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GIS Based Traffic Flow Analysis in King Abdulaziz University, Saudi Arabia

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Abstract: ***Some places or cities in developing countries suffer from a dearth of traffic statistics which is necessary for analysis of traffic situation and for proposing solutions to traffic problems in these places. King Abdulaziz University is an example of these places. It suffers from traffic congestion and long delays especially in the gates, which is an active student and academic movements and some streets which has the highest traffic because it connects many colleges, companies and stadiums at the university. This research aims to analyze the traffic situation in the king Abdulaziz University. It analyzes traffic counts collected at 14 gates and 20 different street segments. Based on the statistical analysis of these data, the results were presented in a map format, making it easy to interpret and quick to make decisions. The results display different levels of congestion and vehicular volume along digital traffic gates and streets. The results will be beneficial for agencies in charge of traffic conditions planning and management in King Abdulaziz University. GIS is powerful tool for both spatial and non-spatial data analyses. From the analysis, it can provide traffic data to transport planners in road controlling authorities in order to understand congestion better, determine its causes and priorities investment where it is most needed.***

Keywords: King Abdulaziz University, traffic counts, traffic congestion, GIS

1. Introduction

The adoption of modern technology in traffic management is necessary in order to manage the current traffic scenarios and to find the effective recommendations to the suffocating congestion and traffic accidents. Different techniques efforts are attempted by the researchers to tackle the problems of traffic congestion and route selection based on different attributes and is performed in different scenarios.

In their study, "GIS Based route optimization was performed in Kanchipuram city by conducting the traffic volume survey" [1] show how the GPS data was used to identify the spatial location of traffic congestion and other location based spatial information. Traffic scenario in the study area was needed to be upgraded due to severe traffic congestion, delay in travel time even in short distance. They identified the traffic volume at congested locations, developed a GIS database for the traffic volumes and determined alternate routes.

[2] performed research that involved a GIS modeling approach for the delivery of fresh vegetables. The problem that was targeted in this study was related to the spoiled vegetables due to the time wasted during traffic jams and congestions in unfavorable temperature and environment conditions in most areas within Kuala Lumpur. As vegetables are best when fresh so main target was to select the most suitable path for the delivery of orders. Moreover, efficient rout selection for delivery also saves time and fuel. A regression model was used in this research, and the variables like distance, car volume, school zones, residential areas and population density were considered however the results showed that distance was the most significant variable in the regression model.

[3] was developed a model that was basically depending on the speed of the vehicle at different times of the day. The model was able to find the minimum travelling time between two points on the map after giving starting time. The dataset was consisting the speeds of the vehicles at specific times of the days of week.

In their research**, [**4] was developed a model by integrating GIS application into cloud platform by using Microsoft Azure VM as cloud computing platform. They proposed a new concept of vehicle traffic management by combining vehicle resources, GIS technologies and cloud computing.

Another research for [5]was conducted that targeted bicycle traffic flow by studying the behavior of bicycle travel and clarifies the travel distance is the primary factor for the rider to consider. The psychological compensation effect caused by different travel environment was discussed. It was also advocated that street space quality played a vital role in selecting the route for riding.

The efforts of modern scientists have focused on developing a range of tools and techniques that they can use it to beat traffic challenges and to assist in planning and decision-making. (GIS-T) has evolved over the years as one of the most efficient tools for planning, research and transportation management [6].

[7], searched in her study the significance of real-time traffic information collected through GIS to optimize the routing of the vehicle within a dynamic random transport network. These characteristics would offer assistance for users and motorists to improve productivity and level of service as long as the web application allows them to interactively discover the optimal route for their destinations.

[8] established a GIS-based model to reduce travel distance and user travel time. Constraints were considered, as impediments of intersections, velocity and the sort of road. It is stated that GIS is an effective tool to solve those complex problems in an accurate and quick way.

[9] was proposed a dynamic shortest path algorithm in traffic networks based on the integration of GIS and real-time traffic conditions. It uses GIS for improving the

visualization of the urban network map and analysis of ambulance routing. The results advocated that dynamic routing of emergency vehicle is better as compared with static solutions already available. It was also illustrated that in the scenarios when roads incidents and serious traffic congestion occurred efficient routes are very critical. The main idea was to save the initial planed route and then by receiving the real time data only a part of the already defined path is changed. The reason behind such an approach was to decrease the computation cost of calculating he path from scratch and to increase the performance. A web application [10], was built by examining the value of real-time traffic information that was collected with the help of Geographic Information Systems. The goal of the application was to achieve optimal vehicle routing within a dynamically stochastic transportation network. The proposed algorithm was an updated form of Dijkstra's algorithm in order to incorporate stochastically changing traffic flows. The web application was developed for the users to interactively find the optimal path and in identifying destinations effectively.

In recent times the research related to creating and using maps, dramatically grabbed the attention of research community [11]. One of the main reasons of this trend is useful applications of cartography in combination with technology which is basically known as digital cartography served in many ways for the common people in their daily lives. Digital mapping provides many applications which includes: everyday navigation where people do not have to worry about the routes and paths, telecommunication companies plan customer-relationship and management of location services, traffic control and authorities perform hotspot analysis to predict accident locations by using GIS data, urban planning for growth and direction of expansion, environmental impact analysis, agricultural applications, disaster management and flood damage estimation, banking and taxation, community development and security and tracking.

[11] show that teachers and students are not the only beneficiaries of GIS, but administration can also use analytic capabilities of GIS to carry out their processes in an efficient and effective way. The integration of GIS in an appropriate way can strengthen the teaching of essential elements in geography and social studies. Currently the trend of using electronic mapping is not very much welcomed however it has a lot of potential. Many administrative tasks at campus and district level can be carried out by using electronic mapping. Like school bus routing can be done in an effective way so that time and resources can be saved. Boundary adjustment can be performed. New school construction sites can be systematically selected, Examining the safety and flow of sidewalks, streets, and transportation systems can be done. Placement of safety patrol and crossing guards can also be aided.

Raymond stressed the importance of GIS and explained that it helps the students to observe, explore and analyze the information by using graphical user interface and integrated tools. It helps the students to think and explore critically and to question which ultimately results in the formation of new ideas and open ways to explore and produce innovations. ESRI suggests that education can be enhanced using GIS. A reasonable and logical information framework can be built by teachers and students which can be supported and followed by community in the form of sharing their experiences and gain insight of the knowledge of the students. This kind of collaboration can benefit all the stakeholders: students, teachers, and community. Research findings suggest that GIS is a powerful tool to enhance the educational experiences of learners while further developing higher order thinking skills.

The study of [11] emphasizes the importance of the integration of GIS in the education sector and also presented some of the limitations and challenges that may prove as a barrier in the practical implementation. These barriers are:

- Unavailability of required hardware at the school.
- Insufficient training to use the existing hardware.
- Lack of software and support.
- Unavailability of dataset.
- Unskilled teachers to use GIS tools.
- Lack of opportunities to learn and develop skills.

GIS tools can be easily incorporated in all grades and subjects, which can support and enhance the learning and productive activities in the existing curriculum. Using these tools teachers and students will be able to explore and analyze information in new ways.

The concept presented by [12] is quite interesting, they believed that education sector especially universities have warmly welcomed the digital development. Now a days like everyone else students have access to fast wireless internet and they are managing their social activities, responsibilities, and different tasks digitally. Moreover, now the students have more options, like in the past only way to get information and details related to course was the classroom with a professor present in it. But digital transformation also created new ways of learning where the time restriction of specific lectures at specific times is removed. Now recorded lectures can easily be accessed from anywhere, which means physical presence is also not compulsory. The authors advocated that like all other activities that are possible through digital transformation the acquisition of information about the campus and place of learning of students can also be made interesting and attractive by introducing interactive maps where students can acquire spatial information about their campus in a similar, digital format. They presented also two interactive maps, the University of Wisconsin-Madison Interactive Campus Map and Lakeshore Nature Preserve Interactive Map. Basically, two different models were used for the representation of the same campus of university. The University of Wisconsin-Madison Interactive Campus Map works on way finding-based model to search for, navigate to, and retrieve information about specific features on campus while the Lakeshore Nature Preserve Campus Map is based on atlas-based model, the motive here is to provide various geographic features about different places on campus. It helps the students to understand the history and geography about the culture landscape.

The main objective behind the development of Wisconsin-Madison Interactive Campus Map was to give an easy access and attractive way to the stakeholders to access

university departments, buildings, resources, facilities, and way finding [12]. The potential users of these maps are: the students who are not familiar with the University of Wisconsin-Madison campus, and require general information about the spatial configuration of campus features and students and faculty who are already familiar with the spatial layout of campus, but they need specific details about one or more of its features. As far as the development is concerned it was performed by one full-time employee with an undergraduate degree in computer science and three students. Major part of the development was carried out using Flash 8 using ActionScript 2.0 (AS2); Adobe Illustrator CS2 and Adobe Photoshop CS2. Zoomify was integrated with AS2 to yield more efficient map navigation through raster tiling. The database used to store data was MySQL database and interface was developed using Ruby on Rails for the administration. The objective behind the development of second map Lakeshore Nature Preserve Interactive Map was to make available different graphic stories for the public awareness to legitimizing and solidifying the preserve as a vital fixture in the campus landscape. Development of this map started in June 2006 and completed in November 2006. Three students took part in the development ne working full-time and two part-time. Development was completed in Flash 8 using ActionScript 2.0; Adobe Illustrator CS2, Adobe Photoshop CS2 and ArcGIS 8.0 were also used for preparation of the data layers.

2. Description of Study Area and Data

2.1 Description of Study Area

Situated in the western part of Jeddah **Figure 1**, King Abdulaziz University is limited by seven (7) districts **Figure 2** and covers an area of 6 km^2. It was established in 1967, King Abdulaziz University is a private national university carrying the name of the establisher of Saudi Arabia. The university is located in the large city of Jeddah and it aims at spreading higher education in the western area of Saudi Arabia. King Abdulaziz University has more than 82, 000 students, with separate campuses for men and women. The university offers faculties in a wide range of subject areas, including mechanical engineering, medicine, pharmacy, dentistry, agriculture & forestry, art and design, humanities, business, law, sciences, . . . It also offers courses and programs leading to officially recognized higher education degrees such as pre-bachelor degrees, bachelor degrees, master degrees, doctorate degrees in several areas of study. In addition to offering a range of on-campus undergraduate and graduate programs, King Abdulaziz University also teaches a distance learning program.

King Abdulaziz University is located in an area of equal elevations, and we note that as we move west to east, the topography of the university increases. The lowest level of topography at King Abdulaziz University is 17 metres and the highest elevation is 58 metres **Figure 3**.

Figure 1: Location of the study area

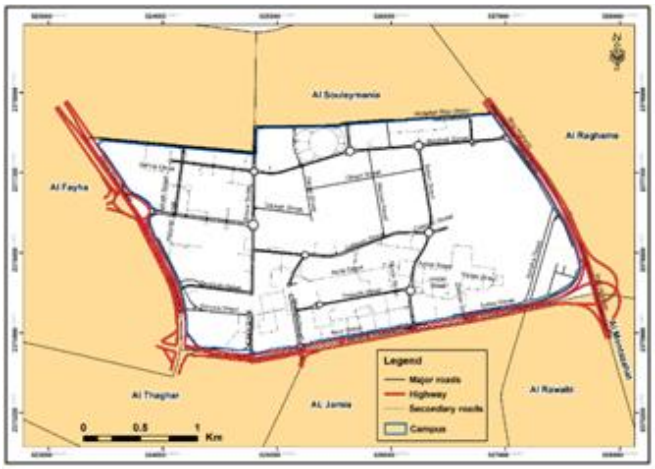

Figure 2: Districts around King Abdulaziz university

Figure 3: Digital Elevation Model of King Abdulaziz University

King Abdulaziz University contains many roads, including the main road and local subways. The University contains many roads, including one-way and two-way roads. It is located in the east, west and south of major roads (highway) of great importance in Jeddah city **Figure 4**.

We note that the roads surround the University of All Sides, and that the University has easy access to all the buildings and facilities, through the number of roads in the University. The length of all roads in the University is 50 km.

Figure 4: King Abdulaziz University Street

The University of King Abdulaziz contains many buildings, more than 450 buildings **Figure 5**, including teaching buildings, buildings for administrators and academics housing, buildings for the University's services and annexes like parking and student breaks, etc.

Figure 5: Facilities and building at King Abdulaziz University

2.2 Data

In this study many types of data were acquired:

1) Traffic volume count
2) X and Y Coordinates of gates
3) Name of streets in the study area
4) The Name of gates
5) Road network
6) Digital Elevation Model of King Abdulaziz University (SRTM-30m)
7) Data from Jeddah Municipality (Jeddah districts)

Data for the research were acquired from both primary and secondary sources. They included:

1) Street or Roads maps of King Abdulaziz University were extracted from the satellite image.
2) Traffic volume count for roads were obtained from field work
3) Gates were obtained from the field work (Gates name, coordinate, Traffic volume count) coordinates were collected by using Global Positioning System (GPS).
4) Building and all facilities in King Abdulaziz University were digitized based on satellite images from Google earth.
5) Topographic map of Jeddah at a scale 1: 50000was sourced from The Saudi Geological Survey (SGS).
6) United States Geological Survey (USGS) web site
7) Field work: The major important data (Traffic volume count) were collected during eight days (24h) for gates and during three days for roads at 2017.

3. Methodology

In the urban traffic system, there are various traffic data acquisition methods, such as detector, video, and radar. With the application of V2X communication, more traffic data can be collected from connected vehicles, infrastructure, and other traffic sensors. The data can then be fed to the traffic condition evaluation, prediction, and decision-making system. If the traffic management department can leverage real-time traffic information from V2X communication to induce traffic flow and reduce unnecessary travel time, the operational efficiency of the transport network can be improved.

In King Abdulaziz University, fourteen gates and tweenty segment roads are selected to examine their traffic condition by counting traffic volume through survey station that can be collect the number of vehicles that pass a certain point on a road or gates during a period of time. One week traffic condition summary, based on data collected from vehicle counting conducted as part of the survey conducted for this study.

To achieve our study objectives, we are going to adopt the datasets and analysis flowchart shown in **Figure 6**.

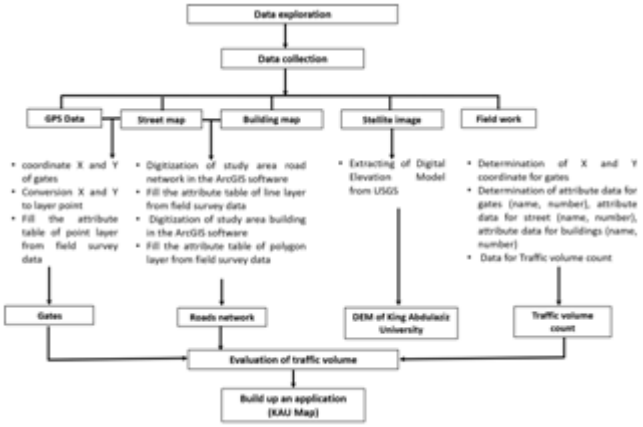

Figure 6: Datasets and analysis flowchart

3.1Data exploration

Data exploration is the first step in data analysis and typically involves summarizing the main characteristics of a dataset. It is commonly conducted using visual analytics tools, but can also be done in more advanced statistical software. Data exploration is an approach similar to initial data analysis, where by a data analyst uses visual exploration to understand what is in a dataset and the characteristics of the data. These characteristics can include size or amount of data, completeness of the data, correctness of the data,

possible relationships amongst data elements or files/tables in the data.

In our case, a primary inspection was carried out to recognize and document gates and street in the study area. This acquaints the researcher with the knowledge of the study area and furnish guide on how to source the data, the kind of data needed and plan the field work.

3.2 Data collection

Data collection is the process of gathering and measuring information on targeted variables in an established systematic fashion, which then enables one to answer relevant questions and evaluate outcomes. Data collection is a component of research in all fields of study including physical and social sciences, humanities, and business. While methods vary by discipline, the emphasis on ensuring accurate and honest collection remains the same. The goal for all data collection is to capture quality evidence that allows analysis to lead to the formulation of convincing and credible answers to the questions that have been posed. In this step we should identify kind of data which we need, where the data is coming from?

3.3 Geo referencing and digitizing the maps

All shape files take the same coordinate system, Universal Transverse Mercator (UTM) Global Coordinate System (GCS) projection and WGS 1984 Zone 37N datum was used. UTM system was selected because it is metric and has the ability to permit the researcher to calculate the distance, length and other measurement that may not be possible with geographic coordinate system. Three shape files were integrated into ArcMap and accorded the same coordinate system with the maps. Fields were generated for gates (name and the traffic volume count). The same thing for street, fields were created for name, type of the road, and traffic volume count.

3.4 Detail Field Work

Field research, field studies, or field work is the collection of raw data outside a laboratory, library, or workplace setting. The approaches and methods used in field research vary across disciplines. For example, A traffic count is an count of vehicular or pedestrian traffic, which is conducted along a particular road, path, or intersection. A traffic count is commonly undertaken either automatically (with the installation of a temporary or permanent electronic traffic recording device), or manually by observers who visually count and record traffic on a hand-held electronic device or tally sheet. There are two general methods for detecting passing vehicles and micromobility users: automatic and manual.

Automatic methods refer to the collection of vehicular and pedestrian data using automatic equipment. The equipment is designed to continuously record the presence, distribution, and variation of traffic flow. The data are recorded and reported for each individual detected observation or summarized by time periods (e.g., by 5 min., 15 min., hour of the day, daily counts).

Automatic methods include permanently installed or portable (typically, for less than 7 days) equipment. Automated methods are further classified as intrusive (i.e., the traffic detection sensor is placed on or under the road surface) or non-intrusive (i.e., there is no sensor on or under the road).

In this research Automatic methods are used to determine Vehicle Volume these are a detection technology which count each passing object, where in most cases an object is a vehicle, whether it is a car or multi-unit truck. In our case 18 automatic station records vehicle volume for 7 days in the study area.

Traffic counts can be used by local councils to identify which routes are used most, and to either improve that road or provide an alternative if there is an excessive amount of traffic. Also, some geography fieldwork involves a traffic count. Traffic counts provide the source data used to calculate the Annual Average Daily Traffic (AADT), which is the common indicator used to represent traffic volume. Traffic counts are useful for comparing two or more roads,

3.5 Data preparation

After the data collection diverse treatments are made to prepare data for analysis these preparations are;

- Vectorization of diverse layers such as (Campus limit, roads, buildings and facilities in KAU)
- Conversion of X and Y coordinates of gates to point layer under Arcmap
- Download of the DEM of King Abdulaziz University from the USGS web site

3.5 Data Integration

To achieve the objective of the research, different sets of data were used. These include the gates, university hospital, stadium, university buildings, road map and field survey. This data was imported, georeferenced to the same coordinate and datum, and integrated in the ArcGIS 10.2 environment for the analysis.

3.6 Data Analysis

Data analysis can help us to answer several questions and to provide details about traffic flow condition such as

- Identification which routes or gates are used most, then improve that road or provide an alternative if there is an excessive amount of traffic.
- Calculation of the Annual Average Daily Traffic (AADT), which is the common indicator used to represent traffic volume.
- Comparison two or more roads or gates,

4. Results and Discussion

Traffic volume count

Volume of traffic (Q): Is the number of vehicles that pass a certain point on a road during a period of time (veh. /hr.) (veh. /min.).

Types of measurement units:
* AADT: Annual Average Daily Traffic (veh. /day)
* ADT: Average Daily Traffic (veh. /day).
* HV: Hourly Volume (veh. /hr.)

In this part, we will study the traffic condition during entry and exit from the university gates and determine the peak hour per day according to the traffic count that was done during the period 01/10/2017-08/10/2017**Figure 7**, **Figure 8**, **Figure 9**and **Figure 10**. Through **Table 1** and **Figure 7**and **Figure 8**, we conclude that:

From Overlay analysis and data obtained from survey station it is found that gates number 1, 3 6, 7 records the highest average volume of traffic at entry peak hour in university from 1/10/2017 to 8/10/2017 whereas the gate number 6B records the lowest average volume of traffic at entry peak hour in university from the same period. The highest average Total daily entry of vehicle in university is recorded in gates number 1, 2, 5, 6, the lowest average Total daily entry of vehicle in university is recorded in gates number 8.

Table 1: Traffic volume count in King Abdulaziz university gates

Exit		Entry		Gates
Average Total daily traffic	Average peak hour traffic	Average Total daily traffic	Average peak hour traffic	
2773	1305	3246	869	1
2095	1133	2592	685	2
1692	1269	1760	1004	3
1587	453	1149	682	3A
1384	1114	1623	668	4
1502	1116	2088	637	5
2251	1317	2382	807	6
1127	908	950	547	6A
1028	562	933	500	6B
1356	724	1459	887	7
3689	937	**No data**	**No data**	7A
No data	**No data**	804	700	8
969	806	**No data**	**No data**	8A
1955	600	1995	600	16

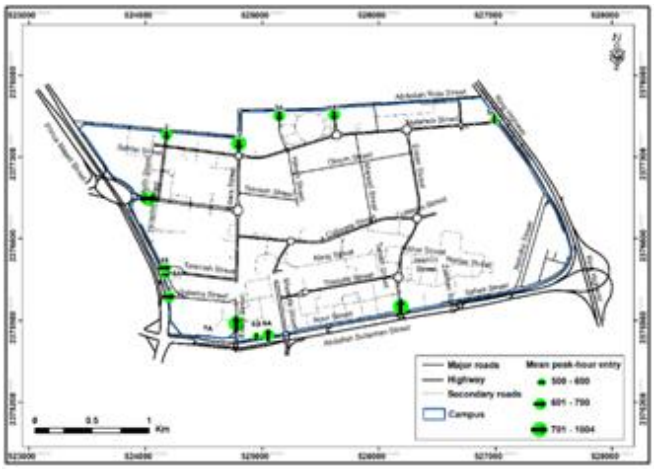

Figure 7: Map of traffic conditions in gates (Mean Peak hour vehicle entry

Figure 8: Map of traffic conditions in gates (Mean Total vehicle entry)

Through **Table 1** and **Figure 9**and **Figure 10,** we conclude that:

Gates number 1, 3 6 records the highest average volume of traffic at Exit peak hour out university from 1/10/2017 to 8/10/2017 whereas the gate number 3A records the lowest average volume of traffic at Exit peak hour out university from the same period. The highest average Total daily Exit of vehicle out university is recorded in gates number 7A, 1, 2, 16, the lowest average Total daily Exit of vehicle out university is recorded in gates number 8A.

We think that major causes of traffic congestion include: poor driving habits, work zones, inadequate road capacity, lack of parking facilities, poor traffic control/management, road side parking, special events, reluctant to use parking facilities and bus stop, lack of efficient public mass transport system.

Figure 9: Map of traffic conditions in gates (Mean Peak hour vehicle exit)

Figure 10: Map of traffic conditions in gates (Mean Total vehicle exit)

Analysis of roads traffic congestion

One of the most widely used approaches for estimating traffic congestion begins with Annual Average Daily Traffic (AADT) count data (Anderson et al., 2006). AADT is a measure used primarily in transportation planning and transportation engineering. It is the total volume of vehicle traffic on a road segment for one year, divided by 365 days. Importantly, however, due to limited resources and manpower, in this study we use Average Daily Traffic (ADT), this is the number of vehicles that pass a certain point on a road on a certain period of day divided by the number of days, in our case the period is three days. The ADT cannot practically be measured on every single road segment, not even within a single district. Consequently, researcher has focused on spatially extrapolating ADT counts from some road segment that selected randomly.

Traffic volume count

In King Abdulaziz, tweenty traffic corridors are randomly selected to examine their traffic condition by counting traffic volume. The corridors are numbered from 1 to 20. These roads will be studied one by one in the following parts. Three days traffic condition summary, based on data collected from 18 survey stations **Figure 11**implanted on every road segment selected for this study.

Figure 11: Survey station on selected traffic corridors in King Abdulaziz University

In this analysis, the traffic condition maps, as shown in **Table 2** and **Figure 12**, **Figure 13**, **Figure 14** and **Figure 15** was created using Arc GIS 10, The results of the analyses showed the traffic flow of the selected traffic corridors, highly, medium and low.

Figure 12: Map of traffic conditions in street segments (Mean Peak hour vehicle entry)

Table 2: Traffic volume count in King Abdulaziz university streets

Exit		Entry		Street segment
Average peak hour traffic		Average Total daily traffic	Average peak hour traffic	
2762	1500	3536	833	1
1633	734	815	797	2
1716	1112	2469	588	3
2546	1000	1959	1033	4
1890	1000	2123	1500	5
1793	1033	1582	866	6
1464	1424	1783	833	7
933	665	933	674	8
1500	319	866	829	9
1500	450	866	829	10
2217	1500	1805	833	11
933	467	1565	1500	12
966	682	966	665	13
1464	1424	1411	940	14
1701	800	1500	1395	15
1564	1394	1436	1066	16
2070	1500	2359	800	17
1823	866	1823	1266	18
1341	800	1343	833	19
940	800	1290	894	20

Through **Figure 12**and **Figure 13**we conclude that:

Al Malaeeb street, Al Takniya street, Azhar Street and colleges street records the highest average volume of traffic at entry peak hour in university from 29/09/2017 to 31/09/2017 whereas Al Marsad Street records the lowest average volume of traffic at entry peak hour in university from the same period. The highest average entry Total daily traffic is recorded in al Malaeeb street, Edara Street and al Ihtifalat street, the lowest average entry Total daily traffic is recorded in Al Marsad Street, Al Haseb street and Al Ouloum street.

Through **Figure 14** and **Figure 15** we conclude that:

Eskan street, Edara Street, Colleges Street records the highest average volume of traffic at Exit peak hour out university from 29/09/2017 to 31/09/2017 whereas the Haseb street, Al Ouloum street and Al Takniya street records the lowest average volume of traffic at Exit peak hour out university from the same period. The highest average Exit Total daily traffic is recorded in Edara Street, Al Maleeb street and Al Ihtifalat street, the lowest average entry Total daily traffic is recorded in Marsad Street and Al Takniya street.

Figure 13: Map of traffic conditions in street segments (Mean Total vehicle entry)

Figure 14: Map of traffic conditions in street segments (Mean Peak hour vehicle exit)

Figure 15: Map of traffic conditions in street segments (Mean Total vehicle exit)

5. Conclusion

This study shows the following conclusions:

1) GIS based analysis can be used as an effective tool for the Road Transportation and Management system for the vehicle routing and traffic congestion related studies.
2) More than three gates and six streets suffer from traffic congestion especially at entry and exit peak hour.
3) Through traffic analysis the highest numbers of gates which suffer from traffic congestion are located on western, northern and southern part of King Abdulaziz University.

The research made the following general policy and future research recommendations

1) Alternate transportation infrastructure, such as bus lanes, bike lanes can provide travel options outside private vehicles. Investment in public transportation can expand those options even further.
2) One of the easiest ways to improve traffic congestion is to remove the issue of congestion arising from too many people trying to travel at once on any given road. When a civil engineer's design offers alternative routes to the same destination, this can help reduce the number of vehicles in high-traffic areas. This allows all streets to share the load of traffic and reduces the number of times drivers wait in it.
3) Another solution is to reduce the number of lanes available to private vehicles, in favor of public transportation. By exchanging a few open roadway lanes for bus lanes, carpool lanes, or even sidewalks, a civil engineer's design can reduce the overall number of vehicles on the road, as some potential drivers may opt for another form of transportation that's cheaper or better fits their lifestyle.
4) Increased number of gates on streets with less traffic congestion, especially in the eastern and northern part of King Abdulaziz University.
5) Increased number of traffic men to regulate road traffic and university gates

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