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Impact of Lane Occupancy on Urban Roads

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Abstract

Focused on the lane occupancy phenomenon, this paper analyzes the roads during two different accidents to the evacuation period. Firstly, according to the statistical data, this paper calculated the correction coefficients under the road traffic condition, and then obtained the actual traffic capacity result at each moment of the road when combining the function model of the actual traffic capacity corrected by the running speed and the road traffic condition. Next the actual traffic capacity results are fitted to the Smooth spline interpolation, and then the actual traffic capacity is further verified by the traffic congestion situation. The actual traffic capacity of the road during the accident to evacuation is summarized as follows: the actual traffic capacity shows a nonlinear trend, that is, ascending-attenuating-recovering and gradually stabilizing. Finally, using Mann-Whitney U test to carry out the difference test on the actual traffic capacity, it is found that there is significant difference between the two groups of data, and the actual traffic capacity of the second case is stronger than that of the first one, and the reasons for the difference are analyzed as follows: the ratio of the steering traffic volume at the downstream intersection is different; this road section includes the community intersection and there are vehicles entering and leaving; meanwhile the speed of each lane is different and there are buildings near the lane. The above conclusions will provide theoretical basis for the traffic management department to correctly guide the vehicle driving, approve the road construction, design the road channelization plan, set the roadside parking space and the non-port-type bus stations.

Keywords: Lane occupancy; Actual traffic capacity; Spline interpolation; Congestion situation; Mann-whitney U.

1. Introduction

With the development of the society and the improvement of people's living standards, automobiles have become a common means of transportation, and the urban transportation demand has also expanded accordingly. However, the construction of transportation infrastructure in China is not perfect, and the phenomenon of traffic congestion often occurs in many large and medium-sized cities. Among them, the lane occupancy phenomenon caused by traffic accidents, roadside parking, road occupation and other reasons will reduce the capacity of the lane or cross-section area in unit time, causing the vehicle to line up and traffic congestion. If it is not handled properly, the regional congestion will even occur. Therefore, correctly estimating the impact of the lane occupancy on the urban road capacity will provide theoretical basis for the traffic management department to correctly guide the vehicle driving, approve the road construction, design the road channelization plan, set the roadside parking space and the non-port-type bus stations. At present, there are certain researches on road capacity. In generally, for the calculation of the road capacity, most researchers used the methods in Road Capacity Theory and American Road Capacity Manual [1]. For example, Zheming Yang and others directly used the function of the actual traffic capacity to calculate the result [2]. Although the calculation result is more accurate, the operation speed is difficult to measure, and the initial value of some parameters is difficult to set. If this method is used alone, the calculated actual

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traffic capacity will have a certain error. At present, there are currently three calculation methods for the basic capacity in the actual traffic capacity: the road head spacing method which Yulie Wang et al. are using [1], the observing headway distance method which Zhuzhu Mu et al. are using [3], and the observing velocity density method which Zheming Yang et al. are using [2]. Most of the methods for testing the significance of the two sets of data today are the t-test. For example, Sohail Muhammad et al. used the t-test method to analyze the paired products in the study [4]. Ziyang Xun also used the t-test to analyze the difference factors in the analysis of the difference of the actual traffic capacity [5]. Although t-test is a method to test the difference of data, it requires normal distribution of data and homogeneity of variance. For the lane occupancy phenomenon, the distribution of data is unknown, so this method is not applicable. A few people such as Xiaoyu Zhang and others used the weighted average of the actual capacity of each time period to analyze the difference reason when studying the actual traffic capacity difference [6].

This paper makes a descriptive analysis of the change process of the actual traffic capacity in the cross-section area of the accident during the period from the accident to the evacuation. The actual traffic capacity refers to the maximum possible traffic volume passing through a certain point on the road per unit time under actual road and traffic conditions. Firstly, according to the statistical data, the correction coefficients are calculated under the road traffic conditions. Later, the actual traffic capacity at every moment is determined by the objective function of the actual traffic capacity, and that is fitted to Smooth spline interpolation, and then the actual traffic capacity from the function calculation is further verified using the traffic congestion. Finally, the Mann-Whitney U test is used to compare the differences in vehicle traffic capacity between the two roads, to make up for the lack of data as well as the unknown distribution and summarize the reasons for the differences, which provides theoretical basis for the traffic management department to make adjustments.

2. Model Establishment and Inspection

The original data of the research object in this paper comes from the topic of the 2013 National College Students Mathematical Modeling Competition (China Society for Industrial and Applied Mathematics, 2013), To facilitate analysis and calculation, make the following assumptions:

(1) Assume that the road surface is flat and there is no slope;
(2) Assuming that the driver is skilled in driving and obeys the traffic rules, the driver's condition has a correction factor of 1 for the road capacity;
(3) Does not consider the impact of other factors besides traffic accidents on road capacity;
(4) Assuming normal traffic, the traffic volume in the upstream section remains unchanged.

Source: http://www.mcm.edu.cn/problem/2013/cumcm2013problems.rar

2.1. Road-Actual Capacity Calculation

(1) Method for determining actual traffic capacity based on operating speed and road traffic conditions

Regarding the capacity of the basic section of the expressway, the classical method of determination has been given in the Road Capacity Theory and the American Road Capacity Manual. The more classic solution is: First determine the basic capacity based on the design speed. Combined with the actual road and traffic conditions, the lane width and lateral clearance correction, the large vehicle mixing rate correction and the driver adaptability correction for the basic traffic capacity. The basic formula is:

$$C = C_o \times f_W \times f_{HV} \times f_P \tag{1}$$

Among them, C represents the capacity of the actual road, C_0 represents the capacity of the basic road, f_W represents the lane width and the lateral clearance factor. f_{HV} represents the large vehicle correction factor, f_P represents the driver's adaptive correction factor.

(2) Basic road capacity

The basic traffic capacity of a vehicle is the number of vehicles passing through a lane per hour under ideal traffic conditions. The formula is:

$$C_o = \frac{1000v}{l_o} = \frac{1000v}{l_{an} + l_{car} + \frac{v}{3.6}\alpha + \frac{v^2}{254\varphi}} \tag{2}$$

Among them, C_O indicates the basic road capacity, V is the vehicle speed, l_{an} indicates the safety distance from the rear vehicle, l_{car} indicates the vehicle length, α indicates the driver response time, φ is the road condition.

In combination with daily life and road speed limit requirements, the speed of the vehicle in this section is set to 40 km / h; The vehicle length of the car is set to 5m; the safety distance from the rear car is set to 5m; the driver response time is set to 1s; the road parameter of the road segment is set to 0.7. Substituting the above data into (2), C_O =1372.

2.2.1. Calculate the Correction Factors for Road Traffic Conditions

(1) Lane width and lateral clearance correction factor f_w

Because the width of the lane affects the speed of the vehicle and the number of vehicles traveling in the same direction, it affects the road capacity. According to the relevant information, in the urban road design, the standard lane width is 3.5 m. When the lane width is greater than the value, the traffic capacity is not affected; when the lane width is less than the value, the traffic capacity is reduced, the correction coefficient of the lane width to the traffic capacity is:

$$f_W = \begin{cases} 0.5\left(W_0 - 1.5\right) & W_0 < 3.5 \\ 1 & W_0 \geq 3.5 \end{cases} \tag{3}$$

Among them, W_o is the lane width and the lane width is 3.25 m. Find f_w =0.875.

(2) Large car correction factor f_{HV}

In mixed traffic, there are many types of vehicles, different roads, different performances, and large mutual interference, which will affect the road capacity. Therefore, different types of vehicles need to be converted. Taking the car as the standard, the correction factor f_{HV} of the road composition for the capacity is obtained by multiplying the conversion factor obtained by comparison with the standard vehicle by the ratio of the corresponding vehicle. The specific calculation formula is Qi [7]:

$$f_{HV} = \frac{1}{1 + \sum P_i(E_i - 1)} \tag{4}$$

Among them, f_{HV} indicates the large vehicle correction factor, P_i indicates the ratio of the traffic volume of the vehicle *i* to the total traffic volume, E_i indicates the vehicle conversion factor of the vehicle *i*.

Since the signal period of the traffic light is 60 s and the phase time is 30 s, the counting is performed in a cycle of 30 s. By referring to the public transportation situation survey motor vehicle type conversion factor reference value, the vehicles in the road 1 are divided into buses and cars, the reference conversion factors are 1.5 and 1, respectively. Therefore, the correction factor of large vehicles in each cycle is shown in Table 1. Due to space limitations, only some data are listed here. For details, see Appendix I

Table-1. Table of correction factors for large vehicles in each cycle

Time	Number of cars	Number of buses	Large vehicles correction factor
16:40:02	5	0	1.00
16:40:32	12	1	0.96
16:41:02	5	0	1.00
16:41:32	8	3	0.88
16:42:32	7	2	0.90
16:43:02	7	2	0.90
16:44:02	6	1	0.93

Table 1 shows the partial data of the correction factor of the large vehicle in each cycle. It can be seen that the number of buses in this section is significantly smaller than the number of cars.

(3) Driver adaptability correction factor f_p

Driver adaptability means that the motor vehicle driving work should have various physiological conditions, psychological conditions, behavioral awareness, and behavioral ability that can meet the needs of safe driving.

In general, the driver's correction factor for traffic capacity is between 0.9 and 1.0. Since this paper assumes that the driver's driving skills are mature and obeys the traffic rules, the coefficient is chosen to be 1.0.

2.2.2. Calculate the Actual Traffic Capacity of the Road

(1) Cubic spline interpolation

1) Cubic Spline Interpolation referred to as Spline interpolation, Cubic spline interpolation is a smooth curve through a series of shape points.
2) Cubic spline function:

Definition: Function $S(x) \in C2[a,b]$, And a cubic polynomial on $[x_i, x_{j+1}]$ between each cell.

among them, $a = x_0 < x_1 < ... < x_n = b$ is the given node, then $S(x)$ is called the cubic spline function on node $x_0, x_1 ... x_n$.

If the function value x_j is given on node $Y_j = f(x).(j=0,1...n)$ and is true, then $S(x)$ is called cubic spline interpolation function.

(2) The actual traffic capacity of the road calculated using equation (1) is:

$$C = C_o \times f_w \times f_{HV} \times f_p = 1200.5 \times f_{HV}$$

Combined with the large vehicle correction factor obtained in Appendix I, the actual traffic capacity at each time point of the road is shown in Table 2. Due to space limitations, only some data are listed here. For details, see Appendix 1.

Table-2. Actual traffic capacity table of roads at various points in time

Seconds (s)	Actual traffic capacity (pcu/h)
0	3324.46
23	3601.50
53	3411.95
83	3601.50
113	3468.11
143	3601.50
173	3169.32
233	1080.45
263	1080.45
293	1200.50

Table 2 shows some data of the actual traffic capacity of the road at each time point. It can be seen that the actual traffic capacity of the road section has not stabilized when the accident has not occurred. After the accident, the actual traffic capacity of the road is significantly reduced. Maintain at a lower level. Perform a Smooth spline interpolation fit and the resulting curve is shown in Figure 1.

Fig-1. Curve of actual cross-sectional capacity of road-to-seconds

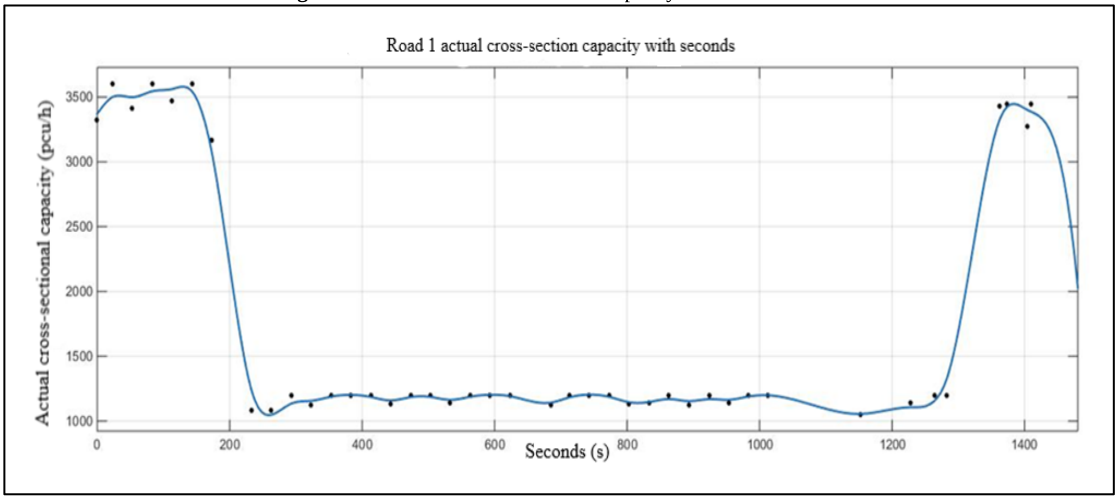


Figure 1 shows the actual cross-sectional capacity of the road as a function of the number of seconds. From this, it can be seen that the actual traffic capacity of the road changes with the number of seconds, and the same conclusion as in Table 2 is obtained.

2.2.3. Verify With Congestion

Since the running speed is difficult to measure, and the initial value of some parameters is difficult to set, it will affect the basic traffic capacity, so the actual traffic capacity will have errors. Therefore, the congestion in the video is taken as the saturation of the road. Use the definition of actual traffic capacity, that is, use the following formula：

$$C = \frac{N}{t} \tag{5}$$

Where C represents the actual traffic capacity, N represents the number of equivalents of the car, and t represents the blockage time. The conversion factor of the vehicle equivalent is shown in Table 3. (The vehicle conversion standard comes from the "Technical Standard for Highway Engineering (JTG B01--2003)").

Table-3. Traffic volume survey model division and vehicle conversion factor

Model	Conversion factor
Car	1.0
Bus	2.0
Motorcycle	0.4-0.6
Large truck	2.5

The actual traffic capacity of the blocked road section obtained by using equation (5) is shown in Table 4.

Table-4

Period	Minibus	Bus	Vehicle equivalent	Use congestion time to solve to actual traffic capacity	f_{HV}	Using functions to solve to actual traffic capacity
16:42:39-16:44:27	30	5	37.5	1250.00	0.93	1120.47
16:44:32-16:44:54	8	0	8	1309.09	1.00	1200.50
16:45:38-16:47:25	29	1	30.5	1026.17	0.98	1180.82
16:47:50-16:49:38	34	1	35.5	1183.33	0.99	1183.59
16:50:04-16:52:46	47	2	50	1111.11	0.98	1176.49
16:52:46-16:53:52	18	2	21	1145.45	0.95	1143.33
16:54:04-16:56:05	37	1	38.5	1145.45	0.99	1184.91
16:57:54-16:58:18	5	2	8	1200.00	0.88	1050.44
16:59:08-16:59:31	8	1	9.5	1486.96	0.95	1137.32
16:59:43-17:00:07	9	0	9	1350.00	1.00	1200.50

Table 4 shows the actual traffic capacity results of the road congestion time. It can be seen from the table that the actual traffic capacity results solved by the congestion time and the actual traffic capacity results solved by the function are not much different. There is an acceptable error of about 10%. Therefore, the parameter setting is more reasonable, and the actual capacity function model corrected by the running speed and road traffic conditions is more reliable.

The actual traffic capacity calculated by the two calculations is drawn at the same time. The result is shown in Figure 2:

Figure-2. Comparison of actual traffic capacity results at the moment of road congestion

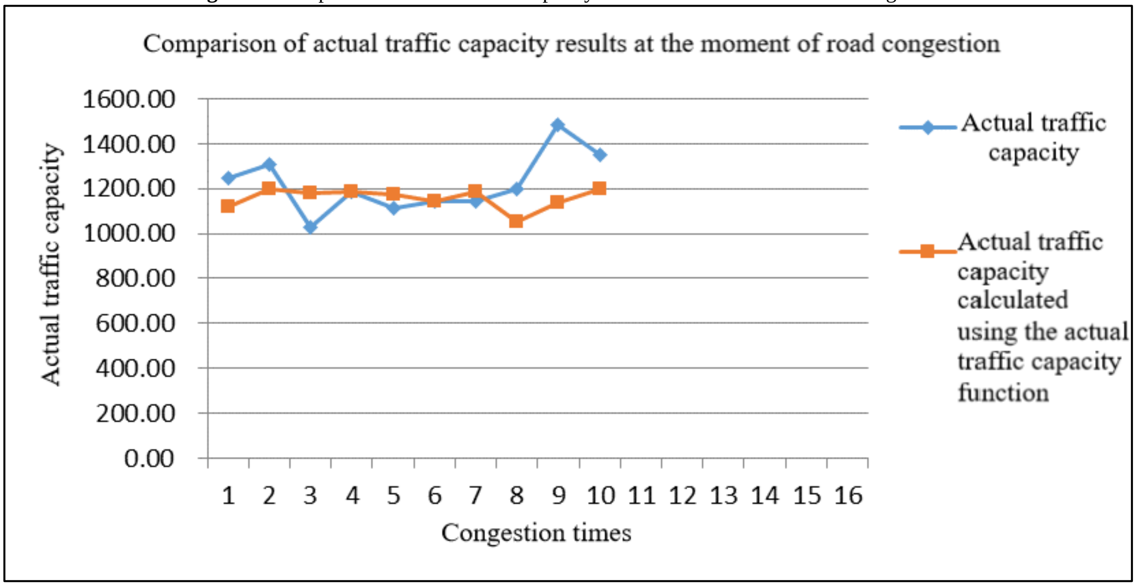


Figure 2 shows the comparison of actual traffic capacity results at the time of road congestion. It can be seen easily from the fact that the actual traffic capacity results solved by the congestion time and the actual traffic capacity results solved by the function are not much different, which indicates that the above functional model is successfully established.

2.3. Calculate the Actual Traffic Capacity of Road 2

According to the idea and method of calculating the actual traffic capacity of the road 1, with 30 seconds as a breakpoint, the number of vehicles in various types of vehicles and the traffic volume of large vehicles accounted for the percentage of total traffic are counted in the road 2. Then, according to the statistical data, the actual traffic capacity of the road 2 is determined by the objective function of the actual traffic capacity corrected by the running speed and the road traffic conditions.

The actual traffic capacity at each time point of the road is shown in Table 5. Due to space limitations, only some of the data is listed here. For details, see Appendix II.

Table-5. Road 2 Actual traffic capacity table at each time point of the road

Seconds (s)	Basic capacity (pcu/h/ln)	Traffic composition factor	Actual traffic capacity(pcu/h)
0	1372	1.00	3241.35
30	1372	1.00	3241.35
60	1372	1.00	3241.35
90	1372	0.97	3136.79
99	1372	1.00	3241.35
326	1372	1.00	1080.45
360	1372	0.92	1080.45
390	1372	0.96	1080.45
420	1372	0.94	1045.60
450	1372	0.95	1080.45
480	1372	1.00	1080.45

Table 5 shows some data on the actual traffic capacity of the road at each time point, where the basic traffic capacity is 1372pcu/h/ln. It can be seen that the actual traffic capacity tends to be stable when the road section accident does not occur; after the accident, the actual traffic capacity of the road is significantly reduced and has been maintained at a low level. Taking the number of seconds as the abscissa, the actual traffic capacity result is fitted by Smooth spline interpolation, and the obtained curve is shown in Figure 3.

Figure-3. Road 2 actual cross-section capacity with the number of seconds curve

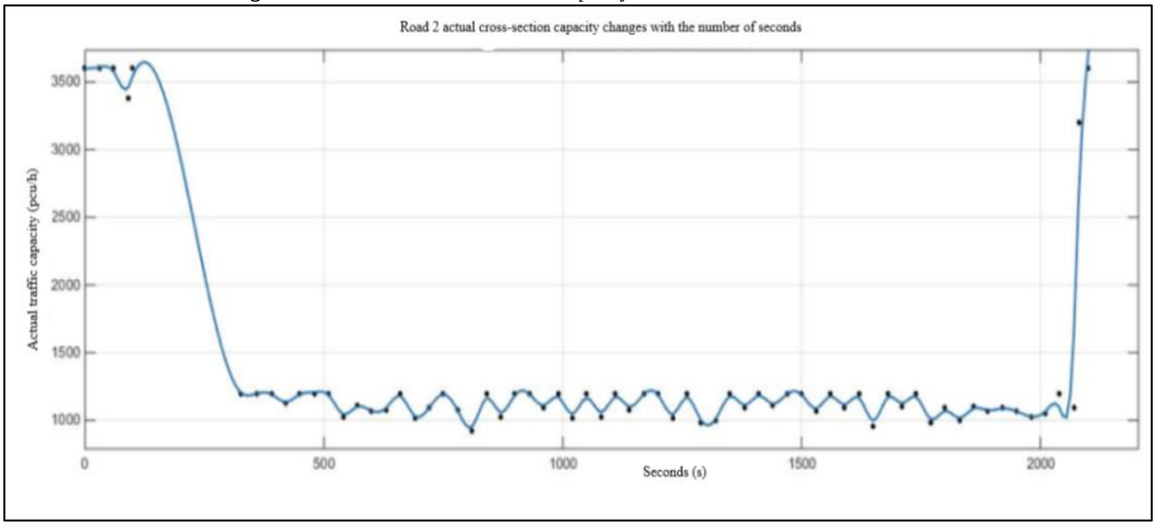
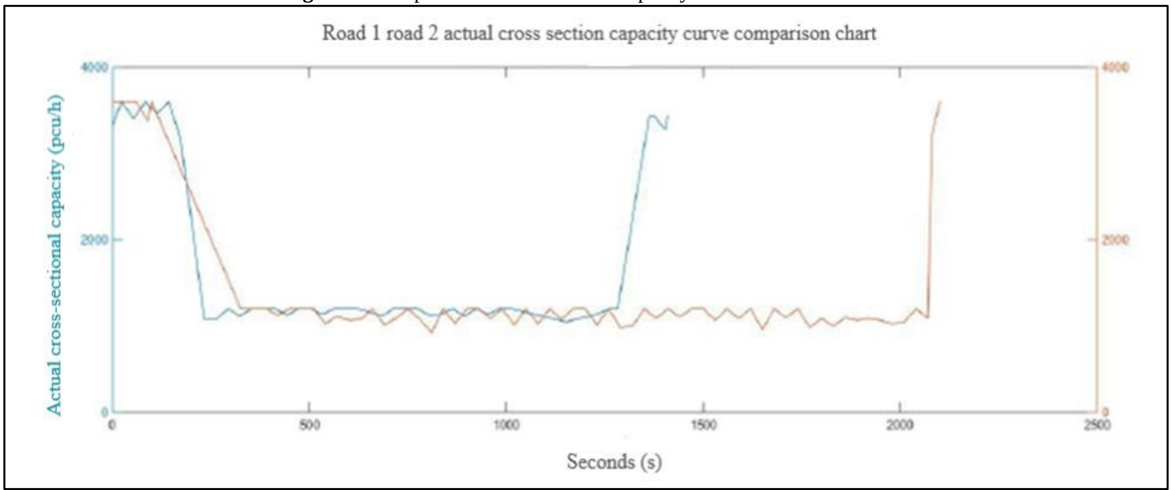


Figure 3 shows the actual traffic capacity of the road 2 cross-section as a function of the number of seconds, from which it can be seen visually that the actual traffic capacity of the road varies with the number of seconds. The two curves of road 1 and road 2 are placed in the same figure for comparison. The result is shown in Figure 4.

Figure-4. Comparison of actual traffic capacity between Road 1 and Road 2



The figure shows:

1) The actual traffic capacity of road 1 and road 2 before and after the accident is fluctuating around 3500pcu/h, and the fluctuation range is close;
2) After the accident, the actual traffic capacity of the road cross-section of road 1 and road 2 plummeted and fluctuated around 1000pcu/h, and the fluctuation range is close. In summary, from the image analysis of the two, there is no obvious difference. It is difficult to analyze the description, so a significant difference test is used.

2.4. Mann -Whitney *U* Significant Difference Test

2.4.1. Mann-Whitney *U* Significant Difference Verification Model Preparation

Mann-Whitney U is also called "Mann-Whitney rank sum test", was proposed by H.B. Mann and D.R. Whitney in 1974. Assuming that the two samples are from two populations that are identical except for the population mean, the purpose of Mann-Whitney U is to test whether there is a significant difference between the mean values of the two populations.

(1) Sort

Two independent random samples of capacity n_A and n_B are randomly extracted from the two populations A and B, and n_A *and* n_B observations are arranged in order of magnitude. Specifying 1 as the level of the minimum observed value, 2 as the level of the second smallest observation, and so on, if the same observations exist, use the average of their order as the rating.

(2) Calculate the grades T_A and T_B of two samples

(3) Calculate the minimum rank sum U

The formula for the Mann-Whitney U test can be given according to T_A and T_B. The calculated two rank values are not equal, but their sum is always equal to $n_A n_B$, which yields $U_A + U_B = n_A n_B$. If $n_A \leq 20$ and $n_B \leq 20$, the test statistic is:

$$U_A = n_A n_B + \frac{n_A(n_B+1)}{2} - T_A \qquad U_B = n_A n_B + \frac{n_A(n_B+1)}{2} - T_B$$

(4) Calculate the test quantity Z

Select the smaller value U in U_A and U_B to bring in the inspection quantity Z. The formula is as follows:

$$Z = \frac{U - \frac{n_A n_B}{2}}{\sqrt{\frac{(n_A - n_B)n_A n_B}{2}}}$$

(5) Test

Compare Z and $Z_{\frac{\alpha}{2}}$. If $Z \leq Z_{\frac{a}{2}}$, accept the null hypothesis. There is no significant difference; otherwise, reject the null hypothesis.

2.4.2. Mann-Whitney *U* Significant Difference Test for Road 1 and Road 2

1) Hypothesis H_0: There is no significant difference between the actual traffic capacity data of the two groups; H_1: There is a significant difference between the actual capacity data of the two groups.
2) Mix the two sets of samples and arrange them in order from small to large and arrange the grades uniformly. The minimum level is 1 and the second small level is 2(If the evaluation results are the same size, take the average of these data bit orders). And find the sum of the two samples, which are recorded as T_A and T_B respectively.

Table-6. Uses SPSS to obtain the sum of the two data levels

Group	digital	Grade average	Sum of levels
1	41	66.10	2710.00
1	66	46.48	3068.00

It can be seen from Table 6 that the sum of the ranks of group 2 is greater than the sum of the ranks of group 1, and it can be concluded that the actual traffic capacity of road 2 is better than that of road 1.

3) Using the SPSS software to obtain the test statistic Z of the two sets of data, the data is shown in Table 5 below.

Table-7. SPSS significance test results

	Actual cross-sectional capacity
Mann-Whitney U	857.000
Wilcoxon W	3068.000
Z	-3.297
Asymptotic significance (Two-tailed)	0.001

Take $\alpha = 0.5$ and get $Z_{\frac{\alpha}{2}} = 1.96$. As can be seen from the table statistics, it can be seen from the table that the test value p is less than 0.05, so this paper have to reject the null hypothesis, that is, it can be considered that the difference in the actual traffic capacity of the cross-section of the same cross-section traffic accident in the video in the 30 second cycle is significantly different.

2.4.3. Analysis of the Difference in Actual Traffic Capacity

1) The downstream ratios of the downstream intersections are different. The ratio of straight traffic and left turn traffic to the downstream intersection is 79%. When people enter from an upstream intersection, they choose the lane according to their own wishes. Most people choose to go straight and turn left. When the two roads are blocked, the cars on the road must turn to the right turn lane in order to pass. This kind of cut-off behavior is less efficient and wastes time. On the contrary, if the right turn lane and the straight lane are blocked. The flow ratio of these two lanes is 65% in total, so the time wasted less than the first case, so the actual traffic capacity will be better.
2) The car entered and exited the intersection of the community and caused an impact. Since the intersection of the community is on the right turn lane, if the left turn and the straight lane are blocked, when the right turn lane is queued up to the intersection of the community, the entry and exit of the community car will be affected, and the circulation of the right lane will also be affected. And if the right lane and the straight lane are blocked, even if the right lane captain arrives at the gate of the community, the impact on the left lane will not be too great.
3) The driving speed of each lane is different. Since the lane 3 is in the overtaking lane, the speed of the vehicle in the lane 3 is faster than that in the lanes 1 and 2. Therefore, accidents in lanes 1 and 2 and accidents in lanes 2 and 3 will affect the traffic jam time, which will result in differences in the actual traffic capacity of the road.
4) There is a building on the right side of the road. There are similar buildings such as residential buildings and bookstores on the right side of the road. Therefore, some vehicles stop at the outer lane, which increases the difficulty of driving the road on the right side.

3. Conclusion

This paper firstly uses the method of data statistics to obtain the number of different models in each cycle every 30 seconds, and calculates the standard car equivalents, eliminating the ambiguity caused by different vehicle types. Finally, the correction coefficients of road traffic conditions are calculated, and the actual traffic capacity results at every moment of the road are obtained by combining the functional model of the actual traffic capacity corrected by the running speed and road traffic conditions. On the basis of this, use the situation during the congestion period, that is, the relationship between the vehicle equivalent and the clogging time, to solve the problem that the speed is difficult to measure， and the initial value of some parameters is difficult to set. Also, this paper compares it with the classic traffic actual capacity to solve the function results and further verification, make the correction factor more accurate so that reduce the error of the actual traffic capacity and make the final experimental conclusion closer to the reality. Finally, the Mann-Whitney U test is used to test the difference of the actual traffic capacity in the two road situations, which reduces the problems caused by the unknown and the lack of data. Then this paper can discover the significant differences between the two groups of data, that is, the actual traffic capacity of the second case is stronger than that of the first case. Also, this paper can analyze the reasons for the differences, which include the different ratio of the steering traffic volume of the downstream intersection, the road section where there are vehicles entering and exiting, the different speed of each lane, and the buildings nearby the lanes.

However, due to some difficulties in measurement and some calculations that are difficult to simplify, this study still has following shortcomings:

① For some dynamic parameters, take the average without significant influences on the model.

② When this paper calculates the actual road capacity, the correction factor of the driver adaptability and the vehicle driving speed are calculated repeatedly, making the efficiency low.

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Appendix 1

Seconds（s）	**Traffic factor**	**Basic capacity (pcu/h)**	**Actual capacity (pcu/h)**
0	0.92	1372	3324.46
23	1.00	1372	3601.50
53	0.95	1372	3411.95
83	1.00	1372	3601.50
113	0.96	1372	3468.11
143	1.00	1372	3601.50
173	0.88	1372	3169.32
233	0.90	1372	1080.45
263	0.90	1372	1080.45
293	1.00	1372	1200.50
323	0.93	1372	1120.47
353	1.00	1372	1200.50
383	1.00	1372	1200.50
413	1.00	1372	1200.50
443	0.94	1372	1129.88
473	1.00	1372	1200.50
503	1.00	1372	1200.50
533	0.95	1372	1137.32
563	1.00	1372	1200.50
593	1.00	1372	1200.50
623	1.00	1372	1200.50
685	0.93	1372	1120.47
713	1.00	1372	1200.50
743	1.00	1372	1200.50
773	1.00	1372	1200.50
803	0.94	1372	1129.88
833	0.95	1372	1137.32
863	1.00	1372	1200.50
893	0.93	1372	1120.47
924	1.00	1372	1200.50
953	0.95	1372	1137.32
983	1.00	1372	1200.50
1013	1.00	1372	1200.50
1152	0.88	1372	1050.44
1228	0.95	1372	1137.32
1264	1.00	1372	1200.50
1283	1.00	1372	1200.50
1362	0.95	1372	3430.00
1374	0.96	1372	3444.91
1404	0.91	1372	3274.09
1410	0.96	1372	3444.91

Appendix 2

Seconds (s)	Basic capacity (pcu/h/ln)	Traffic composition coefficient	Actual capacity (pcu/h)
0	1372	1.00	3241.35
30	1372	1.00	3241.35
60	1372	1.00	3241.35
90	1372	0.97	3136.79
99	1372	1.00	3241.35
326	1372	1.00	1080.45
360	1372	0.92	1080.45
390	1372	0.96	1080.45
420	1372	0.94	1045.60
450	1372	0.95	1080.45
480	1372	1.00	1080.45
510	1372	0.92	1080.45
540	1372	0.95	997.34
570	1372	1.00	1040.43
600	1372	0.95	1016.89
630	1372	0.87	1023.58
660	1372	1.00	1080.45
690	1372	0.92	990.41
720	1372	1.00	1029.00
750	1372	1.00	1080.45
780	1372	0.95	1023.58
810	1372	1.00	939.52
840	1372	0.92	1080.45
870	1372	1.00	997.34
900	1372	0.92	1080.45
930	1372	1.00	1080.45
960	1372	0.95	1029.00
990	1372	1.00	1080.45
1020	1372	1.00	990.41
1050	1372	0.92	1080.45
1080	1372	1.00	997.34
1110	1372	0.90	1080.45
1140	1372	0.91	1023.58
1170	1372	1.00	1080.45
1200	1372	0.95	1080.45
1230	1372	1.00	990.41
1260	1372	0.96	1080.45
1290	1372	1.00	972.41
1320	1372	1.00	982.23
1350	1372	0.94	1080.45
1380	1372	1.00	1029.00
1410	1372	0.95	1080.45
1440	1372	1.00	1037.23
1470	1372	0.89	1080.45
1500	1372	1.00	1080.45
1530	1372	0.96	1016.89
1560	1372	1.00	1080.45
1590	1372	0.90	1029.00
1620	1372	0.95	1080.45
1650	1372	0.91	960.40
1680	1372	0.96	1080.45
1710	1372	0.94	1033.47
1740	1372	0.95	1080.45
1770	1372	0.94	972.41
1800	1372	0.92	1029.00
1830	1372	0.93	982.23
1860	1372	1.00	1033.47
1890	1372	0.95	1016.89
1920	1372	0.94	1029.00

1950	1372	1.00	1016.89
1980	1372	0.95	997.34
2010	1372	0.96	1008.42
2040	1372	0.95	1080.45
2070	1372	0.89	1029.00
2080	1372	0.97	3050.68
2100	1372	0.93	3241.35