corresponding switch node. The system also determines the minimum cost network that satisfies the demand and constraints. The Cluster Partitioning Around Medoids (PAM) original algorithm has been modified and a new algorithm (CWSP-PAM algorithm) has been proposed by the author in a recent work [1]. In the present paper, the CWSP-PAM algorithm is modified by introduce the Ant-Colony-Based algorithm [2] in the second step of network planning process to find the optimal path between any node and the corresponding switch node. Results demonstrate the effectiveness and flexibility of the modifying algorithm in tackling the important problem of network planning

1.   Introduction

During the last decade users of electronic equipment has learned to appreciate the advantages gained by interconnecting electronic equipment and enabling transport of digitized information between them. The introduction of hyper-link documents with universal resource links (HTML) enabled the emergence of the World-Wide-Web and made computer-to-computer communication interesting for the average computer user, which again triggered a demand for connecting personal computers to the internet. Agreements on second generation mobile phone standards like GSM enabled equipment manufactures to produce cheap, powerful and user friendly mobile handsets which again has lead to mobile communication being an everyday activity for many people. So far users themselves have been forced to keep track of similarities and differences in functionality, price and quality of the services offered in the "jungle of telecommunications". But times are changing. Many operators have realized that restructuring, integration and optimization of their networks could enable them to present a far more user friendly and attractive overall service offer. In addition higher overall utilization of network resources could be achieved and hence better revenue experienced [3]. Therefore, Network planning became the key importance during the construction of new communities and cities, in which telephone and data services have to be introduced as a component of the overall master plan of the city.

The process of network planning is divided into two sub problems: determining the location of the switches and determining the layout of the subscribers' network lines paths from the switch to the subscribers while satisfying both cost optimization criteria and design constraints[1]. Due to the complexity of this process artificial intelligence (AI) [4], [5], clustering techniques [6], [7]and [8] and Ant-Colony-Based algorithm [2] has been successfully deployed in a number of areas.

In this paper, to solve the first problem, algorithm CWSP-PAM is used. To solve the second problem, the CWSP-PAM algorithm is modified by introduce the Ant-Colony-Based algorithm [2] in the second step of network planning process to find the optimal path between any node and the corresponding switch node.

In sections 2 Clustering Techniques are reviewed. In section 3, the CWSP-PAM-ANT algorithm is fully discribed. A case study is presented in section 4. Section 5 discuss related work. The paper conclusion and future work is presented in section 6.

2. Clustering Techniques

The goal of a clustering algorithm is to partition a given data set into clusters or groups, which are not predefined, such that the data points in a cluster are