EVALUATION OF PARKING AREA SPORT ACTIVITIES BASE ON LAND USE NEEDS EDUCATION ACTIVITIES SYSTEM

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Abstract: The need for parking space in the land use system for educational activities is needed in line with the growth of vehicle users. Educational areas with a high center of activity really need adequate parking space for ease of accessibility. The center of sports activities in the area of higher education activities requires the ease of using vehicle parking. The system of sports activities in higher education areas with high movement activities requires evaluation of parking space requirements in accordance with the activity system. Analyzing parking space requirements based on system activities is the main objective of this study. Specifically the purpose of the study is based on the analysis of parking duration. The frequency and accumulation of vehicles in the parking area is a characteristic impact of the activity system of sports activities. The analysis method based on parking space units is analyzed based on parking methods with variables that affect vehicle use in the activity system in the sports activity zone. Variables of parking user characteristics are based on survey responses from vehicle users from their activity system. The results showed the existing conditions with 34 units of parking spaces with parking index 1.1764 with the need for parking space of 460 m2. With a system of high activity and vehicle growth, the parking area needs at the prediction of the next 10 years require an area of 59 parking spaces with a parking index of 0.949 with a parking area of 643.89 m2. So that the development of the parking area in the sports zone activity system requires an additional parking area of 183, 89 m2.

Introduction

The development of a system of higher education activities developed rapidly requiring good infrastructure requirements in accordance with the system of activities. The system of higher education zone activities requires alignment with the growth of the mobility system in the activity zone. The center of sports activities is a infrastructure that is very important for the development of education.

The sports activity system that develops competition activities is in desperate need of parking area infrastructure that meets the requirements of the activity system. The growth of vehicle users with high activity causes the needs of the parking zone in sports activities to require an adjustment based on their activity system. The frequency of vehicles with a system of vehicle user activity greatly affects the needs of the parking area. The duration and accumulation of vehicle parking were analyzed based on routine activities at the peak hours of the activity system. The

purpose of this study is to analyze the parking area requirements on land use education activity systems based on a system of sports activities in universities.

The development of an activity system that is determined based on the frequency of activities with high mobility (Akbardin, 2005; Akbardin, 2013; Akbardin and Putra, 2016) requires infrastructure requirements that are in accordance with the vehicle movement volume based on the activity system (Akbardin, et.al., 2017; Akbardin, et.al., 2018a; Akbardin, et.al., 2018b; Akbardin, et.al., 2018c).

Parking

Parking is the state of a vehicle that is temporary stopped and the vehicle does not move for a while with the driver did not leave the vehicle (Benenson, I., K. Martens, and S. Birfir., 2008; Beunen, R., C. F. Jaarsma, and H. D. Regnerus. 2006; Bonsall, P., and I. Palmer. 2004; Borgers, A., A. Kemperman, L. Toll, and H. Timmermans. 2010; CROW. 2003; Departemen Perhubungan 1998)

Determination of Parking Space Units (SRP)

The determination of parking spaces units (SRP) is divided into three kinds of vehicles and based on the determination of SRP for passenger cars are classified into three classes (Benenson, I., K. Martens, and S. Birfir., 2008; Beunen, R., C. F. Jaarsma, and H. D. Regnerus. 2006; Bonsall, P., and I. Palmer. 2004; Borgers, A., A. Kemperman, L. Toll, and H. Timmermans. 2010; CROW. 2003; Departemen Perhubungan 1998). As in Table 1

Table. 1. Determination of Parking Space Units (SRP)

Category	Parking Space Unit
1. a. Car passenger Type I	2,30 x 5,00
b. Car passenger Type II	2,50 x 5,00
c. Car passenger Type III	3,00 x 5,00
2. Bus/truck	3,40 x 12,50
3. Motorcycle	0,75 x 2,00

(source : parking planning and operating guidelines.1998)

Pattern Parking

The implemented parking pattern is in accordance with existing conditions in accordance with the needs of the system activity and space capacity (Akbardin, 2005; Akbardin, 2013; Akbardin and Putra, 2016). There are several parking patterns that have developed both in big cities and in small towns (Akbardin, et.al., 2017; Akbardin, et.al., 2018a; Akbardin, et.al., 2018b; Akbardin, et.al., 2018c). The developed parking pattern is as follows:

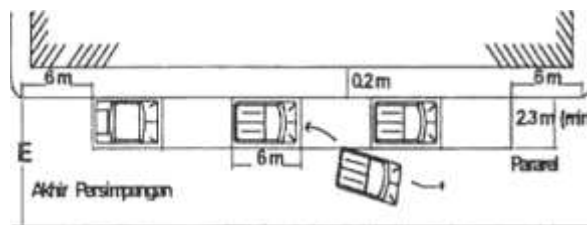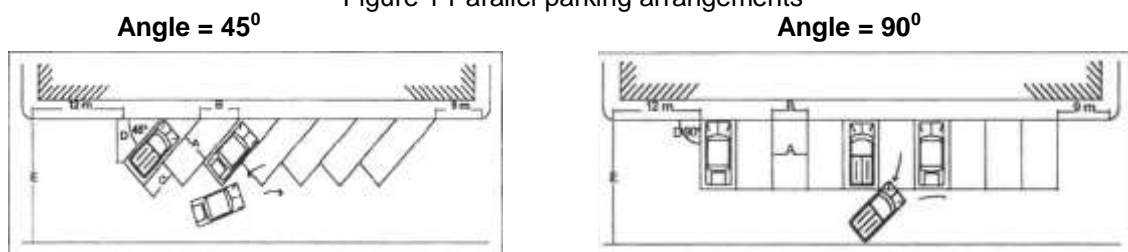Figure 1 Parallel parking arrangements

Angle = 45⁰ **Angle = 90⁰**

Figure 2 The parking procedure forms of the angle 45^0 and 90^0

Methodology

This research approach from the study of the parking user behavior characteristics toward the accessibility of the center location for non commercial activities by estimating the related variables of the non-commercial parking activity system on UPI campus. The method used in this study is a spaciousness survey with data collection through the questionnaire design. The utilise of this method has done to determine the research variables used (Akbardin, et.al., 2017; Akbardin, et.al., 2018a; Akbardin, et.al., 2018c; Guan, H., X. Sun, X. Liu, and L. Liu. 2005;

The used research variables are:
• Volume of incoming and outgoing vehicles
• The duration of the vehicle
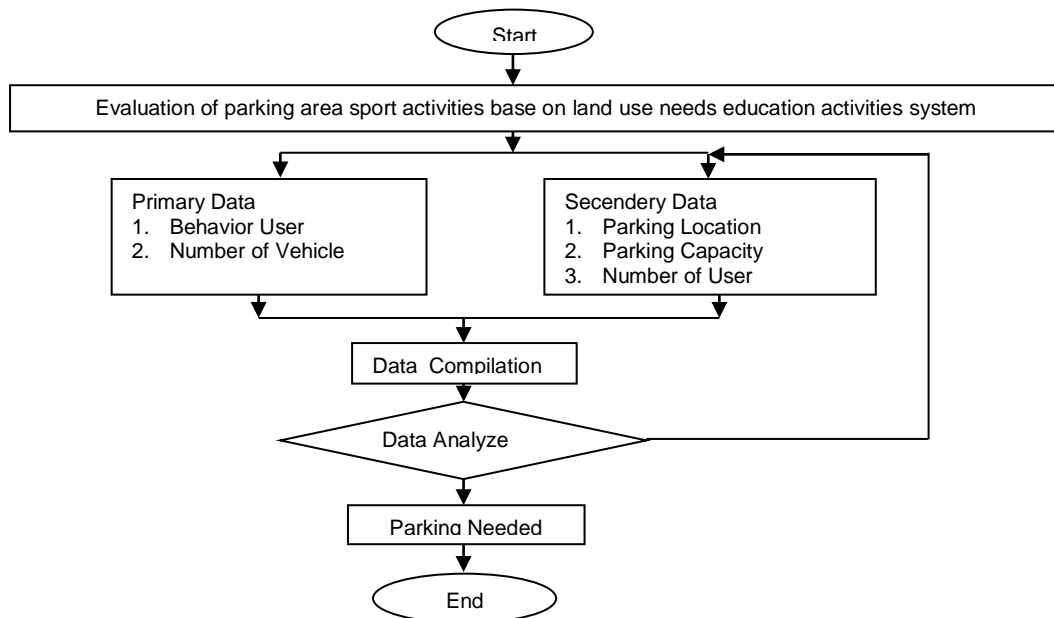• Parking user
• Parking capacity

Figure. 3. Research Flow Chart

Result and Discussion

Analysis existing conditions parking area

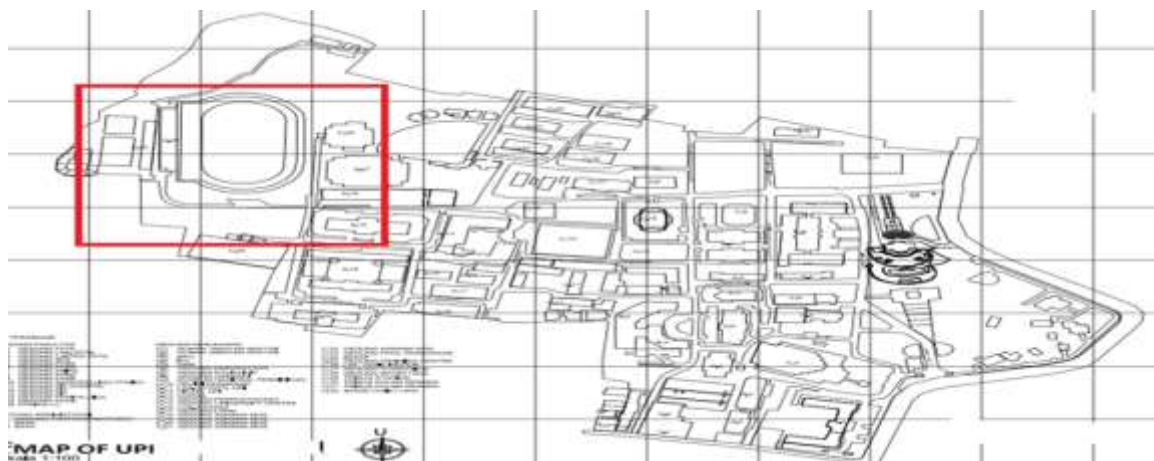Existing conditions are parked in the center of sports activities with a parking area
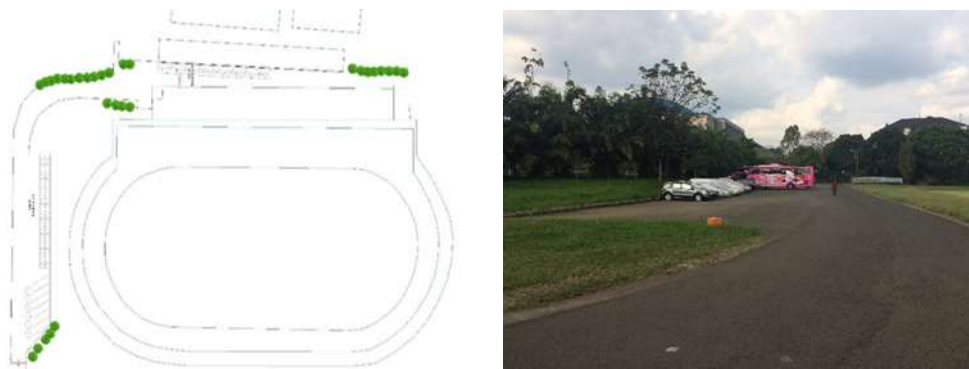

Figure. 4. Map of UPI land Use

Figure. 4. Parking area of sports activities center

Parking swimming pool Arena and UPI stadium are located behind when entering the Indonesian University of Education, on this parking lot there is a parking for visitors' buses. The parking lot of the bus is required to park near the UPI stadium, and the parking area along with the swimming pool and stadium is 1068.69 m²

With these parking conditions the parking plan:
1. Four-wheeled SRP group I is 2.3 m x 5 m
2. Parking at the Pool & Stadium is an on street parking or off-street parking
3. Parking patterns
   • According to the 90º parking angle with the provision of an effective maneuver space of 6.2 m
   • According to the parking angle of 600 (bus) with the provision of a 2-way alley lane width of 9.5m

From the Pool & Stadium parking the capacity of 34 four-wheeled parking spaces with a parking area of 1068.69 m² was obtained.

Observation phase by calculating the duration of each vehicle that enters and exits and records the identity of the vehicle. In addition, it can find out the field conditions for the implementation of parking space units, parking bans, as well as parking pattern management according to land transportation agency management standards about parking

Vehicle Data Analysis

Vehicle data is used to find out which vehicles come in and vehicles that come out with the time of each minute with the time division per hour from 06.00-16.00.
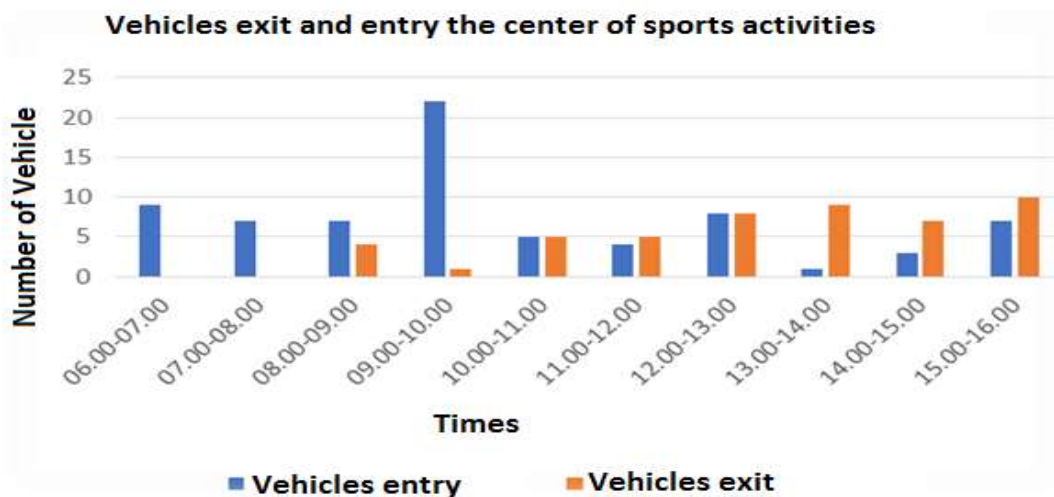

Figure. 5. Number Vehicles exit and enter the center of sports activities

The volume of vehicles at the center of sports activities that enter with a high volume is seen at 09:00 to 10:00, the vehicle is a routine activity for swimming training and other sports, for the largest volume of vehicles coming out is 15 : 00-16: 00 which is the completion of the activity.

Analysis of vehicle parking duration

The duration in parking is taken to determine the duration of each vehicle parked in the parking lot that has been provided, this duration is divided by hour. The duration of the highest vehicle is the average parking lot at the pool and stadium, which is> 10 hours with the number of vehicles 24 vehicles, the duration indicates that the parking lot is used to park together with residents around the pool.
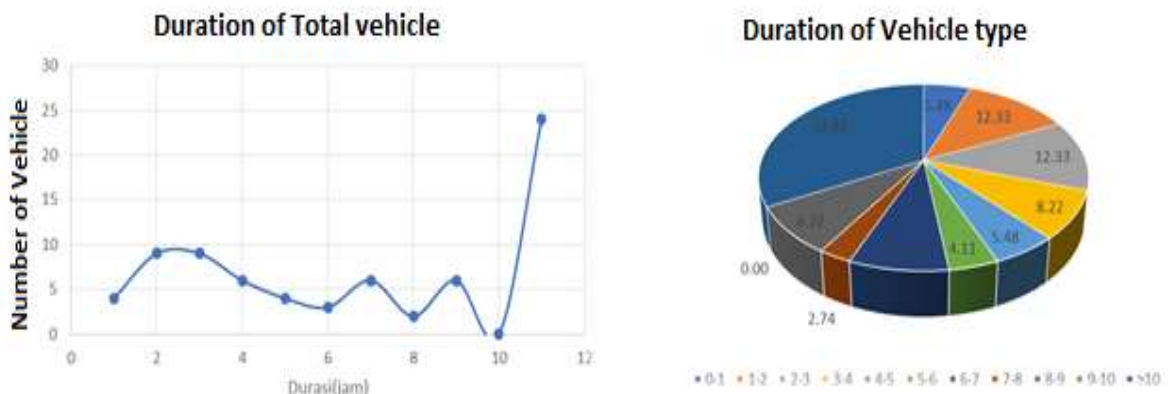

Figure. 6. Characteristics of vehicle parking duration

The duration of the most vehicles is the highest average parking at the swimming pool and stadium, which is> 10 hours with the number of vehicles 24 vehicles, the duration indicates that the parking lot is used for parking together with residents around the pool

Vehicle parking accumulation

Parking accumulation is used to find out the maximum parked vehicles in the parking lot every day, in the accumulation of parking in the Indonesian Education University taken on the highest day in the parking volume already. Accumulation is obtained from: Incoming vehicles - vehicles coming out + vehicles in place.The biggest accumulation of parking is 40

Figure. 7. Characteristics of vehicle parking accumulation

Analysis of Turnover

Turnover is used to determine the turnover of each vehicle parked in parking space units in 1 day.

Turnover = (parking volume) / (available parking space)

The parking volume used is the largest parking volume and parking space taken from the calculation of parking space according to SRP class I four-wheeled vehicles. Turnover = 73/34 = 2.15 rounded up to 3 which means that in 1 parking space there are 3 times the parking change (high vehicle activity).

Parking Index Analysis

Parking index is used to determine the parking capacity presntase used.

Parking index = (Accumulated parking) / (Available parking area) x 100%

Description   : >100% (exceeding capacity)
                : <100% (not exceeding capacity)
Parking Index   = 40/34 x100% = 117.65% which means it exceeds capacity of 17.65%

References. References include all cited works in the text. It is the authors' responsibility to check the accuracy of references. References should follow the APA Style.

Accumulation and Volume of Vehicle Parking

From the graph above it can be seen that at 08: 30-12: 30 (4 hours) it is always full and at 6: 00-8: 30 (2 hours 30 minutes) and 12: 30-16: 00 (3 hours 30 minutes) always empty.

Extensive parking area requirements
Plot number   : 34 SRP
Size of vehicle class I : 2.3 m x 5 m
Parking index   : 1.1764
Parking area needed   : 1.1765 x 34 x 2.3 x 5 = 460m2

Analysis of Vehicle Distribution

Parking capacity of the center of sports activities has parking capacity by 34 with user kapaistas parking spaces by 40 SRP, then parking capacity along with a pool and a stadium less than 6 SRP, not only shared parking for the stadium and the swimming pool but there is also

parking citizen, and therefore it has to be the addition of a parking lot and parking facilities, there is a parking lot near the stadium used by UPI. On the bus parking provision of parking spaces by 6 SRP, if less then da land that can be used again. For roads to the stadium and swimming pool need to be widened again.
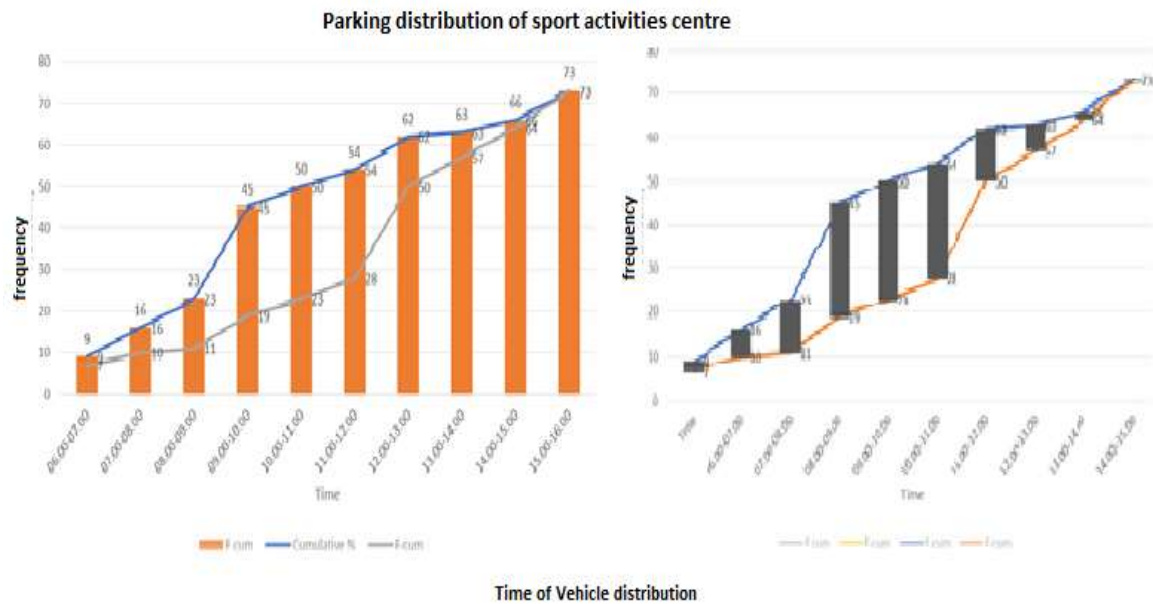

Parking distribution of sport activities centre

Time of Vehicle distribution

Table. 2 Parking Needs Analysis Results for predictions for the next 10 years

Parking identification	Area of Parking needed
Number of space	: 59 SRP
Size of vehicle class I	: 2.3 m x 5 m
Parking Index	: 0,949
Parking area needed	: 0,949 x 59 x 2.3 x 5 = 643,89 m^2

Conclusion

Based on the analysis of the evaluation of the parking needs of the center of sports activities in education land use shows that the parking volume with parking users exceeds the space capacity of the users of the activity center. This is because the behavior of parking users at training and competition activities at the center of sports activities increases rapidly. Central parking space for sports activities allows parking users to use outside the activity system. So that the system of sports center activities requires a parking integration system between non-commercial zones and their environment to be able to maximize parking space according to the system of activity activities in parking lots.

Acknowledgement

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