CHARACTERISTICS AND PARKING TIME MODELING OF ON-STREET PARKING FOR LOADING AND UNLOADING IN CBD

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abstract : Lllegal parking of vehicles for the loading and unloading of goods at Tenjin area in Fukuoka-city, Japan, is more than half of goods vehicles with high parking turn rate. Then, it is necessary to use effectively curb space and parking meter as a step of short-term plan to ease traffic congestion and parking difficulty in the Central Business District(CBD). This study aims to investigate the characteristics of the on-street parking for loading and unloading, and propose a model to describe parking time.

1. INTRODUCTION

With the social economic activities, the parking of goods vehicles for loading and unloading in CBD is unavoidable. However, the loading and unloading of goods on the streets will bring many problems to the district such as traffic congestion, environment and parking difficulty. As a short-term plan, some spaces for loading and unloading in CBD should efficiently be used for the parking of goods vehicles. And also, from traffic safety, practical use of the parking space should be discussed in order to secure road space.

Some relevant researches concerning the loading and unloading on street had been reported by Philip A. Habib(1976, 1978), Dennis Christiansen(1978), Dohgaki(1991), Harada(1992) and Tsukaguchi(1994). It is known that there are a lot of research cases how to use curb space and parking meter for loading and unloading. And in the majority of those studies, actual situations of the on-street loading and unloading were investigated and the maintenance of parking facilities were discussed. However, up to now, neither detailed investigations nor the examinations about the use state have been done after the exclusive parking meter for loading and unloading is set up. In the same time, it is doubt whether building policy and planning standard of parking facilities for goods vehicles can be applied to other cities. The on-street parking situations for loading and unloading is related to many impacting factors to express various characteristics of the city such as investigation time, proportion of road area to total land area, traffic volume, population of economic activity, integration of commercial and business district, and maintenance conditions of the on-street and the off-street parking facilities etc. And with the change of these factors, relevant situation will be different. Therefore, it is requested how to consider these factors in the investigation of loading and unloading.

In this study, as a basic research to grope for the strategy to secure and use effectively curb space or the on-street parking for loading and unloading, the actual situations of parking meter for goods vehicles set up at Tenjin district in Fukuoka-city are investigated. And, it is an attempt to grasp the characteristics of on-street parking for loading and unloading and construct the forecasting model for parking time.

2. OUTLINE OF SURVEY

On-street parking situations at the sections of exclusive parking meter for goods vehicles at Tenjin area are surveyed, where is the CBD of Fukuoka-city and there are busy activities for business and commerce. The concept of investigation on the on-street parking for loading and unloading are outlined in Fig. 1. Fundamentally, the conditions of pickup and delivery services(PUD) and surroundings of parking related to goods and vehicles should be investigated. Main items in this survey include types of vehicles, numbers of goods and parking time, which are also underlined as in Fig. 1. 650 vehicles in three kinds of days such as sunny weekday, rainy weekday and holiday are surveyed as in Table 1.

In cases of the weekday, observation days are divided into sunny and rainy day based on the weather. According to the data collected, it should be examined whether there is difference in actual conditions of parking for loading and unloading between two kinds of weekdays. Table 2 shows that in the size of goods, time zone of parking and parking time, there are not any differences of significance even at 25 % level under the chisquare-test for different weekday. But, the difference in the composition rate of a category with the exception of these items is turned up. In the same time, two-way ANOVA(analysis of variance) to the whole factors is used to analyze whether numbers of goods is affected by types of vehicles and other factors.

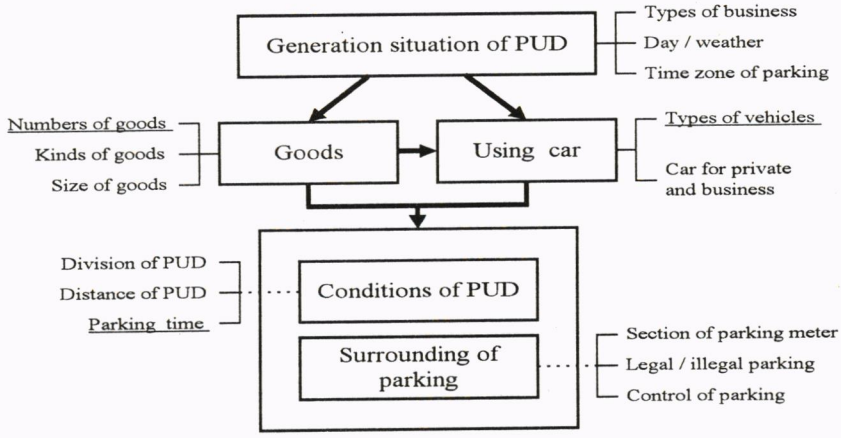

Fig. 1. Concept of investigation on parking for loading and unloading

Table 1. Outline of investigations

Description		Time zone	No. of sample	Investigation point
Sunny weekday	3/19/1996 Tuesday	09:00 - 18:00	139 vehicles	Parking meter 8
Rainy weekday	3/21/1996 Thursday	09:00 - 18:00	152 vehicles 244 vehicles	Parking meter 5 Parking meter 8
Holiday(sunny)	3/20/1996 Wednesday	09:00 - 18:00	115 vehicles	Parking meter 5

Note : March 20 is holiday on the Vernal Equinox

Table 2. Chisquare test of the distributions of the on-street parking for loading and unloading in sunny weekday and rainy weekday

Items	Value of chis.	D. F.	Prob. of sig.	Judgment
Typs of business	7.42	1	0.007	***
Time zone of parking	7.02	8	0.535	v
Types of vehicles	20.63	6	0.002	***
Kinds of goods	4.86	3	0.182	*
Size of goods	2.31	3	0.511	v
Numbers of goods	24.81	4	0.000	***
Division of PUD	4.24	3	0.237	*
Distance of PUD	13.17	3	0.004	***
Parking time	5.60	5	0.347	v
Legal/illegal parking	3.37	1	0.067	**
Prevented parking	6.68	1	0.010	***

Note : 1. Dismiss ; *** : 1%, ** : 10%, * : 25%, Adoption ; v : 25%
2. Types of business are divided into commercial and business facilties
3. Types of vehicles ; Large-sized truck(2.1 tons and more), Middle-sized(0.36-2.0 tons), Light truck(0.35 tons and less), Large-sized van(0.36 tons and more), Light van (0.35 tons and less), Wagon, Passenger car
4. Size of goods ; Large-sized($100*60*80cm^3$), Middle-sized($60*30*40cm^3$), Small-sized($30*20*10cm^3$), Others
5. Legal parking is defined that a car is accurately parked in one parking meter. And otherwise the parking is called as illegal parking.

3. PARKING CHARACTERISTICS FOR LOADING AND UNLOADING BASED UPON TYPES OF VEHICLES AND NUMBERS OF GOODS

To analyze actual conditions of the on-street parking for loading and unloading in details, the goods vehicles are divided into seven types as in Fig. 2. Because the parking space in eight lots of the parking meter is somewhat narrow, the parking frequency of the middle-sized & light truck and the van is higher, but the large-sized truck in the weekday doesn't almost appear. On the other hand, the parking frequency of passenger car and large-sized van is higher than that of the truck on holiday. The parking frequency of middle-sized truck is high on sunny weekday, while the parking of light van is frequent on rainy weekday. Through these analyses, it can be derived that the changes of weather or days have an influence on the parking situations.

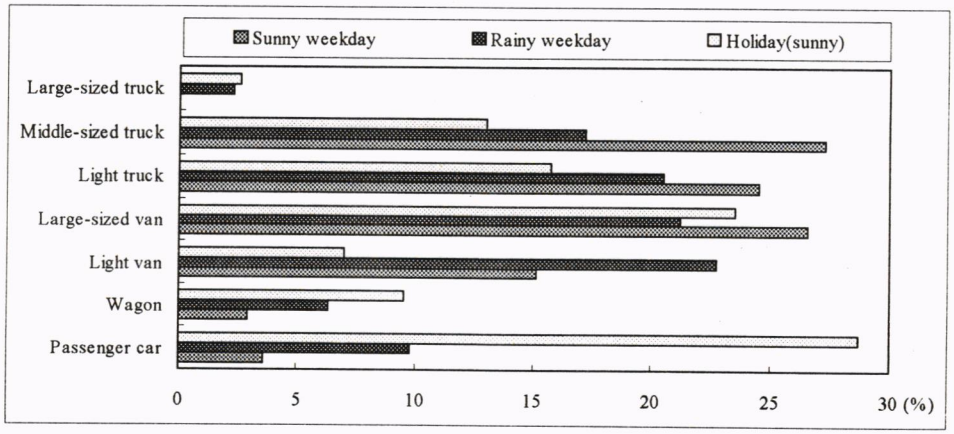

Fig. 2. Proportion of each type of vehicles in the on-street loading and unloading

Fig. 3 shows the proportion of each type of vehicles to numbers of pickup and delivery goods. On sunny weekday, the vehicles with high rate are separately middle-sized truck, large-sized van and passenger car if numbers of goods are 0 piece, light truck if numbers of goods are 1 piece, large-sized van, middle-sized truck and light truck if there are 2-5 pieces, while middle-sized and light truck if there are 6 pieces and more. And also, when numbers of goods are more than 11 pieces, the majority of goods vehicles with high rate are large-sized van, middle-sized and light truck. Especially, if there are no goods on the vehicles the proportion of wagons and passenger cars come up to 23.1% although the goods vehicles occupies majority.

On rainy weekday, the vehicles with high rate are separately passenger car if numbers of goods are 0 piece, light van if numbers of goods are 1 piece, light truck and large-sized van if there are 2-5 pieces, middle-sized truck and large-sized van if there are 6-10 pieces, while middle-sized truck when numbers of goods are 11 pieces and more. And, On holiday, the vehicles with high rate are separately passenger car if there is none or 1 piece of goods, light truck and large-sized van if 2-10 pieces, while middle-sized truck if 11 pieces and more. The large-sized truck is still main mean to the transport with great volumes more than 1 piece although its relevant rate is generally low on rainy weekday and holiday.

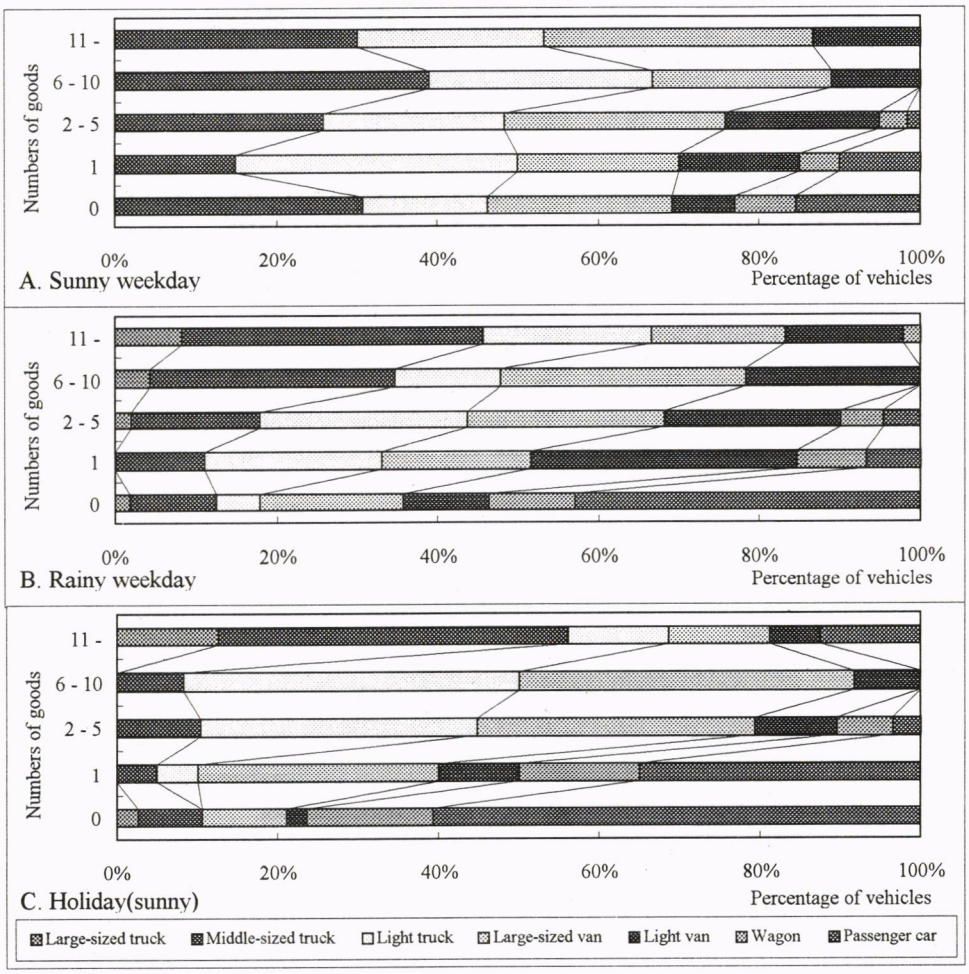

Fig. 3. Composition rate of vehicles to numbers of goods

Four types of vehicles(middle-sized truck, light truck, large-sized van and light van) as the transport means of the goods movement in CBD occupy 93.5% on sunny weekday, 81.6% on rainy weekday and 59.2% on holiday. Therefore, it is obvious that the four types of goods vehicles as mentioned-above are main transport means of goods movement at terminals in CBD.

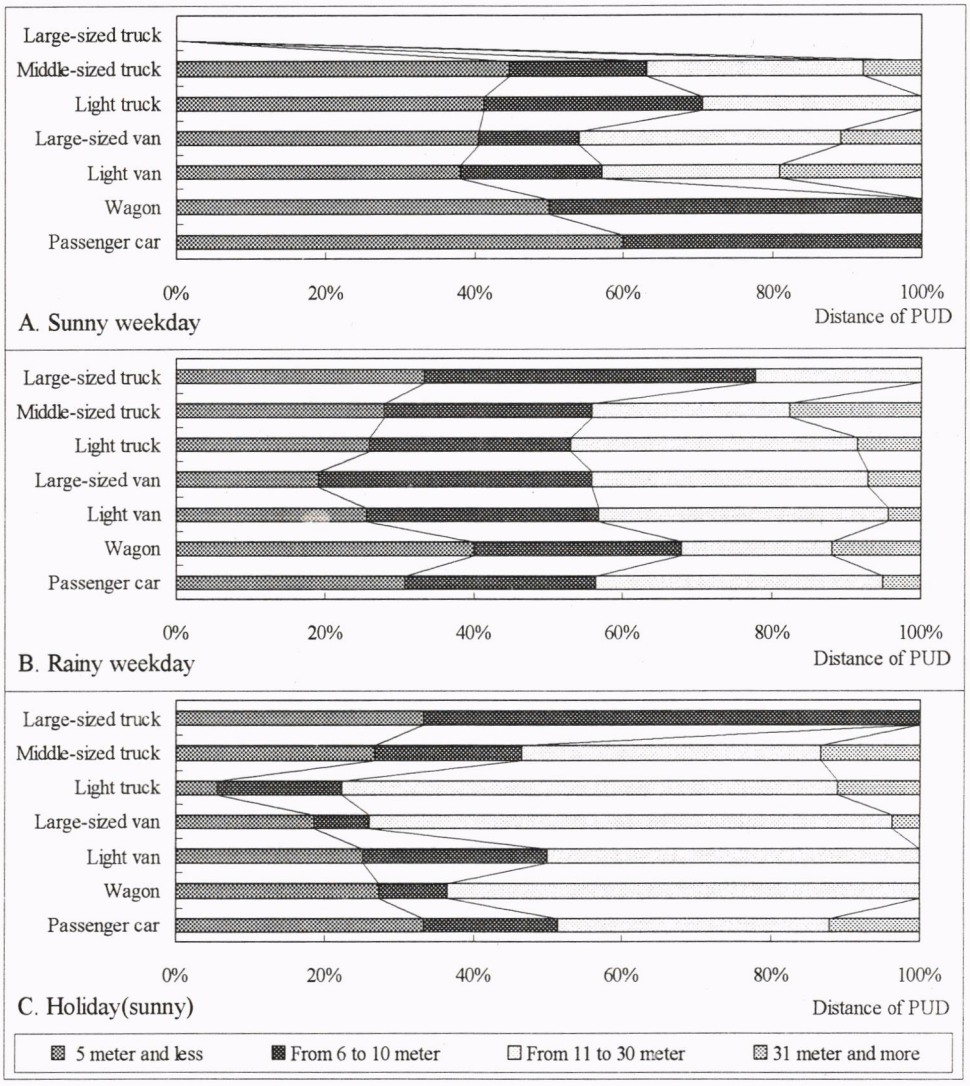

Fig. 4. Rate of PUD distance to types of vehicles

From the respect of numbers of goods, the causes which goods vehicles are miniaturized in Tenjin area can be found. The average loading numbers of goods in transport vehicles are 9.7 pieces on sunny weekday, 6.3 pieces on rainy weekday and 8.3 pieces on holiday, separately, the dependence on large-sized vehicle is very low. And the selection of types of vehicles should also correspond with consignor's needs for the driblet and just-in-time transport. Therefore, goods vehicles are miniaturized. But on the other hand, the traffic volume of road is increased in order to respond the social demand called as high frequency and small volume.

Fig. 4 shows the rate of pickup and delivery distance based on types of vehicles. On sunny weekday, the trend of parking near destination is strong because the rate of parking distance less than 10 meter from destination is high in general. Furthermore, considering the relationship with types of vehicles, to goods vehicles, the rate of PUD distance less than 10 meter is over 50%, but to all of passenger car and wagon, the PUD distance is less than 10 meter. On rainy weekday, the rate of PUD distance less than 10 meter is about 80% in large-sized truck, and subsequently about 70% respectively. In addition, to other vehicles except for wagon, most of the PUD distance is from 6 to 30 meter . On holiday, to large-sized truck, the rate of PUD distance less than 10 meter is 100%, and to other types of vehicles, the rate of PUD distance from 11 to 30 meter is high. So, there are great differences based on the different weekday. Especially, on holiday, average PUD numbers of goods in large-sized truck is 113.3 pieces, and the trend that vehicles park near destination is strong, parking over 31 meter off destination aren't almost found.

On the other hand, Fig. 5 shows the distribution of pickup and delivery numbers of goods for loading and unloading. There are a lot of PUDs with 2-5 pieces on the weekday. That is, it accounts for 41.7% on sunny weekday and 38.1% on rainy weekday. However, none piece of goods occupies 33% on holiday which is the greatest proportion, and 25% on the weekday.

Also, the large-sized truck is not observed on sunny weekday. In pickup and delivery numbers of goods, there is no great difference among sunny weekday (16.3 pieces), rainy weekday (15.9 pieces), and holiday (16.1 pieces) if means of PUDs numbers of goods only in middle-sized truck are compared. And, small-sized truck is 6.2 pieces on sunny weekday, 4.7 pieces on rainy weekday and 6.8 pieces on the holiday. There are few pickup and delivery volumes on rainy weekday.

By the way, about the pickup and delivery numbers of goods in passenger car, we can find that sunny weekday : 1.4 pieces, rainy weekday : 0.7 pieces, holiday : 2.8 pieces. It shows there are more PUD numbers on holiday, that is, there is higher parking frequency for the shopping on holiday. Therefore, although middle-sized truck is influenced neither by the day of the week nor by the weather; it can be said that light truck, large-sized van, light van, wagon and passenger car will be influenced.

Fig. 5 shows the average on-street parking time for loading and unloading based on numbers of goods, it is 19.5 minutes on sunny weekday, 26.3 minutes on rainy weekday and 22.8 minutes on holiday in the case of none piece of goods because of the business, slip arrangement and waiting etc.

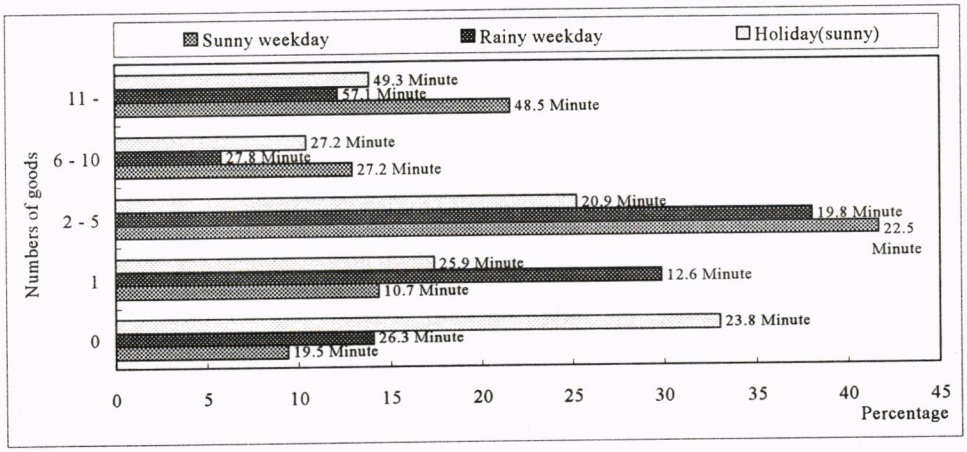

Fig. 5. Numbers of goods and average parking time

In the case which there are goods in vehicles, parking time is needed with the increase of numbers of goods except for one piece on holiday. Average time of loading and unloading are 27.7 minutes on sunny weekday, 23.1 minutes on rainy weekday, 29.1 minutes on holiday. But, there is not much difference in none piece of goods(sunny weekday : 26.9 minutes, rainy weekday : 23.6 minutes, holiday : 27.3 minutes).

Table 3. Two-way ANOVA about numbers of goods

Source of var.	Sum of sq.	D. F.	Mean sq.	F ratio	Level of sig.(5%, 1%)	Judgment
Types of vehicles	191.80	6	31.97	28.01	2.099, 2.802	**
Distance of PUD	60.83	3	20.28	17.77	2.605, 3.782	**
Main effects(1975)	258.14	9	28.63	25.13	1.880, 2.407	**
Residual	730.45	640	1.14			
Total	988.59	649				
Types of vehicles	99.31	6	16.55	16.75	2.099, 2.802	**
Kinds of luggage	158.96	3	52.99	53.63	2.605, 3.782	**
Main effects	356.27	9	39.59	40.07	1.880, 2.407	**
Residual	632.32	640	0.99			
Total	988.59	649				
Types of vehicles	143.09	6	23.85	21.82	2.099, 2.802	**
Size of luggage	91.95	3	30.65	28.05	2.605, 3.782	**
Main effects	289.26	9	32.14	29.41	1.880, 2.407	**
Residual	699.33	640	1.09			
Total	988.59	649				
Types of vehicles	184.75	6	30.79	27.64	2.099, 2.802	**
Parking time	80.52	5	16.11	14.46	2.214, 3.017	**
Main effects	277.84	11	25.26	22.67	1.752, 2.185	**
Residual	710.75	638	1.11			
Total	988.59	649				

Note : ** ; Significant in 5%

Table 3 is an analysis of significant differences about the number of pickup and delivery based on types of vehicles and other items. From weekday & holiday, and section of parking meter & parking management, there are not significant differences for numbers of goods. However, there are some significant differences in the pickup and delivery division, the pick up and delivery distance, the legal/illegal parking, the types of business for the pickup and delivery destination, the kind of goods, the size of goods and the parking time etc.

4. MODELING OF PARKING TIME

For the management of parking meter, the forecast of parking time is very important. The forecast model of parking time for loading and unloading is necessary in order to understand the actual situations of the on-street parking and express the parking time theoretically, and it is the basis of simulation to calculate a necessary number of parking space for loading and unloading. And also, there are very meaning for making parking measures in the future.

Fig. 5 and Table 4 show that there are some differences in average parking time for loading and unloading according to types of vehicles, weekdays, weather and numbers of goods. Then, factors impacting on the on-street parking time for loading and unloading should be clarified. The relations among these factors and parking time for loading and unloading are analyzed by the quantification theory Ⅰ. From the first analysis, only the factors with high explanation power are selected and used to the second analysis, which result are shown in the Tables 5, 6 and 7.

Table 4. Average parking time and rate of legal/illegal parking

Description		Ave. parking time(Min.)	Legal parking(%)	Illegal parking(%)
Large-sized truck	Sunny weekday	-	-	-
	Rainy weekday	44.6	55.6	44.4
	Holiday(sunny)	124.7	66.7	33.3
Middle-sized truck	Sunny weekday	39.4	47.4	52.6
	Rainy weekday	31.3	27.9	72.1
	Holiday(sunny)	28.0	53.3	46.7
Light truck	Sunny weekday	20.9	41.2	58.8
	Rainy weekday	19.4	13.6	86.4
	Holiday(sunny)	29.3	27.8	72.2
Large-sized van	Sunny weekday	24.6	40.5	59.5
	Rainy weekday	22.9	46.4	53.6
	Holiday(sunny)	24.8	55.6	44.4
Light van	Sunny weekday	19.4	38.1	61.9
	Rainy weekday	18.8	40.0	60.0
	Holiday(sunny)	17.0	50.0	50.0
Wagon	Sunny weekday	13.0	25.0	75.0
	Rainy weekday	21.2	40.0	60.0
	Holiday(sunny)	23.9	36.4	63.6
Passenger car	Sunny weekday	31.6	40.0	60.0
	Rainy weekday	27.8	28.2	71.8
	Holiday(sunny)	22.8	18.2	81.8
Total	Sunny weekday	26.9	41.7	58.3
	Rainy weekday	23.6	33.1	66.9
	Holiday(sunny)	27.3	38.3	61.7

Table 5. Quantification analysis I for the on-street parking time of PUD on sunny weekday

Description		No. of data	Cat. score	Range	Par. cor.
Time zone of parking	09:00 - 09:59	21	7.131		
	10:00 - 10:59	17	-5.709		
	11:00 - 11:59	27	-1.601		
	12:00 - 12:59	9	-7.657		
	13:00 - 13:59	15	6.192	21.055	0.271
	14:00 - 14:59	19	-7.117		
	15:00 - 15:59	12	6.051		
	16:00 - 16:59	12	9.293		
	17:00 - 17:59	7	-11.762		
Kinds of luggage	Clothing	58	1.967		
	Food-stuffs	40	-8.984	21.736	0.230
	Drinks	20	-1.125		
	Others	21	12.752		
Numbers of luggage	none	13	-45.015		
	1 piece	20	-3.474	61.432	0.449
	2 - 5 pieces	58	3.625		
	6 - 10 pieces	18	-2.673		
	11 pieces -	30	16.417		
Division of PUD	Delivery	101	-6.456		
	Pickup	12	9.319	27.656	0.366
	Pickup and delivery	13	21.200		
	Others	13	20.356		
Distance of PUD	- 5 Meter	59	-0.828		
	6 - 10 Meter	30	-1.912	31.267	0.312
	11 - 30 Meter	39	-4.755		
	31 Meter -	11	26.512		
Legal/illegal parking	Legal parking	58	16.694	28.648	0.510
	Illegal parking	81	-11.954		
Types of vehicles	Large-sized truck	0	0		
	Middle-sized truck	38	7.920		
	Light truck	34	-1.012		
	Large-sized van	37	-3.915	19.142	0.232
	Light van	21	-6.264		
	Wagon	4	-9.538		
	Passenger car	5	9.604		
R		0.705			

On sunny weekday and rainy weekday, there is the high explanation power in legal and illegal parking, numbers of goods, PUD division, PUD distance etc. On holiday, the pattern of them differs somewhat from sunny weekday and rainy weekday. The types of vehicles effect greatly on parking time instead of legal and illegal parking. From the category, we can know that on sunny and rainy weekday, the more numbers of goods, the longer parking time for pickup and delivery, business and waiting.

However, there is the long parking time with none piece of goods on holiday. The share of parking meter during a day for the goods vehicles is only about 30%, and parking time of passenger car over 41 minutes occupies 25%.

The mean of PUD numbers in that time is none piece and the average parking time is 79 minutes. Therefore, it can be said that the case of none piece of goods is a kind of pattern with long parking time. If main elements which influence on the on-street parking time for loading and unloading are extracted from the analysis results of quantification theory I , it is possible to be summarized as numbers of goods, PUD division and PUD distance.

Table 6. Quantification analysis I for the on-street parking time of PUD on rainy weekday

Description		No. of data	Cat. score	Range	Par. cor.
Time zone of parking	09:00 - 09:59	70	9.264	18.517	0.198
	10:00 - 10:59	54	-2.142		
	11:00 - 11:59	48	2.387		
	12:00 - 12:59	31	-9.253		
	13:00 - 13:59	33	-5.242		
	14:00 - 14:59	53	0.426		
	15:00 - 15:59	47	-2.325		
	16:00 - 16:59	43	-0.672		
	17:00 - 17:59	17	-4.234		
Kinds of luggage	Clothing	134	0.335	6.084	0.074
	Food-stuffs	128	-2.409		
	Drinks	48	3.675		
	Others	86	1.012		
Numbers of luggage	none	56	-18.767	47.011	0.393
	1 piece	118	-3.057		
	2 - 5 pieces	151	-0.281		
	6 - 10 pieces	23	4.276		
	11 pieces -	48	28.244		
Division of PUD	Delivery	274	-5.431	24.210	0.283
	Pickup	21	7.190		
	Pickup and delivery	45	6.342		
	Others	56	18.779		
Distance of PUD	- 5 Meter	104	-2.631	15.655	0.175
	6 - 10 Meter	121	-4.049		
	11 - 30 Meter	137	2.693		
	31 Meter -	34	11.606		
Legal/illegal parking	Legal parking	131	10.789	16.123	0.281
	Illegal parking	265	-5.334		
Types of vehicles	Large-sized truck	9	5.756	9.170	0.101
	Middle-sized truck	68	1.658		
	Light truck	81	-0.668		
	Large-sized van	84	-1.136		
	Light van	90	-3.012		
	Wagon	25	0.638		
	Passenger car	39	6.158		
R			0.578		

Table 7. Quantification analysis I for the on-street parking time of PUD on holiday

Description		No. of data	Cat. score	Range	Par. cor.
Time zone of parking	09:00 - 09:59	20	5.413		
	10:00 - 10:59	20	-2.753		
	11:00 - 11:59	10	-11.149		
	12:00 - 12:59	8	4.047		
	13:00 - 13:59	12	-4.076	23.819	0.281
	14:00 - 14:59	16	11.623		
	15:00 - 15:59	6	-2.406		
	16:00 - 16:59	15	0.057		
	17:00 - 17:59	8	-12.196		
Kinds of luggage	Clothing	42	2.181		
	Food-stuffs	22	-8.005	17.520	0.199
	Drinks	8	-13.115		
	Others	43	4.405		
Numbers of luggage	none	38	143.184		
	1 piece	20	-66.860	220.990	0.316
	2 - 5 pieces	29	-77.806		
	6 - 10 pieces	12	-72.731		
	11 pieces -	16	-60.916		
Division of PUD	Delivery	64	69.766		
	Pickup	6	69.486	216.549	0.320
	Pickup and delivery	7	99.406		
	Others	38	-146.783		
Distance of PUD	- 5 Meter	27	-14.532		
	6 - 10 Meter	19	7.939	33.528	0.348
	11 - 30 Meter	60	1.176		
	31 Meter -	9	18.996		
Legal/illegal parking	Legal parking	44	7.119	11.531	0.218
	Illegal parking	71	-4.412		
Types of vehicles	Large-sized truck	3	69.293		
	Middle-sized truck	15	-4.756		
	Light truck	18	3.019		
	Large-sized van	27	-2.927	80.682	0.420
	Light van	8	-11.389		
	Wagon	11	2.751		
	Passenger car	33	-1.546		
R			0.705		

5. DISCUSSION OF THE ON-STREET PARKING FOR LOADING AND UNLOADING

From Chapter 4, it is known that the average parking time is less than 40 minutes which is seen as restriction time of exclusive parking meter. But, the rate over 41 minutes is 19.4% on sunny weekday, 4.9% on rainy weekday and 20.9% on holiday. In the case of parking time over 41 minutes, the average parking time (for 74-80 minutes) is about two times of the limitation at the parking meter. So, the introduction planning of short parking time should be considered to use efficiently the exclusive parking meter for goods vehicles.

The rate of legal and illegal parking vehicles is shown as in Table 4. It is known that most of the rate of illegal parking vehicles is higher than that of legal parking except for large-sized truck. In other words, the turn rate of parking meter is high(17.4-30.5). It can be said that there is absolute shortage in the amount of the on-street loading and unloading facilities. Therefore, it is thought that the reasonable development of loading and unloading facility is a pressing need to solve the parking problem as a short-term plan.

And, in the exclusive parking time zone for goods vehicles(10 a.m. - 8 p.m.), non-goods vehicles (passenger car, wagon) should be introduced to the off-street parking facilities. But,

passenger cars often stay at the exclusive on-street parking space for goods vehicles, because the off-street parking facilities of Tenjin area in day time are full. Then, first of all, the on-street parking lot should be extended to solve the parking trouble for loading and unloading. The secondly, the conversion to the off-street parking facilities for non-goods vehicles must be introduced.

The improvements of parking meter for large-sized truck have also to be required. A representative vehicle of long parking time is large-sized truck(less than 4 tons and over 2.1 tons) . As shown in table 4, majority of large-sized goods vehicles exceed restriction time of exclusive parking meter for goods vehicles because parking space for large-sized truck is limited. But for decreasing such waste time in use of a parking meter, it is also not suitable that the parking time of large-sized truck is set up as to 40 minutes as the same as that of passenger car. Therefore, it is necessary to make relevant introduction measures to short parking time of goods vehicle for loading and unloading, or progress the policy through the conversion from large-sized vehicle to middle-sized and light, the on-street parking to off-street parking facilities for dealing with the on-street parking problem in Tenjin area.

6. CONCLUSIONS

This paper is a report of case study at Tenjin area in Fukuoka-city where the parking problem for loading and unloading occurs remarkably. So, the characteristics on the on-street parking for loading and unloading is investigated, and the factors impacting on parking time are clarified. In the same time, the problem on the on-street parking is studied. The following results are obtained :

1] In ordinary day, equal nature of each category rate on the sunny and rainy weekdays is examined by chisquare-test. As a result of the analysis, size of goods, time zone of parking, and parking time is not any difference at the level of significance in 25%. But the other factors are adopted at the level of significance in 1%.

2] From strictly observing types of vehicles on the on-street parking for loading and unloading, the main vehicle is middle-sized truck on sunny weekday, while light van on rainy weekday. The induced frequency of passenger car is high on holiday, And, it can be said that the main transport pattern is goods vehicles on the weekday, and non-goods vehicles on holiday.

3] The pickup and delivery distance based on types of vehicles according to the high rate is less than 10 meter on sunny weekday, from 6 to 30 meter on rainy weekday and from 11 to 30 meter on holiday.

4] The rate of one piece of goods or less is 43.9% on rainy weekday and 50.4% on holiday. However, the rate of two pieces or more are high on sunny weekday with 76.2%. That is, there is a little quantity of pickup and delivery on rainy weekday and holiday, mass quantity on sunny weekday.

5] The numbers of goods, PUD division and PUD distance are considered as main influence factors of parking time for goods vehicles.

6] It is necessary to improve the use method of parking meter on large-sized truck with long parking time.

The use state of parking meter for goods vehicles is investigated in this paper. From now on, we will examine the situation of the on-street parking in the parking meter which passenger cars are completely eliminated in order to predict whether present parking space can corresponds with the needs of the on-street parking for loading and unloading.

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