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ESSENTIAL DYNAMICAL TRAFFIC FLOW CHARACTERISTIC SURVEILLANCE USING COUNTING FACILITY VIACOUNT II

SLEDOVÁNÍ ZÁKLADNÍCH DYNAMICKÝCH CHARAKTERISTIK DOPRAVNÍHO PROUDU SČÍTACÍM ZAŘÍZENÍM VIACOUT II

Abstract

In this paper is shortly described counting facility Viacount II, which is dedicated for velocity and traffic flow composition measuring. Continuously results of the test measuring are described. Also additional possibilities of the counting facility utilization on the field of the Road Transport Laboratory activities are in this paper described.

Keywords: road transport, traffic flow, Viacount

Abstrakt

Příspěvek stručně popisuje sčítací zařízení Viacount, které je určené pro měření rychlosti a složení dopravního proudu v silničním provozu. Dále uvádí některé výsledky zkušebního měření na ulici Opavská v Ostravě-Porubě. Na závěr jsou nastíněny další možnosti využití zmíněného sčítacího zařízení v rámci činnosti Laboratoře silniční dopravy při Institutu dopravy (FS, VŠB-TU Ostrava).

Klíčová slova: silniční doprava, dopravní proud, Viacount

1 INTRODUCTION

Dynamical traffic flow characteristic surveillance in the road transport is standard process at the present time. Mainly vehicles velocity, traffic volume, traffic density, traffic flow composition (number of cars, trucks, other vehicles) and time delays between vehicles are monitored. Some of these characteristics are simply monitored by standard manual counting method, other ones (especially velocity) are monitored by counting facilities. The counting facility Viacount II is also suitable for mentioned monitoring and is one of used laboratory equipments of the Road Transport Laboratory, Institute of Transport, VŠB – TU Ostrava.

2 DESCRIPTION OF VIACOUNT II AND ITS USAGE

Viacount II (see Fig. 1) is a road transport counting facility, which consist of 24,165 GHz Doppler radar, integrated data RAM, serial RS 232 interface and Pb-gel battery 12V/18 Ah. Facility is designed for vehicle velocity measuring in one traffic lane and one driving direction or in both directions at the same time. Vehicle velocity, vehicle length and time delay between two vehicles are monitored and recorded. Time and date of measured unit are saved in memory area ([1] a [2]).

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Fig. 1 Counting facility Viacount II and experimental application

Input – output communication between facility and PC (parameter settings and data transmission) is realized by ViaTerm software application (see Fig. 2, [3]) and data processing is realized by ViaGraph application (see Fig. 2, [4]). Data export to other software application is also possible. Basic output format are tables and graphs.

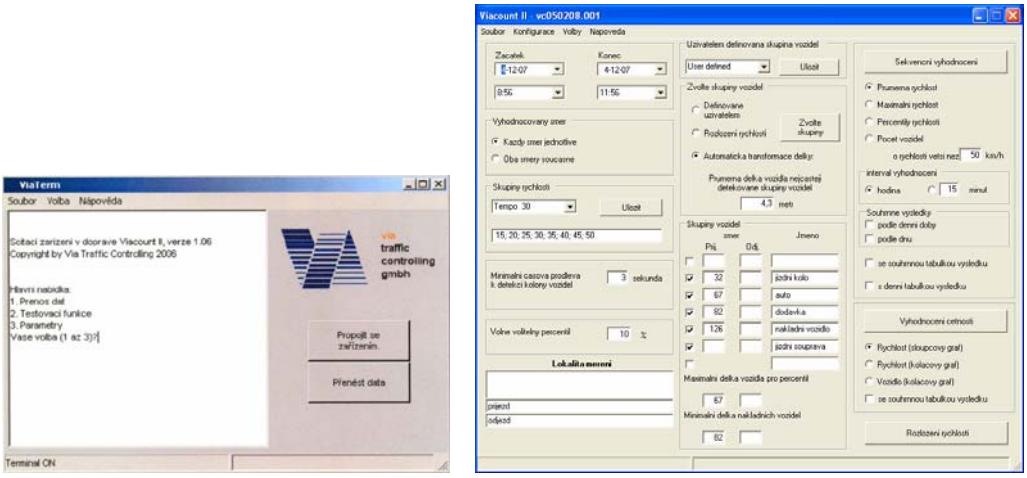

Fig. 2 ViaTerm (left) and ViaGraph (right) software environment

Counting facility Viacount II is utilized especially for the research and development activities of the Road Transport Laboratory (Institute of Transport, VSB – TU Ostrava) in following spheres:

- dynamical traffic flow characteristic surveillance (velocity, traffic volume, traffic density)
- velocity measuring of road vehicles within bachelor and diploma papers, studies and projects
- appreciation and correction of the traffic organization and controlling (intersections)
- rates for conversion specification for unit vehicle conversion
- traffic flow management using data from traffic flow motion detection systems
- possibilities of road traffic organization using Tempo 30 system in living quarters
- road vehicle emission measuring for real traffic flow structure and organization

Mentioned facility is also utilized for students support with the aim of manage observation and evaluation methods of situations in traffic operations (in subjects Organization and Control of Transport I. and II., Experimental Methods in Traffic Engineering, Elements of Organization and Controlling of Traffic, Transport Systems in Intravilan I. and II. etc.).

3 EXPERIMENTAL MEASURING AND RESULTS

On the street Opavská, urban neighborhood Ostrava-Poruba, c. 200 meters from the crossroad (Opavská – 17. listopadu), the first experimental measuring has been realized. Only one straight-ahead flow was monitored, especially the road direction from Ostrava to Opava. This measuring has been completed by video record and standard manual counting method (traffic volume, traffic density). This complement was realized due to data check and additional processing and utilization.

Fig. 3 Experimental possition of the counting facility Viacount II (see A) and monitored direction of traffic (see B)

The objective of experiment was to further investigate monitoring capability of the measuring facility. Condition of the automatic vehicle detection based on the physical vehicle length (electronic length assignment) has been tested – see tab. 1. These rates are only information indicators, because of variable radar – vehicle distance in the real traffic situation.

Tab. 1 Proportional vehicle length (radar ray vehicle length) [2]

	Bicycle, motorbike	Car	Lorry	Bus, truck	Combination of vehicles
Real length	< 2,5 m	< 5,2 m	< 9,0 m	< 12,0 m	> 12,0 m
Distance of scanning position	Lateral radar position, straight-ahead flow/ /Lateral radar position, contra-flow				
0,5 m	< 290/350	< 550/700	< 700/850	< 1000/1150	> 1000/1150
1,0 m	< 322/400	< 600/750	< 750/920	< 1080/1220	> 1080/1220
1,5 m	< 354/450	< 650/800	< 800/990	< 1160/1290	> 1160/1290
2,0 m	< 386/500	< 700/850	< 850/1060	< 1240/1360	> 1240/1360
2,5 m	< 418/550	< 750/900	< 900/1130	< 1320/1430	> 1320/1430
3,0 m	< 450/600	< 800/950	< 950/1200	< 1400/1500	> 1400/1500

Measuring facility was in "lateral" position (height 90 cm), 2 m away from the external edge line (edge line width 25 cm), it means that the distance between measured vehicle and the measuring facility was from 2,25 to 2,5 m. Maximal electronic vehicle lengths 696/843/1301 (in order car/lorry/ truck) by ViaGraph software application have been analyzed. Facility was adjusted to the maximal real vehicle length 4,83/5,85/9,02 m. Because of the manual counting method results corresponded with the experimentally obtained data results, the automatically evaluated values are acceptable.

Fig. 4 and Fig. 5 shows selected examples from many data outputs. From the expert view are very interesting following items. Maximum speed limit (50 km/h) was exceeded by 61,11 % of vehicles. Average time delay 7,99 % and number of vehicles in a convoy, was affected by the vehicle "groups" incoming from the near crossroad. The average day traffic volume (14 718 vehicles/day) was misrepresented because of a short measurement time. The trucks represented 12,04 % of monitored vehicles. More information in [5].

Data output in ASCII format is used for data transmission from facility memory to PC (Data download), for online measured data output (Radar on-line data output) and for data file modification. One row is assigned to every vehicle, e.g. -74;307;0.92;28.02.08;11:37:01. All items are separated by semicolon. The first item is velocity (minus means contra-flow, range is 0 – 255km/h). The second item is electronic vehicle length (0 – 65535 units) and the third item is time delay between vehicles (0,00 – 655,36 s). After that follows date and time item (with 1 s precision).

These items are shortly transposed to tabular form – see tab.2

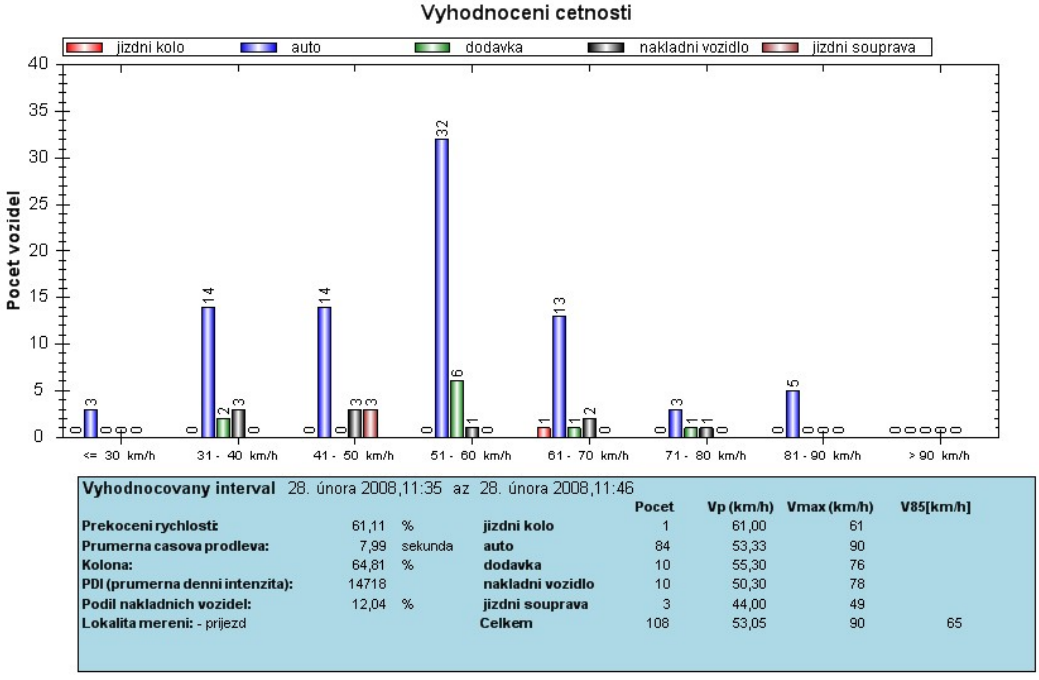

Fig. 4 Measuring result example from the ViaGraph environment– graphical output – column sequence corresponded with order in legend (vehicle category);
(jízdní kolo = bicycle or motorbike; auto = car; dodávka = lorry;
nákladní vozidlo = truck or bus; jízdní souprava = combination of vehicles)

Cetnosti v absolutnich hodnotach

	jizdni kolo	auto	dodavka	nakladni vozidlo	jizdni souprava	Celkem
do 30 km/h	0	3	0	0	0	**3**
31 - 40 km/h	0	14	2	3	0	**19**
41 - 50 km/h	0	14	0	3	3	**20**
51 - 60 km/h	0	32	6	1	0	**39**
61 - 70 km/h	1	13	1	2	0	**17**
71 - 80 km/h	0	3	1	1	0	**5**
81 - 90 km/h	0	5	0	0	0	**5**
nad90 km/h	0	0	0	0	0	**0**
Celkem	**1**	**84**	**10**	**10**	**3**	**108**

Cetnosti v procentech

	jizdni kolo	auto	dodavka	nakladni vozidlo	jizdni souprava	Celkem
do 30 km/h	0	3,57	0	0	0	**2,78**
31 - 40 km/h	0	16,67	20,00	30,00	0	**17,59**
41 - 50 km/h	0	16,67	0	30,00	100,00	**18,52**
51 - 60 km/h	0	38,10	60,00	10,00	0	**36,11**
61 - 70 km/h	100,00	15,48	10,00	20,00	0	**15,74**
71 - 80 km/h	0	3,57	10,00	10,00	0	**4,63**
81 - 90 km/h	0	5,95	0	0	0	**4,63**
nad90 km/h	0	0	0	0	0	**0**
Celkem	**0,93**	**77,78**	**9,26**	**9,26**	**2,78**	**100,00**

Fig. 5 Measuring result example from the ViaGraph environment– tabular output
(jízdní kolo = bicycle or motorbike; auto = car; dodávka = lorry;
nákladní vozidlo = truck or bus; jízdní souprava = combination of vehicles)

Tab. 2 Tabular data evaluation (selection),
(OA – car, D – lorry, NA – truck, bus, JS – vehicle combination)

Velocity [km/h]	Electronic vehicle length [-]	Time delay between vehicles [s]	Date and time	Vehicle category
63	626	0	28-2-08 11:35:26	OA
33	802	8,89	28-2-08 11:35:36	D
32	535	0,34	28-2-08 11:35:37	OA
41	1555	3,15	28-2-08 11:35:43	JS
37	846	1,42	28-2-08 11:35:46	NA
33	636	0,24	28-2-08 11:35:47	OA
36	628	0,68	28-2-08 11:35:49	OA
38	609	0,64	28-2-08 11:35:50	OA
36	1215	0,83	28-2-08 11:35:53	NA
60	794	9,64	28-2-08 11:36:04	D
19	562	6,02	28-2-08 11:36:11	OA
23	682	0,44	28-2-08 11:36:14	OA
28	494	1,43	28-2-08 11:36:16	OA
39	722	2,94	28-2-08 11:36:20	D
36	652	0,63	28-2-08 11:36:22	OA
39	573	0,43	28-2-08 11:36:23	OA

4 CONCLUSION

The experiment results show vehicles detection ability of the counting facility Viacount II in the traffic flow. Video record of the experiment is suitable for following check.

Very interesting in selected locality is monitoring of the vehicle groups (colons). The colons were monitored consequently in succession (longer time delay between colons was detected). The reason of this is position of the intersection with traffic lights, about 200 meters back. This intersection sends vehicles in groups because of static signal plan, four-phase controlling etc.

Further utilization possibilities of the counting facility Viacount II are inexhaustible. Except the measuring of the traffic volume (transportation survey, designing works) and vehicles velocity (traffic flow characteristics, velocity maps etc.), the results of the measuring are also utilizable for road vehicles emission measuring loading cycles. Especially monitoring of the situations on the four-lane highways, at first velocity measuring in straight road direction will be measured (2 straight-ahead flows – normal traffic), continuously velocity measuring in straight road direction, when one lane will be closed (accident, repair works). This monitoring has relation to the road capacity, alternate traffic route selection etc. We will deal with this problem in future in Laboratory of Road Transport (www.id.vsb.cz/lsd).

REFERENCES

[1] *ViaCount – Sčítací zařízení v dopravě*. Uživatelská příručka. PRO traffic Frýdek-Místek, 2004, 36 s.

[2] *ViaCount II.– Traffic counting equipment*. Uživatelská příručka. PRO traffic Frýdek-Místek, 2007, 21 s.

[3] *ViaTerm*. Uživatelská příručka. PRO traffic Frýdek-Místek, 2007, 10 s.

[4] *ViaGraph – program pro zpracování dat*. Uživatelská příručka. PRO traffic Frýdek-Místek, 2006, 28 s.

[5] Křivda, V., Richtář, M. *Měření intenzity, rychlosti a složení dopravního proudu na ul. Opavská v Ostravě-Porubě (měření č. 1). Protokol č. LSD-2008-01.* Ostrava: Laboratoř silniční dopravy, ID, FS, VŠB-TU Ostrava, 2008, 22 s.

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