DATA COLLECTION AND ANALYSIS TO IDENTIFY THE TRAFFIC PROBLEMS OF THE EXISTING NETWORK AND APPLICATION OF SOFTWARE FOR SOLUTION PROPOSALS, A CASE STUDY

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Abstract: *The development of information technologies are taking part in all spheres of human lives. In the traffic engineering shows a big need for application of advanced computing tools.*

Softwares for traffic analysis except that allow precise, visual and multifactor analysis of the imagined or proposed traffic solutions, they save time and money as opposed to the site testing. For proper development of the traffic, it is needed detailed and comprehensive planning of the process that will contribute to improving the traffic infrastructure.

One of the crucial steps before using any software for traffic analysis is the collection of data with purpose to establish the relevant traffic loads for the examined area. Namely, to get the real realistic picture of the traffic situation, it is necesarry recording the traffic to get daily, monthly and annual imbalance on traffic intensity in the investigated location. From the data obtained, the software will use the relevant data that realistically reflect the traffic situation.

In the present work will be shown simulation of the most critical crossroads in the town of Gostivar in the two versions of existing and newly-condition situation using the software tool PTV VISSIM 7. Here will be analysed the most important parameters of the current traffic flow - the time losts in order to indicate the need of change the way of the traffic management of this intersection.

Keywords: *SOFTWARE, SIMULATION, TRAFFIC ANALYSIS*

1. Introduction

All human activities and mobility directly depend on the traffic areas. The main factor for the development of each territory is the existence and connection of quality traffic infrastructure with the surrounding areas. Quality traffic network contributes to the development of all spheres of human life.

Traffic planning is coordination between the providing of transport, land use, economic development and social planning, which are forming a cyclic process. Planning and implementation are an integral system.

For proper traffic development, it is needed detailed and comprehensive planning process that will contribute to improving the traffic infrastructure.

In any taking of measures, activities, wearing a conclusion or implementation of an idea, to get a real realistic picture of the traffic situation, as the first and basic step is to present the current status of traffic and getting the hour, daily, monthly and yearly imbalance on traffic intensity of the investigated location.

2. Determination of traffic imbalance

Obtaining arelevant data that will objective show the situation on the ground is an essential step in any activities on traffic network. For that purpouse, it is made a recording of the traffic to determine the daily, weekly, monthly and annual imbalance.

2.1. Determination of daily traffic imbalance

To determine the daily imbalance of traffic and the establishment of the rush hour, it is made a daily traffic recording on 13.04.2015 (Tuesday) with a duration of 12 hours (06:00 to 18:00 pm) at the junction 1 (JNA – Ginoski brothers). Counting papers were made so that the intake of each vehicle that passes is recorded in the appropriate category where it belongs, certainly on approaches and directions. Filming was done in twenty minute intervals, for getting a clearer picture of real hourly intensities, as well as consideration of the traffic load.

The next figure shows the locations of which were located the counters.

Fig. 1 *Location of counters.*

The counting is performed on three approaches from a total of 4 - because the fourth approach is one-way - only out of the junction.

The table below shows the traffic load of the research crossroad.

Table 1: Total traffic load for the crossroad Ginoski brothers - JNA.

from		to		App. 1	App. 2	App. 3	Total junction (20 min.)	Total junction (hour)
H.	M.	H.	M.					
6	0	6	20	29	10	22	61	
6	20	6	40	43	36	24	103	433
6	40	7	0	138	78	53	269	
7	0	7	20	128	87	44	259	
7	20	7	40	118	78	34	230	803
7	40	8	0	165	82	67	314	
8	0	8	20	149	110	84	343	
8	20	8	40	192	32	80	404	1194
8	40	9	0	216	117	114	447	
9	0	9	20	164	140	86	390	
9	20	9	40	132	132	75	339	1073
9	40	10	0	150	121	73	344	
10	0	10	20	173	129	79	381	1074

10	20	10	40	157	141	82	380	
10	40	11	0	136	114	63	313	
11	0	11	20	197	178	87	462	
11	20	11	40	137	158	78	373	1232
11	40	12	0	162	155	80	397	
12	0	12	20	157	177	87	421	
12	20	12	40	128	202	89	419	1239
12	40	13	0	130	164	105	399	
13	0	13	20	131	172	81	384	
13	20	13	40	122	190	90	402	1210
13	40	14	0	176	166	82	424	
14	0	14	20	165	131	90	386	
14	20	14	40	171	182	81	434	1228
14	40	15	0	138	180	90	408	
15	0	15	20	158	183	76	417	
15	20	15	40	159	152	83	394	1183
15	40	16	0	151	147	74	372	
16	0	16	20	173	184	70	427	
16	20	16	40	175	156	79	410	1184
16	40	17	0	139	143	65	347	
17	0	17	20	148	176	71	395	
17	20	17	40	171	154	86	411	1151
17	40	18	0	147	139	59	345	

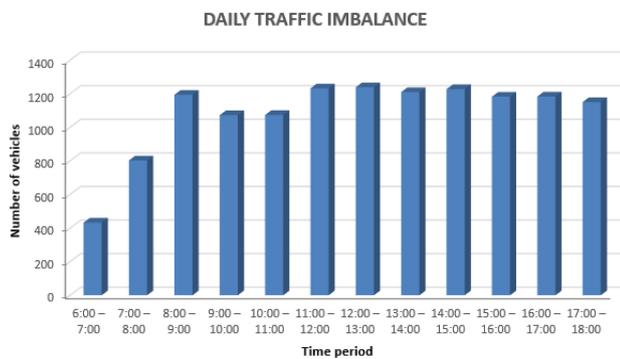From the table was obtained daily imbalance of traffic, shown below.

Chart 1: Daily traffic imbalance

With proper analysis of the data from the tables and the diagram can be seen that we have extended rush hour with the greatest intensity between 11:00 and 15:00.

2.2. Determination of weekly traffic imbalance

The weekly imbalance of traffic over a single authoritative week is shown in the following diagram.
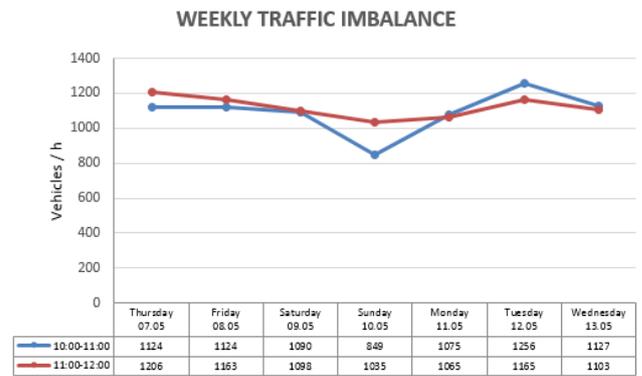

Chart 2: Weekly traffic imbalance

Predictably, the minimum intensity of the traffic occurs on sunday. The biggest traffic movement in turn, has on tuesday (open market day).

2.3. Determine the monthly traffic imbalance

In determining the monthly imbalance in traffic in Gostivar, as a prevail month was taken August, in consultation with experts in the field. The reason for this is that quite a number of residents from Gostivar are emigrants who spend summer vacations in their home areas. They contribute to the most intense agitation exactly in August.

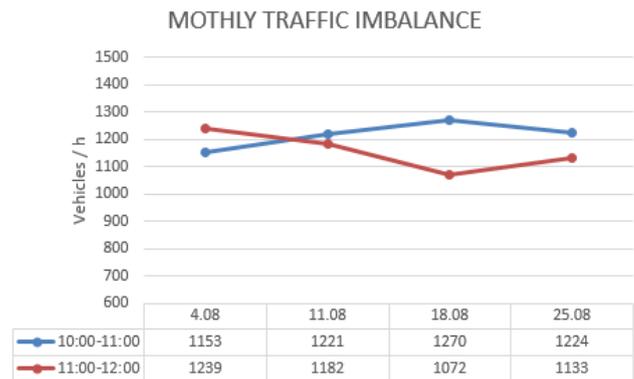The distribution of traffic for the month august is shown in the diagram that follows.

Chart 3: Monthly traffic imbalance

The values for current vehicles of the adequate junction (JNA – Ginoski brothers) vary about 1200 vehicles / hour, with the largest deviations of 18 august.

2.4. Determination of annual traffic imbalance

The annual traffic imbalance is obtained based on recordings of the traffic made on the same junction (JNA – Ginoski brothers) where is done the filming for daily, weekly and monthly traffic imbalance.

During the traffic recording are taken into account all types of motor vehicles (passenger cars, buses, heavy goods vehicles and motorcycles).

In order to get a relatively accurate data on the annual imbalance of traffic, the team with the previously specially designed counting apers, has executed the recording of the traffic. Filming was done over one year (one day per month), starting from April - 2015 to March - 2016 in the most congested day of the week (Tuesday).

The traffic recording was done in period with duration of two hours (10:00 to 12:00 am), in twenty minute intervals, getting clearer realistic picture of the intensity of movement at the

crossroad JNA – Ginoski brothers (where is performed the recording for daily, weekly and monthly imbalance).
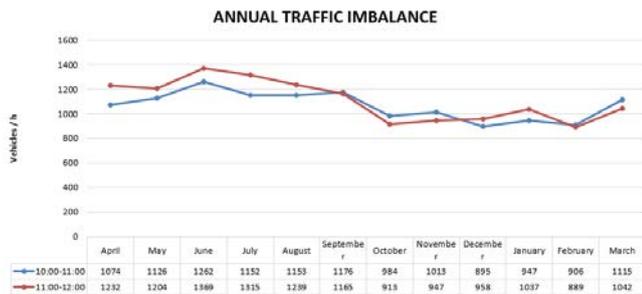

Chart 4: Annual traffic imbalance

The greatest traffic intensity occurs in June.

3. Simulating of the current traffic situation with the collected data and proposed solutions: A case study

The obtained data on traffic intensity is used to visually display the traffic situation and to evaluate the level of service on the crossroad. The following figure shows the current traffic situation on the crossroad (JNA - Ginovski brothers) designed in the software PTV VISSIM 7.

Fig. 1: Current situation at the crossroad JNA – Ginoski brothers

From the entered data of the number of vehicles that passed thorough the given intersection with a 10 minute simulation that enables the PTV VISSIM 7, as output was obtained analysis for the stalled vehicles depending on their direction and frequency.
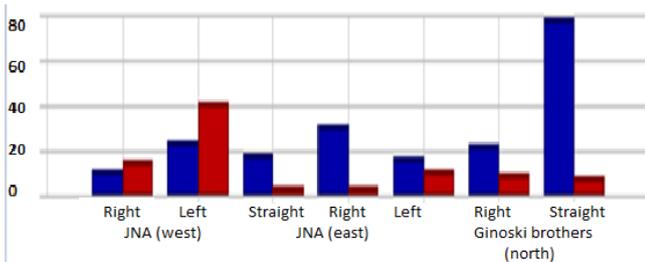

Chart 5: Time delay pro vehicle depending on their direction and frequency

The red pillars of the diagram represent the time delays, while blue columns - the number of vehicles. From the results can be seen that the approach JNA (West) - occurs the longest time delay for turning left (41 seconds), while the smallest, and in certain periods there is no time delay is for the vehicles from JNA (right). Theese time delays are varying significantly with the time of other streets that are included in this intersection.

The only oneway street has a major role in the reducing of traffic density. The proposed solution that is offered to reduce time losses of intersection, and the reduction of traffic accidents is building a roundabout.

The reconstruction of four-legged intersection in an appropriate roundabout by setting the appropriate road signs and rules is build

in the software PTV VISSIM 7 and is shown in the following figure.

Fig. 2: Appearance of the new designed roundabout JNA – Ginoski brothers

Following are shown the time delays with the new roundabout according to approaches and directions of movement.
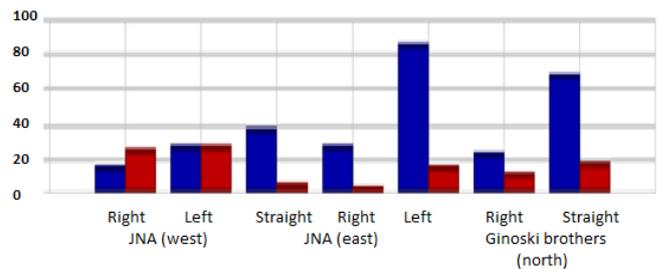

Chart 6: Time delay pro vehicle in roundabout depending on their movement and frequency

We already know that the maximum time loss in the current situation at the intersection is 41 seconds. Here we see that with the existence of roundabout, the time delays will be reduced to 25 seconds.

A comparison of time delayss at the current intersection and construction of roundabout in the same simulation period (10 min) is given in the graph below.
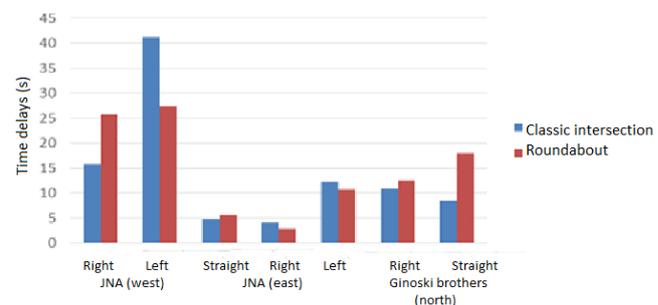

Chart 7: Comparison of time delays pro approach and direction between classic crossroad and roundabout for the intersection

The construction of roundabouts would balance the approaches in terms of time losts. Thus, the direction Brothers Ginoski (north) - right, gets certain time losses at the expense of other approaches, what results with smoother traffic flow at this intersection.

Conclusion

The detailed, concise and comprehensive data collection about the traffic situation is the basis for a quality traffic project. The collected quality data reflects real the traffic situation, and based on the same evaluates will be decided which steps need to be taken to increase safety, ease of road traffic flows and improving the traffic conditions of the investigated area.

To achieve these important goals in traffic planning, there are several software tools that make the work of traffic engineer easier - that gives him the opportunity virtually to see if his decision will result in better results, or need to take into account some other solution.

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