Traffic lights prioritization as a strategy for improving the buses’ commercial speed

ABSTRACT

The urban collective transport in surface is one of the key factors on the mobility of the inhabitants of the cities. Buses are key within any public transport system, and this is why it is necessary to develop systems to improve the features that they offer.

One of the strategies that contributes to increase the buses’ commercial speed and consequently to diminish the time spent by the users on their journeys is the adaptation of traffic lights coordination to the needs of the buses.

Bus transport suffers delays on its service partly due to the lack of adaptation of the traffic lights cycles to its needs. At present time, the traffic lights plans existing in the cities do not take into account the variables that determine the movements of buses. Moreover, these plans do not consider the standard stop time of the buses or the disturbances that this type of vehicles could find along the itinerary.

The purpose of this dissertation is to develop a model for improving the existing traffic lights plans, increasing the commercial speed of the buses. The model of traffic light coordination allows to give priority to those vehicles with more occupation, and therefore it focuses mainly to diminish the travel time of the public transport users.

The model is based on metaheuristic algorithms which are a mathematical tool to optimize the goal function. Concretely, the evolutionary methods based on populations are the algorithms used in this study. Through the optimization of the system it is possible to improve the current situation globally and to obtain a traffic lights coordination more adapted to the real needs.

The developed model has been implemented in six streets from Barcelona. The obtained results corroborate that it is possible to obtain good results only by modifying the phase difference of traffic lights. In this case, an increase of buses’ commercial speed has been obtained considering the six streets globally. While the existing average commercial speed is 9,29km/h, the implemented method has resulted in an increase of the global commercial speed up to 10,27km/h. It represents an improvement of 10,53%. Moreover, travel time of the users of the public transport has managed to be reduced in 8,51%.