Geospatial Analysis of Car Parks’ Adequacy in Obafemi Awolowo University Campus, Ile-Ife

By

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ABSTRACT

Obafemi Awolowo University (OAU) is located in Ife Central, Local Government Area (LGA), Osun State, Nigeria. Car parks adequacy and their mode of utilization is a challenge to the University community, hence the use of geospatial techniques to analyse car parks adequacy in OAU campus academic areas. Google earth image covering the study area was captured, the Geographic Positioning System (GPS) points of the existing parks was taken, the capacities of the park were noted and the inflow and outflow of cars from existing car parks for a period of one month, within the study area was also taken. The image was georeferenced, mosaicked, and after this, the following features were vectorized; roads, buildings and the car parks and this information were stored in the geodatabase. These data was now incorporated with existing literature for geospatial analysis.

Result indicates that the University has twenty nine car parks in the academic area. Almost all the car parks were over utilized while few were under-utilized. It was also noted that some areas where people parked their cars were not designated by the University authority as car parks. None of the parks has space for motorcycle, bicycle, or designated place for people with physical challenges. Larger car parks with provision for all and sundry should be put in place and underground car parks should be considered for future or ongoing structure while enforcing the university rules with respect to car parks.

Keywords: Google earth image, georeferenced, mosaicked, vectorized, geodatabase, geospatial analysis.

INTRODUCTION

Car parking can be defined as a situation when a vehicle is temporarily/permanently put out of use and kept in a designated place without impairing the movement of other vehicles’ (Author’s definition).

Movement from one location to another is a fundamental need for human existence, since all his needs are not evenly distributed. This quest to solve geographic distance and interlink two ends has stimulated man over the years to create and develop mode and means of transportation, this includes road transportation (bicycle, tricycle, motorcycle, vehicle etc.) Air (airplane, jet etc.) Water (ship). According to Berry and Horton, (1970) transportation has been the veins and arteries of urban areas linking together social and functional zones. Over the years, road transportation and the use of cars, tricycle, bicycle, etc have become a necessity such that every individual directly/indirectly needs one. This shift has increased the number of vehicles or automobile privately and commercially owned. The consequence of this trend has led to the congestion on road and excessive use of the existing car parks. Nigeria campus communities provide examples for this study. In the campuses today, we have similar events like in the cities where there are congestions and inadequacy in the existing car parks creating traffic management challenge. The urban transportation problems today manifest in the form of poorly maintained urban road network and road complementary facilities, inefficient public transport system and poor transport planning. According to Rodrigue J.P., Comtois C. and Slack B. (2006), cities and their transport system are fully complementary. Cities are locations with a high level accumulation and concentrations of economic activities which forms complex spatial structures that are supported by transport systems. The design of University Campuses offer unique opportunities in architecture and urban planning. The freedom of thought, speech and association found on university campuses combine with the abundance of impressionable minds to provide fertile soils for sowing architectural ideas. Few people have visited the Obafemi Awolowo University, Ile–Ife campus without being impressed by its beauty and serenity. This “Most beautiful Campus in Africa” represents the Zenith of Campus planning and Architecture in Nigeria (Olaniyan 1985).

In order to provide optimal parking supply, it is the practice in conventional planning to determine how much parking to be provided at a particular site by planners based on recommended minimum parking standards published
by professional organizations. Litman T. (2009) and 
Professor Mudhuri et.cl. (2013) In the short run, different 
measures have been adopted such as deflations of 

Tyre and re-allotting of existing spaces. This study will help in 

providing insight on the spatial distribution of car parks and baseline information for planners in managing their 

resources and possibly provide frame work for monitoring the inflow and outflow of cars for security purpose. 

However, there is need for adequate research that will provide imperial baseline information for effective 

management. The quest to achieve this, inform the objective of this work.

This work/research is trying to see and/or show how all the car parks in the study area is been utilized. 

Scholars have been done, as regards car parking e.g. how car park should be built with respect to lining of the park, 

measurement and numbers of exit that should be made available. Henry Clark and John Smith (1999), Adaramo A.J. 
et.al. (2013).

Scholars focus on discouraging people from coming to school environment with their private cars and making 

use of campus shuttle and the use of bicycle in order not to commit more land to parking and reduce the release of 
carbon dioxide into the atmosphere and put to check the numbers of accident occurring within the campus premises 
Parking Solution (sept.10 2013) and Parking on Campus.

Study on disable parking at the university of Leicester addressed the fact that in designing a car park, 

provision should be made for physically challenged people who are on wheel chair, ways and pattern of parking in an 
environment or in an organization discourage the habit of parking on the walk way. Yue W.L. and Young W. (1993) 
They further emphasize on the total adherence of the road signs and the traffic light. A study at the Department of 
Transportation Services: Parking Regulations, July 2015, University of Maryland. In these university, car parking is 
designed in a way that within the University premises both Staff, Faculties, Students, visitors and even retirees have 
their various parking lots and each were registered to their various parks. In the same University provision is made 
for Special Events parking and fines are designed to people/ cars that park in wrong parking spaces. Priyanka K., 
Meghna S. and Sanjay (2012).

TYPES OF PARKING

1. On street parking
2. Off street parking
3. Parallel parking
4. Right angle parking
5. Multiple level car parking. (etc.)

Fig 1: On street parking. Photo source: www.engineeringcivil.com
Fig 2: Off street parking. Photo source: www.engineeringcivil.com

Fig 3: Parallel parking. Photo source: www.engineeringcivil.com
Fig. 4: Right angle parking, photo source: www.engineeringcivil.com

Fig. 5: Multiple level car park. Photo source: www.szdaily.com
MATERIALS AND METHOD

Study Area

The study area is Obafemi Awolowo University (O.A.U.) campus (Academic area only) Ile-Ife, Osun State of Nigeria, which lies between Longitude 4° 31’1.427”E, and 7° 31’32.153”N and Latitude 4° 31’50.165”E and 7° 31’31.869”N. Study area is bordered on all sides by Ile – Ife town. (Fig. 1).

Fig.6 Map of the Study area

Data

Before taking any measures for the improvement of conditions, data regarding availability of parking space, extent of its usage and parking demand is essential. It is also required to estimate the parking fares also. Parking surveys are intended to provide all these information, since the duration of parking varies with different days. [13] The data used in this study includes: Car park names of Obafemi Awolowo University (O.A.U) academic area only, the designated name is based on the building they are affiliated to. Data on the car parks capacity and their various utility levels was taken for a period of one month. And the coordinate points of all car parks were also taken as part of field study (table 1). In the table below, it was observed that some car parks are assigned the value zero because it is either they are under construction (e.g. Jimoh Ibrahim post graduate school) or they are not designed to be car park (e.g. spider house 2, white house 3).

In the table below it was revealed that thirty seven locations were made use for parking while only twenty nine locations were designed for car parking by the school authority in the study area. The Utility level was calculated by getting the average of weekly count of each park within the hours of 7am to 12pm, divided by the real capacity multiplied by hundred i.e.

\[
\left( \frac{MDC}{RC} \times 100 \right)
\]

Where:-
MDC = Mean of week count.
RC = Real Capacity.

While the X and Y coordinate was taken using Hand-held GPS.
Table 1: Data: (Authors Field Work)

<table>
<thead>
<tr>
<th>CAR PARK NAME</th>
<th>CAPACITY</th>
<th>UTILITY LEVEL</th>
<th>X-CORDINATE</th>
<th>Y-CORDINATE</th>
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<tr>
<td>STUDENT UNION</td>
<td>30</td>
<td>34.4</td>
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<td>YELLOW HOUSE</td>
<td>26</td>
<td>28.2</td>
<td>667710.715</td>
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<td>17</td>
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<tr>
<td>NEW WHITE HOUSE</td>
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<td>28.9</td>
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<tr>
<td>FAC. OF ADMINISTRATION</td>
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<td>118.8</td>
<td>667933.744</td>
<td>831529.066</td>
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<td>14.6</td>
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<td>831606.182</td>
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<td>1500 SEATER LECTURE</td>
<td>22</td>
<td>4.4</td>
<td>667627.821</td>
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<td>ARCHITECTURAL</td>
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<td>831654.609</td>
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<td>831742.137</td>
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<td>831512.533</td>
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<td>13</td>
<td>13</td>
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<td>831701.511</td>
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<td>58</td>
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<tr>
<td>FACULT OF ENVIR. DESIGN &amp; MANAGEMENT</td>
<td>69</td>
<td>44.8</td>
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<td>MUSEUM</td>
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<td>831169.313</td>
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<tr>
<td>AJOSE</td>
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<tr>
<td>SPIDER BUILDING</td>
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<td>BOOA AND BOOC</td>
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<tr>
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<td>39</td>
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<td>831189.104</td>
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<tr>
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<td>76.4</td>
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<td>0</td>
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<tr>
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<tr>
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<td>JIMOH IBRAHIM P.G.SCHOOL PARK 1</td>
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<td>0</td>
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<td>831167.217</td>
</tr>
<tr>
<td>JIMOH IBRAHIM P.G.SCHOOL PARK 2</td>
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<td>0</td>
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<td>831078.348</td>
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<td>0</td>
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<td>831818.157</td>
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<td>WHITE HOUSE 3</td>
<td>0</td>
<td>0</td>
<td>667746.499</td>
<td>831545.508</td>
</tr>
</tbody>
</table>

Workflow

The data used for this research work was collected from both primary and secondary source. The primary data were coordinates of all the existing car parks (both authorized and unauthorized parks). Data were taken using hand-held Geographic Positioning Systems (GPS), while the capacity of the parks was also known through counting. The secondary data is a high resolution image of the study area which was captured from Google Earth. The high resolution image was snapped, mosaicked, geo-referenced and after this, the following features were digitized; roads, buildings and the car parks. Both information were stored in the Database.

From GIS analysis, the following map was generated: distributions of car parks, car parks and their capacity, and car parks with their utility level.
Fig. 7: Flow chart of work study
RESULTS AND DISCUSSION

In this map, all the car parks and their names were shown. It was observed that in the study area, (Academic area only) the school have twenty-nine authorized car parks; two are still under construction while six were unauthorized.
It was observed from this work that it is only one thousand five hundred and sixty-seven (1567) cars that can make use of the parks within the hours of 7:30am to 12:00 pm. It was also observed that department of Humanity car park has the largest car park capacity of one hundred and fifty-six (157) capacities while department of Architecture car park has the lowest of six capacities.

Fig. 10: Car park and their Utility level

It was observed in this study that almost 80% of all the car parks in the study area (Academic area only) were over-utilized i.e. (Administrative car park, Senate car park, Humanity car park etc.) While some were under-utilized i.e. (1500 Lecture theater car park, Spider Building car park, ICT Building car park etc.)

Fig. 11: Spatial Distribution Analysis of Car Parks
This analysis shows that the car parks within the study area are randomly distributed.

![Directional Distribution (standard Deviational Ellipse)](image)

Fig. 12: Directional Distribution (standard Deviational Ellipse)

The standard deviational ellipse show that majority of the car pack within the study area are less than 1km apart showing a very good directional distribution, making it possible for people within the campus community to at least have a closer park to their offices and classes.

**CONCLUSION**

The study showed that the car parks in the study area are randomly distributed. This is mostly based on the buildings' population, date of construction as well as their location. Random distribution is a good car park pattern for this campus community, based mostly on the spatial distribution of the roads. Some car parks were over utilized while some are under-utilized in areas. Wrong parking is also a common place in the campus community.

The study also reveals that no park in the entire campus community is dedicated to motorbikes, bicycles, and the physically challenged people.

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