Abstract:

Nowadays, the costs associated with the transport of goods represent a great part of the final cost of a product. Little by little, the dislocation and the globalization has provoked that there is an increasing flow of goods, elaborated or not, along the whole world, and this rate of growth continues increasing. Before such a flow of goods, and by means of the development of the so called engineering of the transport, they have appeared several kinds of distribution networks that optimize the resources of a network. One of these networks is the call hub&spoke.

The location of the facilities so called hubs is an increasing matter both in the networks of communications and in the passengers' flow of airlines or the networks of parcel service. The problem that treats itself in the present tesina shapes the situation when n nodes can interact only across a set of p hubs completely connected; these two sets, hubs and nodes, and their respective arches of union, shape a totally interconnected graph. Using the quantity of flow and the cost for unit of flow between two nodes in a network, it is necessary to to decide on the location of hubs and on the assignment of every node that it is not hub to those that are. We will refer to this problem as the hub location problem (HLP).

The present study tries to analyze the state of the study of the location and the assignment of hubs (so much the studies on movements of goods, as schemes of air traffic or networks of telecommunications; in short, that have a similar typology) later there propose a model who could use for captures of decision on ideal locations of centers of modal exchange (CIMs) and logistic platforms. For it one tries to be employed at two differentiated senses: to propose a new formulation that interprets and includes the variables that are considered to be more important to apply the model to encaminamiento of goods and to propose a new method of resolution of this type of problems by means of skills metaheurísticas (employment of the Tabu Search).

To define a new formulation, it is necessary to to compile a very good mathematical base on the matter, due to the fact that it is usual that new formulations contain characteristics very similar to the contributed ones for other authors. Once acquainted with the matter, one will proceed to present the directives that could give course to forming a function I target, thanks to the definition of the basic characteristics that shape any formulation of this nature: method of assignment, capacity of hubs, select domain of solutions, considered strategies of parcel, included costs and prefiación or not of the number of hubs that act.

In order to be able to validate the new offer, information and available stages have been in use in the literature, and a small model has been edited to Spanish level to increase the physical meaning of the model.

The model is a new method metaheurístico based on the Search taboo mixed with voracious algorithms, for the problem of location and assignment of p hubs interacting with n nodes in a network. The model baptized as LATS (location and assignment with Tabu Search) does, in every iteration, a search of ideal solutions in the neighborhood of a certain solution. Since it is a question of a model of search, and to avoid a cyclical behavior, a list has created tabu where the most efficient movements are gathered during a short lapse of time in order that the algorithm flees of these solutions and investigates other spaces of search. 3 versions of the algorithm have been done: LATS1, with random diversification of solutions; LATS2, with greedy diversification of solutions; and LATS3, with greedy diversification of solutions and limited neighborhood.

The results have been analyzed in terms of precision and speed of calculation, being LATS2 the most precise and LATS3 the most rapid, reducing the times of execution in more than 40 %. The model has applied himself to a case of transportation of goods by road in Spain, obtaining a satisfactory result. With these new methodologies of resolution, a point of view has been opened for future researches on the matter.

Keywords: Hub; Location; Allocation; Tabu search; Metaheuristics