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WAYS OF IMPROVEMENT OF THE CITY ROAD NETWORK FUNCTIONING

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ШЛЯХИ ПОКРАЩЕННЯ ФУНКЦІОНУВАННЯ ВУЛИЧНО-ДОРОЖНОЇ МЕРЕЖІ МІСТА

European court approved of the decision posting the time spent for commuting must be considered as a part of a working day. Every day employees who have to commute in cities spend from 1 to 2 hours and more to travel to their places of work and get home from work. The employees may spend up to 40 hours per month for commuting purposes. Besides, commuting involves not only wasting time but it's also a large source of financial charges. In small Ukrainian towns fuel costs for cars may vary from 20 to 40 of minimum wages.

Thus, the problem of street-road network efficient functioning is really urgent as its solving would provide less traffic jams and would cut the time spent on commuting.

Transportation system of Ukraine badly needs a considerable renewal [1], as it was designed and built in 70-80s of the previous century and doesn't meet the requirements of modern society. Nowadays more and more highly developed countries in the world are using information technologies to improve street-road networks functioning. So in Melbourne 6 private and state companies under leadership of University of Melbourne School of Engineering and PTV Group, started preparation for the unique project implementation on creating "alive transportation laboratory" [2].

A lively Melbourne district in Australia was chosen as a proof ground where a large number of passenger and cargo transportation routes are located. In the centre of the above-mentioned territory more than 1000 measuring elements will be set up to collect and join data on the "behavior" inside the "laboratory" about the vehicles, bicycles, pedestrians and the whole transport infrastructure. The project goal is to reduce by these smart devices the economic consequences dealing with traffic network, namely: traffic jams, road accidents, environmental pollution etc.

It's practically impossible in Ukraine to improve the street-road network (SRN) functioning so that it will be adaptable to transport flows by means of expensive equipment. So we should more actively seek new inexpensive ways to improve the street-road network functioning.

To seek the ways to improve the street-road network functioning by mathematical statistics methods use.

Under current housing development conditions the city problem on how to rise of street-road network traffic capacity is quite urgent. It's resulted in considerable material costs dealing with city streets and roads traffic way widening and in certain cases this process is completely impossible. Meanwhile, the increasing number of individual vehicles, their general availability for the population makes this problem to be solved immediately.

In should be noted that there are several ways to improve the street-road network functioning. The most important of them are: to reduce the number of vehicles (here i.e. to decrease the vehicle intensity on all road network sections) and to shift traffic flows (here the vehicle intensity can be the same or it will increase).

Dependency diagram of hourly traffic flow intensity on main roads of SRN connecting residential areas with the city center. Having analyzed the diagram it can be seen that

maximum value of intensity per hour N_{max} in rush hours doesn't exceed the traffic capacity of the road. The factor limiting vehicle intensity increase is traffic signalization.

The aim of the suggested measures is to increase vehicle intensity on the cross-road adjoining streets.

For this purpose statistical series of vehicle intensity values per hour are modeled on week days on the cross-road adjoining streets. For the small sample collection one needs to get not less than 10 values of hourly vehicle intensity at the same daytime.

Having obtained homogeneous statistical series of hourly traffic values and having applied the improved by small sample [4] iteration method [5] of the dependence for mathematical expectation finding, which is approximately equal to the average value, i.e. and dispersions. The determined mathematical expectation of hourly traffic allows the distribution law of the given value to be established within small limits during 24 hours. After hourly traffic determination traffic lights cycles are adjusted so that green color cycle lasts longer in those periods when vehicle intensity increase was found by distribution law.

The exact time of traffic lights can be calculated analytically by hourly traffic values obtained after either observation or computer simulation. Those traffic lights where traffic lights cycles' time changes are recommended to equip with digital time indicator of green light signal [6]. After suggested measures taking their efficiency is estimated by Student' criterion t_k and Fisher' ratio test F by the method described in [3]. To perform this an hourly traffic i_h is determined during 24 hours by the earlier described procedure method and form the sample. Sample characteristics i are determined. The above mentioned measures should be taken only on the troubled cross roads of street-road network. In most cases these are the main streets where traffic is queuing from suburbs to the city center in the morning and in the opposite direction in the evening. To collect statistical data on one cross road it takes 10-14 days depending on the formed statistical series homogeneity.

Some measures to increase vehicle intensity on the cross-road adjoining streets by traffic flows redistribution are suggested. Traffic flows are suggested to be redistributed by means of traffic lights cycles' time changing based on hourly traffic diagram analysis being obtained by statistical analysis and small sample theory.

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