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DETERMINATION OF THE QUANTITY OF EXHAUST GASES EMITTED FROM TRANSPORTATION VEHICLES AT THE INTERSECTION USING THE PTV VISSIM PROGRAM

Suyunov Oltibek Do'stmurodovich
Teacher of TerSU

Djalilov Bekzod Jo'raqulovich
Master of TerSU

Abstract: *This scientific article has developed a simulation model of an intersection in Termez using one of the modern traffic flow modeling programs - PTV Vissim software package. The stages of development of the model of the intersection were seen, and based on this model, the current state of the amount of various toxic gases released into the atmosphere by vehicles at the intersection was analyzed.*

Keywords: *PTV Vissim, intersection throughput, traffic flows, vehicle.*

INTRODUCTION. It is known that the number of vehicles is increasing significantly as the population is increasing year by year, i.e. more than 700-800 thousand vehicles are moving on city streets per day. Naturally, it is known that the increase in the number of motor vehicles causes heavy traffic jams on roads, especially at intersections, and has a negative impact on ecology and the environment. However, today there are similar problems with road infrastructure and intersections in the big cities of our country, especially in the case of Termez.

It is known that according to calculations, the amount of toxic substances released from one car is 537 kg per year. If there is one car for every four city residents, it can be seen that one of the biggest impacts on air and the environment is the amount of exhaust gases emitted by vehicles.

Cars in operation pollute the atmosphere a lot, for example: if one car consumes 10-12 liters of gasoline, 25 kg of various harmful chemical compounds are released from it, so one car consumes about 4 tons of oxygen per year [5]. Engine exhaust gases contain more than 500 harmful organic compounds such as carbon monoxide (CO), carbon dioxide (CO2), volatile organic compounds (VOC) or hydrocarbons (HC), nitrogen oxides (NO). Gases emitted by cars stopped at traffic lights contribute to global warming [1]. Traffic jams increase the amount of exhaust gases emitted from cars and worsen the quality of the surrounding air. It is known from the research conducted by scientists that it causes excess diseases for drivers, passengers and people living near the main roads [4].

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LITERATURE ANALYSIS AND METHODOLOGY.

There are many software available to analyze and solve such problems. Popular computer programs include PTV VISSIM, PARAMICS, and AIMSUN, which are used to model traffic conditions at the micro level.

PTV Vissim is part of the PTV Vision® software suite, developed in Germany. This software package is used in many countries in the USA and Europe and has thousands of users worldwide [1].

According to [2], [3], PTV Vissim has shown high efficiency in solving problems of simulation modeling of street and road networks, as well as in evaluating complex projects in the field of traffic management.

PTV Vissim program capabilities allow you to:

- Analysis of road capacity depending on the type of intersection;
- Analysis of the carrying capacity of roundabouts, taking into account the nearest transport nodes;
- Evaluation of "Green Wave" for traffic lights installed on city streets.
- Analyzing the capacity and flow regulation of complex stations, taking into account the traffic of trams and buses;
- Traffic flow modeling of different levels.
- Pedestrian traffic modeling on city streets and highways;
- Study and joint modeling of traffic and pedestrian flow interactions.

RESULTS AND DISCUSSION.

We will create a model of the intersection of Alisher Navoi and Uzbekistan streets in the city of Termez using the PTV Vissim program. The total number of lanes of the main road network is 6, each street is equipped with dividing lanes, there are pedestrian crossings, the total width of the street is 22 meters, the total number of lanes of Uzbekistan Street is 4 equipped with a dividing lane, there is a pedestrian crossing, the total width of the street is 13 meters, the traffic lights installed at the intersection are 2-phase, the cycle duration is 56 seconds. This intersection is one of the most problematic intersections.

Since this intersection is regulated, we need to study the following preliminary information of the intersection before modeling it.

- technical descriptions and schemes of the intersection;
- characteristics of the types of vehicles moving through the intersection;
- composition of traffic flow;
- hourly activity intensity;
- distribution of motor vehicles at nodes;

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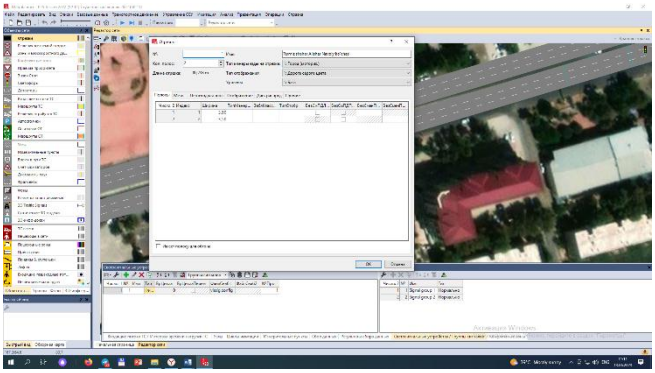
- correct placement of traffic lights at the intersection, their parameters and mode of operation;
- information on general use and commuting traffic;

Studies were conducted by monitoring traffic flow at the intersection. At the initial stage of the research, traffic flow on both sides of the street was studied during Monday, when the traffic flow is high. Studies and observations were made mainly for the times of the day, which are considered to be the busiest and traffic flow. In this case, the opposite sides of the road were observed separately and taken into account.

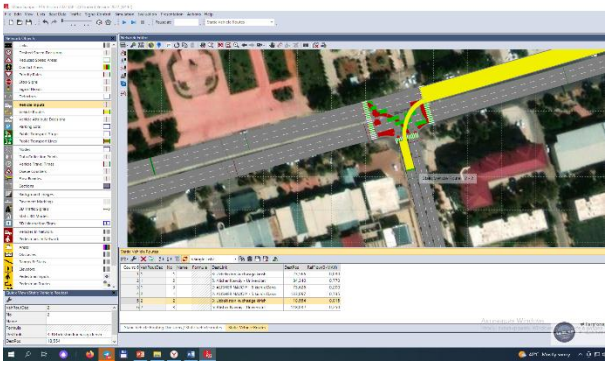
To determine the traffic flow at the intersection, the number of cars that passed through the cross section of the road during 1 hour was determined. For this, it was determined by monitoring the traffic flow at different times of the day.

Entering the collected data into this program and creating a model of the intersection involves several steps. Including:

1. It consists of loading a high-quality image of a simulated section of the road network, modeling the road network, entering the parameters of the road (number of lanes, width, etc.) and connecting them to each other (1 a - picture).
2. Input of quantitative data (traffic flow) on movement through the intersection, distribution of traffic flow by roads and traffic directions (Fig. 1 b).
3. Regulation of priority transition rules using the "Conflict Areas" functional module of the PTV Vissim program (Fig. 1 c).
4. Enter traffic light operating modes through the "Signal Control" menu and attach to the modeled intersection (Fig. 1 d).



a)



b)

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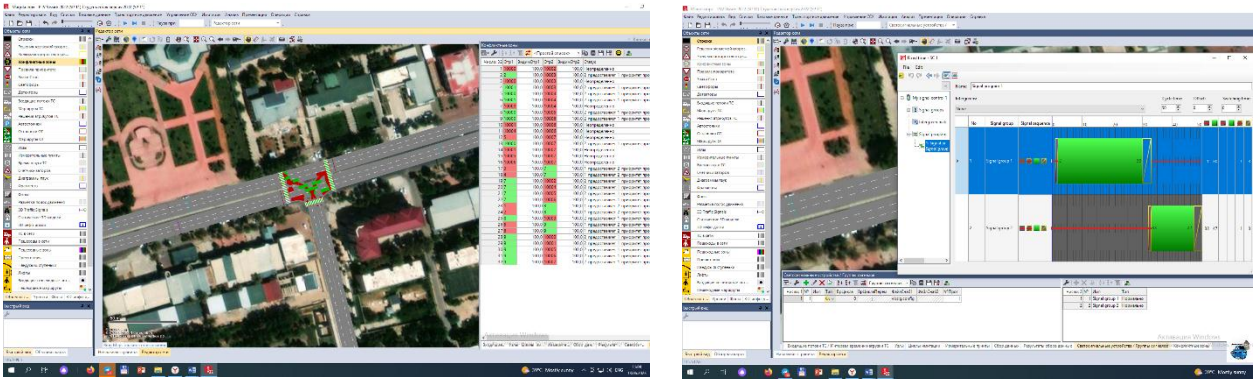

c) d)

Figure 1. Create a model of the intersection and enter the traffic flow into the program

As a result, a microscopic simulation model of the intersection was created, reflecting the current traffic situation. After modeling using the general parameters of the intersection, we can determine the indicators in the current state of the intersection through the "Evaluation" menu of the program. The results obtained by the computer model of the intersection are presented in Table 1.

Table 1 The results of the computer model of the current state of the intersection of Alisher Navoi and Uzbekistan streets in Termez city

№	Indicators	Current status
1	Intersection Level of Service (LOS)	C
2	Fuel consumption (l)	12,559
3	SO exhaust gases (grams)	933,079
4	Nitrogen Oxide NOx (grams)	252,087
5	Organic compounds VOC (grams)	323,074

As can be seen from the table, the service level of the intersection is currently C category. Emissions from vehicles into the atmosphere are 933,079 grams of carbon monoxide (CO), 252,087 grams of nitrogen oxides (NOx), 323,074 grams of volatile organic compounds (VOC), and 12,559 liters of fuel. The results were obtained thanks to the computer model of the intersection developed using PTV Vissim simulation software.

CONCLUSION.

A sharp increase in the number of vehicles in the city leads to traffic jams and an increase in the time spent on commuting. Due to traffic congestion, passengers or transported goods spend a lot of time on their way to the destination, increase the cost of transportation, increase fuel consumption, and have a great impact on urban air pollution.

Traffic costs in the route are considered as the time spent by pedestrians, passengers and vehicles at the intersection during the day, month or year (detention), achieved by reducing the costs associated with waiting time. Intersections are not regulated or, in the case of regulation, are carried out with the correct and effective organization of traffic and pedestrian traffic.

It is carried out at the expense of reducing damages from atmospheric air pollution and improving the psychophysiological working conditions of drivers.

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