COMPARISON OF LEVEL OF SERVICE OF PANTHAPATH SIGNAL DURING PEAK HOUR AND OFF PEAK HOUR USING HIGHWAY CAPACITY MANUAL

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A thesis submitted to the Department of Civil Engineering in partial fulfillment for the degree of Bachelor of Science in Civil Engineering

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147/I, Green Road, Dhaka-1215, Bangladesh

Section: 14C

Spring-2022

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BOARD OF EXAMINERS

The thesis titled "COMPARISON OF LEVEL OF SERVICE OF PANTHAPATH SIGNAL DURING PEAK HOUR AND OFF PEAK HOUR USING HIGHWAY CAPACITY MANUAL" submitted by Sahanaj Sultana, ABM Ariful Islam, Sree Niranjon Kumar, Fahim Bin Quddus, Md Sakib Khan, has been accepted as satisfactory in partial fulfillment of the requirement for the degree of Bachelor of Science in Civil Engineering on 21/05/2022.

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DECLARATION

We hereby declare that this report is our own work and effort and that it has not been submitted anywhere for any award. All the contents provided here is totally based on our own labor dedicated for the completion of the data collection of Level of Service study of the road lying near to our university.

Where other sources of information have been used, they have been acknowledged and the sources of information's have been provided in the reference section.

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Dedicated

to

"Our Parents"

And

"Teachers"

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ABSTRACT

The goal of traffic engineering is to safe, convenient and time efficient movement of people and goods on roadways. The three main parameters of a traffic flow are volume, speed and density. This study is on the Level of Service of the Panthapath Signal, Dhaka. In this study emphasis is given on traffic volume data collection and the different analysis are carried out. The interaction between moving vehicles under such heterogeneous traffic condition is highly complex. For better understanding of the present status of traffic flow at the junction, traffic survey is conducted. In peak hour Level of service (LOS) for North bound is E, for South Bound is F, for East bound is F and for West bound is F. Then off peak hour Level of service (LOS) for North bound is D, for South bound is D, for East bound is E and for West bound is E With the help of the data collection, it has made clear to understand the traffic patterns during different time periods. Hence the analysis from the present study are helpful in controlling the traffic flow at the intersection and also in suggesting some traffic management measures to improve the movement in this region.

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Chapter 1

INTRODUCTION

1.1 Background and Motivations

Traffic engineers and planners need information about traffic. They need information to design and manage road and traffic system. They use the information for planning and designing traffic facilities, selecting geometric standards, economic analysis and determination of priorities. They use this to justify warrant of traffic control devices such as signs, traffic signals, pavement markings, school and pedestrian crossings. The also use this information to study the effectiveness of introduced schemes, diagnosing given situations and finding appropriate solutions, forecasting the effects of projected strategies, calibrating and validating traffic models. Transportation system is a dynamic system. Information about traffic must be regularly updated to keep pace with ever-changing transportation system. Data must be collected and analyzed systematically to get representative information. Traffic surveys are the means of obtaining information about traffic. This is a systematic way of collecting data to be used for various traffic engineering purposes. (Abdulla Al Kayf, 2018)

The main purposes of traffic survey are: traffic monitoring, traffic control and management, traffic enforcement, traffic forecasting, model calibration and validating etc.

Level of Service determination of any intersection requires precise collection of different data such as: traffic speed, traffic volume, lane details etc.

Traffic speed: Speed is an important transportation consideration because it relates to safety, time, comfort, convenience, and economics. Spot speed studies are used to determine the speed distribution of a traffic stream at a specific location. The data gathered in spot speed studies are used to determine vehicle speed Percentiles, which are useful in making many speed-related decisions. Spot speed data have a number of safety applications, including the following:

1. Determining existing traffic operations and evaluation of traffic control devices
    a. Evaluating and determining proper speed limits
    b. Determining the 50th and 85th speed percentiles
    c. Evaluating and determining proper advisory speeds
    d. Establishing the limits of no-passing zones
    e. Determining the proper placements of traffic control signs and markings
    f. Setting appropriate traffic signal timing
2. Establishing roadway design elements
    a. Evaluating and determining proper intersection sight distance
    b. Evaluating and determining proper passing sight distance
    c. Evaluating and determining proper stopping sight distance
3. Assessing roadway safety questions
    a. Evaluating and verifying speeding problems
    b. Assessing speed as a contributor to vehicle crashes
    c. Investigating input from the public or other officials
4. Monitoring traffic speed trends by systematic ongoing speed studies
5. Measuring effectiveness of traffic control devices or traffic programs, including signs and Markings, traffic operational changes, and speed enforcement programs (Robertson, n.d.)

Traffic Volume: The purposes of carrying out traffic volume count are to determine existing traffic volume on a specific road or intersection. This helps in designing, improving traffic system, planning, management etc.

Lane details: This data includes the existing number of lanes, working lane width, existing curb size etc. This helps to redesign, improve, plan traffic network.

1.2 Research Objectives

- To determine existing traffic volume and speed during peak hour and off peak hour.
- To check the fluctuation of Level of Service during peak hour and off peak hour.

1.3 Organization of the study

In this study, the Level of service of Panthapath signal was determined and compared between the peak and off peak hour. The study has been divided into six chapters. They are:

- **Chapter 1- Introduction:** This chapter provides the background and motivations of the research. The overall objectives and expected outcomes are also described in this chapter.
- **Chapter 2- Literature Review:** This chapter provides the theoretical topics regarding roadway, traffic volume, level of service etc.
- **Chapter 3- Methodology:** This chapter includes the in depth discussion regarding data collection methods of this study.
- **Chapter 4- Results and Discussion:** This chapter provides the results obtained from the study and briefly discusses them.
- **Chapter 5- Conclusion and Recommendations:** This chapter concludes the obtained results and comments on further studies that can be done with the help of this study.
- **Chapter 6- References:** This chapter includes all the other researches and studies that helped to do this study.

Chapter 2
Literature Review

2.1 Introduction

Level of service is very effective approach to identify the existing traffic condition of any intersection. Numerous studies have been conducted by different researchers in which they describe the procedure about how to calculate the level of service using various methods.

The level of service has helped in determining various factors that can help us in deciding well that what can be the possible causes of the accidents. Also, it has helped us recognize those highways which are deadly. It helps to fight the problem of congestion and the hazards it can lead to. (Abdulla Al Kayf, 2018)

2.2 Traffic Volume Study

The term traffic volume study can be termed as traffic flow survey or simply the traffic survey. It is defined as the procedure to determine mainly volume of traffic moving on the roads at a particular section during a particular time. Traffic data are needed in research, planning, designing and regulation phases of traffic engineering and are also used in established priorities and schedules of traffic improvements. The traffic engineer must acquire general knowledge of traffic volume characteristics in order to measure and understand the magnitude, composition, and time and route distribution of volume for each area under his jurisdiction.

2.3 Parts of traffic studies

Traffic studies include:

- Inventory of road traffic physical features
- Traffic stream characteristics- volume, speed, density, occupancy studies etc.
- Capacity studies of streets and intersections
- System usage studies- Travel time and delay, O-D survey
- Travel demand- home interview survey

- Road users cost- Value of travel time, vehicle operating cost
- Parking supply & demand studies
- Mass transit performance and usage studies
- Traffic accidents studies
- Environmental impact studies of transport (Hossain, 2018)

2.4 Scope of Traffic Volume Studies:

The traffic volume count study is carried out to get following useful information:

- ❖ Magnitudes, classifications and the time and directional split of vehicular flows. Magnitude is represented by volume of traffic. Vehicles are classified into some predefined classes based on vehicle size and capacity. In a two-way road, vehicles moving towards two directions are counted separately to get the proportion. Time and directional split is useful to identify tidal flow.
- ❖ Proportions of vehicles in traffic stream. Proportion of vehicles indicates whether public or private transport dominates the traffic system. It also indicates the choice of road users.
- ❖ Hourly, daily, yearly and seasonal variation of vehicular flows. These variations are needed to establish expansion factors for future use. Using expansion factors, AADT can be calculated from short count.
- ❖ Flow fluctuation on different approaches at a junction or different parts of a road network system. (Hossain, 2018)

2.5 Level of Service

Level of Service is a part and frequently used term and concept of transportation planning in urban planning. A transport planner finds it useful for number of surveys. It helps in planning for existing and upcoming projects. The level of service in transportation has a big impact on how long your trip will take. Level of service (LOS) is a critical part of transport planning. The objective of LOS is to ensure that all travelers can reach their destinations on time, with the minimum level of discomfort and inconvenience. A level of service is a way to objectively measure the performance of transport systems. In most cases, it measures how well a system delivers a certain level of service. (Anon., 2020) (M. M. Khanam, 2019)

Table 1.1: Level of Service by V/C ratio *(Board, 2006)*

LOS Level	V/C ratio	Description	Control delay per vehicle for signalized intersections (S/veh)
A	⩽0.60	Highest driver comfort; free flowing	⩽10
B	0.60-0.70	High degree of driver comfort; little delay	>10-20
C	0.70-0.80	Acceptable level of driver comfort; some delay	>20-35
D	0.80-0.90	Some driver frustration; moderate delay	>35-55
E	0.90-1.00	High level of driver frustration; high levels of delay	>55-80
F	>1	Highest level of driver frustration; excessive delays	>80

- **A** is considered as the best quality of traffic where the driver can enjoy his drive with better flow and speed of their own choice. While level F stands for worst quality of traffic. A stands for free flow where the motorist has the ability to move between the lanes. There is a high level of physical and psychological comfort to the drivers.
- **B** stands for reasonable free flow where the speed of vehicles is maintained, flexibility for moving between the lanes within the traffic is slightly limited. There is a high level of physical and psychological comfort to the drivers.
- **C** stands for stable flow or near free flow. The mobility of changing lanes require driver's attention and is noticeably limited compared to other. Experienced drivers are comfortable. The minor occurrence may not have a great effect but service will show noticeable effects and there is a chance of traffic delays.
- **D** signifies proceed towards the unstable flow. Speed decreases as the number of vehicles slightly increase. Freedom for changing the lanes within the traffic stream is quite limited and the drivers level of comfort decreases. Minor occurrence on the roads can create delays for the others. This is usually found common on urban streets during the time of peak hours.
- **E** is unstable Flow because of the lesser or unusable gaps, the flow becomes irregular and the speed can increase or decrease. The traffic rarely reaches to its appropriate limit or suggested limit. Speed is nearby or above 50 ml/h. Shockwave is created when there is change is lane or merging of traffic. Any accidents may cause a noticeable delay. Level of comfortability in this flow

becomes poor for the driver. In urban areas usually, we face this problem because of the road congestion which cannot be changed.

- **F** leads to a breakdown of the flow. The time for traveling is not predicted, usually, it takes more than its capacity. A Highway may face **Level of Service** D during its busy hours with C some days and F at other days or once in a week. (Anon., 2020) (S.M. Mim, 2020)

2.6 Highway Capacity

Highway capacity is associated with traffic volume and traffic density.Traffic volume is the number of vehicles passing a given point on a roadway during a specified time period. This is usually expressed as vehicles per hour. (Board, 2006)

2.7 Importance of the Concept of Highway Capacity

- The capacity of a highway should be adequate to serve the needs of the projected traffic.
- The class of highway, lane width, number of lanes and intersections are dependent on capacity.
- Improvements on geometric elements, traffic control devices and traffic management measures can be effectively planned based on the studies of highway capacity.

The adequacy of the existing highway network for the existing traffic volume can be assessed by capacity studies; transportation planning can be done effectively using this information.

Chapter 3
Methodology

3.1 Introduction

The methodology in a research paper, thesis paper or dissertation is the section in which the actions done to investigate and research a problem and the rationale for the specific processes and techniques used within the research to identify, collect and analyze information that helps you understand the problem is described.

3.2 Methodology Overview

Location: A field survey is conducted at the Panthapath Signal. We stood by the side of the road and different vehicles were counted by different persons. We selected one enumerator among us who was in charge of time. She commanded us when to jump from current time step we were working to next time step.

Date: Data for volume study was collected on 22 February 2022. It was Tuesday.

Time: Time of data collection for volume study was from 9:00 to 10:00 am and 12.00 to 1:00 pm.

Weather Condition: It was initially a sunny day and the temperature was 28°C.

Observation: Classified Vehicle Counts.

Method: Direct Manual Method.

Duration: 15 minutes (Short Count)

Equipment: Stop watch, Tally sheet, Pencil, video camera etc.

Number of Enumerators: Five.

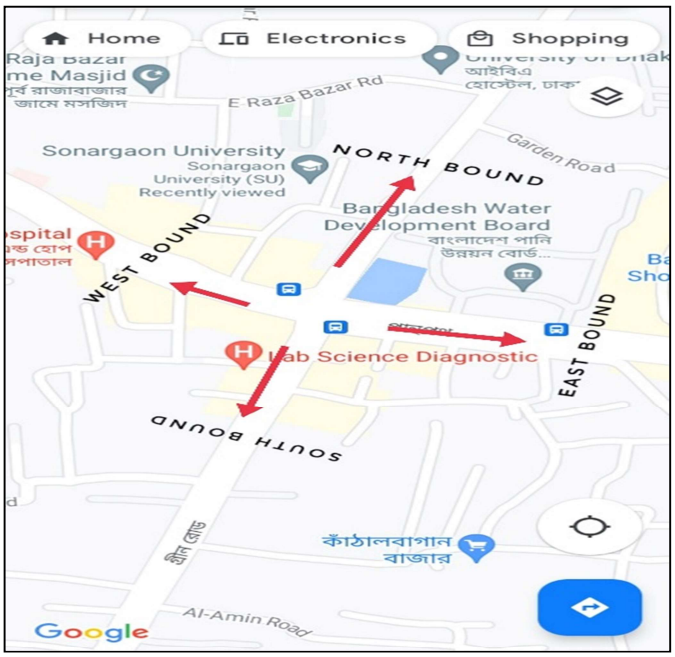
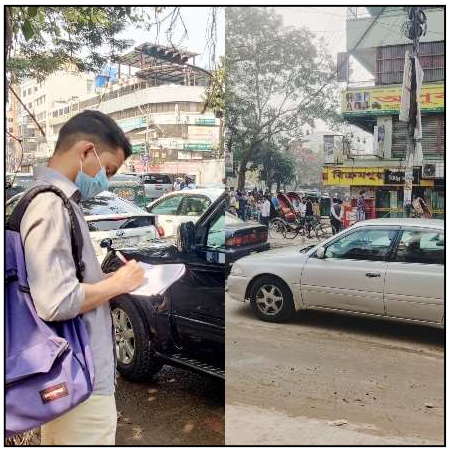


Figure 3.1: Study area



(a)

(b)

(c)

Figure 3.2: (a), (b), (c) Data collection from the study area

3.3 Summary

At first the data collection methodology was discussed at the university and then the data was collected for 15 minutes (Peak Hour) & 15 minutes (Off Peak Hour) from the above mentioned road during a regular day which was then converted to one hour dataset.

Peak hour was 9:00 to 10.00 AM and off peak hour was 12:00 to 1.00 PM. From this survey the number of vehicles, vehicles speeds, vehicles spacing etc were obtained.

After the collection of data, all these data were converted in terms of PCU (Passenger Car Unit) by multiplying it with its corresponding PCU factor.

Chapter 4
Results and Discussion

4.1 Introduction

This chapter presents the findings of the research. The discussion on the results can be presented in this chapter also. The discussion of results can also be presented in a separate chapter. If the findings are distinct enough, the results can be presented in more than one chapter also. The results should be organized as per the specific aims mentioned in Chapter 1.

4.2 Obtained Data and Calculation

Peak Hour Data

Table 4.1: Determination of total volume in terms of PCU in peak hour

Vehicle	North	South	East	West	Total Vehicle	Percentage
Bus	6	3	5	10	24	2
Car	45	51	96	89	281	27
Microbus	15	18	23	21	77	7
Pickup	12	6	15	15	48	5
CNG	25	39	93	68	225	21
Utility	5	8	5	4	22	2
Motorcycle	55	60	79	82	276	26
Bicycle	12	26	30	29	97	9
					1050	

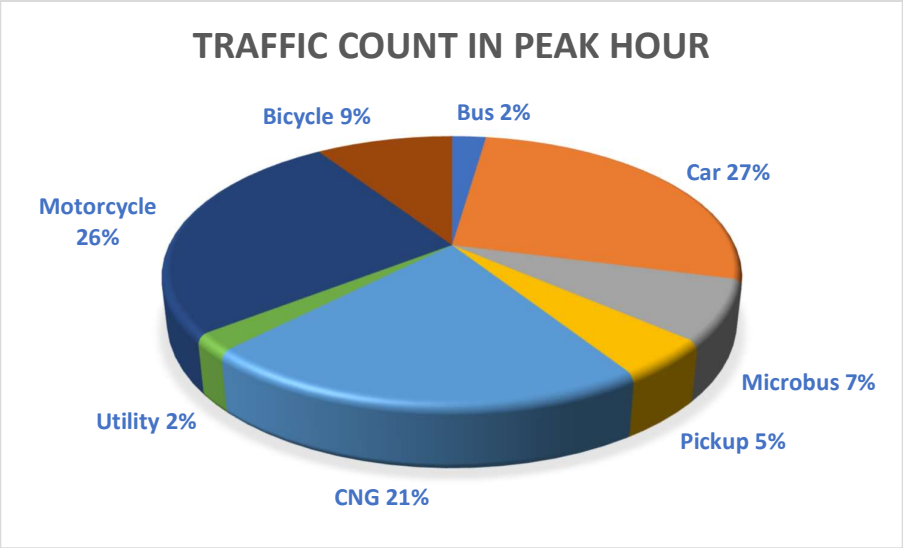


Figure 4.1: Traffic Count in Peak Hour

Off Peak Hour Data

Table 4.2: Determination of total volume in terms of PCU in off peak hour

Vehicle	North	South	East	West	Total Vehicle	Percentage
Bus	5	8	2	4	19	3
Car	32	33	65	55	185	26
Microbus	14	15	11	16	56	8
Pickup	13	5	12	9	39	5
CNG	21	36	57	45	159	22
Utility	2	1	3	1	7	1
Motorcycle	47	56	44	46	193	27
Bicycle	15	17	20	7	59	8
					717	

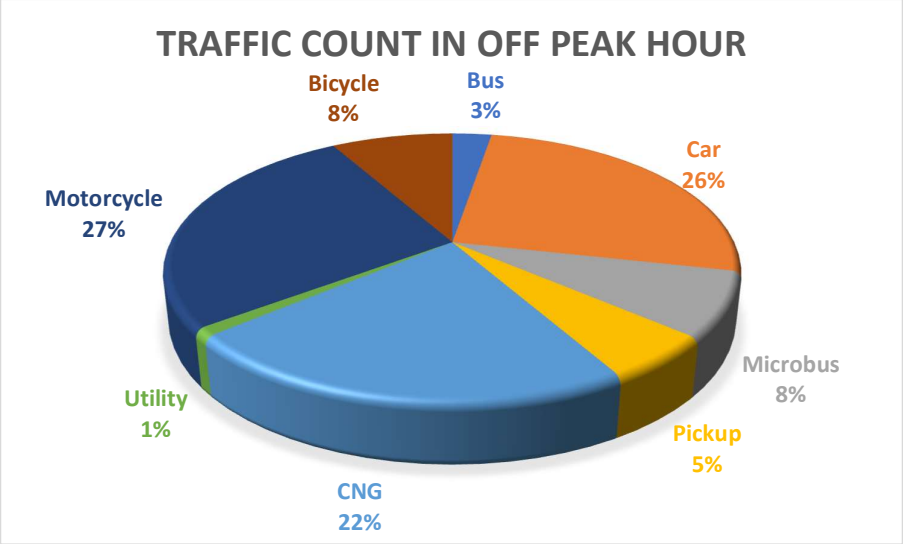


Figure 4.2: Traffic Count In Off Peak Hour

4.2.1 Peak Hour Level Service Determination (9am-10am)

4.2.1.1 North Bound

Table 4.3: North Bound Peak Hour Vehicle

Vehicle	Veh/15 min	Veh/hr	PCU Factors	Total
Bus	6	24	3	72
Car	45	180	1	180
Microbus	15	60	3	180
Pickup	12	48	3	144
CNG	25	100	0.75	75
Utility	5	20	1	20
Motorcycle	55	220	0.75	165
Bicycle	12	48	0.5	24
				860

Volume Capacity Ratio Calculation:

Total Volume (PCU) =860

Average center to center spacing of vehicle,

$S=0.278vt+\frac{v2}{254\mu}+L$

$=0.278*16*2.5+\frac{(16)^2}{254*0.4}+4$

= 17.64

Capacity = $\frac{1000v}{s}$

$=\frac{1000*16}{17.64}$

= 970.03

Volume Capacity Ratio (V/C) = $\frac{Volume}{Capacity}$

$=\frac{860}{907.03}$

= 0.948

Here,

Average vehicle speed V=16 km/hr

Reaction Time t = 2.5s

Average length of vehicle L= 4m

Co-efficient of friction μ= 0.4

4.2.1.2 South Bound

Table 4.4: South Bound Peak Hour Vehicle

Vehicle	Veh/15 min	Veh/hr	PCU Factors	Total
Bus	3	12	3	36
Car	51	204	1	204
Microbus	18	72	3	216
Pickup	6	24	3	72
CNG	39	156	0.75	117
Utility	8	32	1	32
Motorcycle	60	240	0.75	180
Bicycle	26	104	0.5	52
				909

Volume Capacity Ratio Calculation:

Total Volume (PCU) = 909

Average center to center spacing of vehicle,

$S=0.278vt+\frac{v2}{254\mu}+L$

$=0.278*15*2.5+\frac{(15)^2}{254*0.4}+4$

= 16.64

Here

Average vehicle speed V=15 km/hr

Reaction Time t = 2.5s

Average length of vehicle L= 4m

Co-efficient of friction μ= 0.4

$\text{Capacity} = \frac{1000}{s}$

$= \frac{1000*15}{16.64}$

= 901.44

$\text{Volume Capacity Ratio (V/C)} = \frac{Volume}{Capacity}$

$= \frac{909}{901.44}$

= 1.008

4.2.1.3 East Bound

Table 4.5: East Bound Peak Hour Vehicle

Vehicle	Veh/15 min	Veh/hr	PCU Factors	Total
Bus	5	20	3	60
Car	96	384	1	384
Microbus	23	92	3	276
Pickup	15	60	3	180
CNG	93	372	0.75	279
Utility	5	20	1	20
Motorcycle	79	316	0.75	237
Bicycle	30	120	0.5	60
				1496

Volume Capacity Ratio Calculation:

Total Volume (PCU) = 1436

Average center to center spacing of vehicle,

$S=0.278vt+\frac{v2}{254\mu}+L$

$=0.278*14*2.5+\frac{(14)^2}{254*0.4}+4$

= 15.66

Capacity $=\frac{1000v}{S}$

$=\frac{1000*17.33}{18.99}$

= 912.59

Volume Capacity Ratio (V/C) $=\frac{Volume}{Capacity}$

$=\frac{1496}{912.59}$

= 1.67

Here,

Average vehicle speed V=17.33 km/hr

Reaction Time t = 2.5s

Average length of vehicle L= 4m

Co-efficient of friction μ= 0.4

4.2.1.4 West Bound

Table 4.6: West Bound Peak Hour Vehicle

Vehicle	Veh/15 min	Veh/hr	PCU Factors	Total
Bus	10	40	3	120
Car	89	356	1	356
Microbus	21	84	3	252
Pickup	15	60	3	180
CNG	68	272	0.75	204
Utility	4	16	1	16
Motorcycle	82	328	0.75	246
Bicycle	29	116	0.5	58
				1432

Volume Capacity Ratio Calculation:

Total Volume (PCU) = 1432

Average center to center spacing of vehicle,

$S = 0.278vt + \frac{v2}{254\mu} + L$

$= 0.278*14*2.5 + \frac{(14)^2}{254*0.4} + 4$

$= 15.66$

$\text{Capacity} = \frac{1000v}{S}$

$= \frac{1000*14}{15.66}$

$= 893.99$

$\text{Volume Capacity Ratio (V/C)} = \frac{Volume}{Capacity}$

$= \frac{1432}{893.99}$

$= 1.60$

Here,
Average vehicle speed V=14 km/hr
Reaction Time t = 2.5s
Average length of vehicle L= 4m
Co-efficient of friction μ= 0.4

4.2.2 OFF Peak Hour (12pm-1pm)

4.2.2.1 North Bound

Table 4.7: North Bound off Peak Hour Vehicle

Vehicle	Veh/15 min	Veh/hr	PCU Factors	Total
Bus	5	20	3	60
Car	32	128	1	128
Microbus	14	56	3	168
Pickup	13	52	3	156
CNG	21	84	0.75	63
Utility	2	8	1	8
Motorcycle	47	188	0.75	141
Bicycle	15	60	0.5	30
				754

Volume Capacity Ratio Calculation:

Total Volume (PCU) = 754

Average center to center spacing of vehicle,

$S = 0.278vt + \frac{v2}{254\mu} + L$

$= 0.278*22*2.5 + \frac{(22)^2}{254*0.4} + 4$

$= 24.05$

$\text{Capacity} = \frac{1000v}{s}$

$= \frac{1000*22}{24.05}$

$= 914.76$

$\text{Volume Capacity Ratio (V/C)} = \frac{Volume}{Capacity}$

$= \frac{754}{914.76}$

$= 0.82$

Here,

Average vehicle speed V=22 km/hr

Reaction Time t = 2.5s

Average length of vehicle L= 4m

Co-efficient of friction μ= 0.4

4.2.2.2 South Bound

Table 4.8: South Bound off Peak Hour Vehicle

Vehicle	Veh/15 min	Veh/hr	PCU Factors	Total
Bus	8	32	3	96
Car	33	132	1	132
Microbus	15	60	3	180
Pickup	5	20	3	60
CNG	36	144	0.75	108
Utility	1	4	1	4
Motorcycle	56	224	0.75	168
Bicycle	17	68	0.5	34
				782

Volume Capacity Ratio Calculation:

Total Volume (PCU) = 782

Average center to center spacing of vehicle,

$S = 0.278vt + \frac{v2}{254\mu} + L$

$= 0.278*24*2.5 + \frac{(24)^2}{254*0.4} + 4$

$= 26.35$

Capacity $= \frac{1000}{s}$

$= \frac{1000*24}{26.35}$

$= 910.82$

Volume Capacity Ratio (V/C) $= \frac{Volume}{Capacity}$

$= \frac{782}{910.82}$

$= 0.86$

Here,
Average vehicle speed V=24 km/hr

Reaction Time t = 2.5s

Average length of vehicle L= 4m

Co-efficient of friction μ= 0.4

4.2.2.3 East Bound

Table 4.9: East Bound Off Peak Hour Vehicle

Vehicle	Veh/15 min	Veh/hr	PCU Factors	Total
Bus	2	8	3	24
Car	65	260	1	260
Microbus	11	44	3	132
Pickup	12	48	3	144
CNG	57	228	0.75	171
Utility	3	12	1	12
Motorcycle	44	176	0.75	132
Bicycle	20	80	0.5	40
				915

Volume Capacity Ratio Calculation:

Total Volume (PCU) = 915

Average center to center spacing of vehicle,

$S=0.278vt+\frac{v2}{254\mu}+L$

$=0.278*20*2.5+\frac{(20)^2}{254*0.4}+4$

$= 21.84$

Capacity $=\frac{1000v}{s}$

$=\frac{1000*20}{21.84}$

$= 915.75$

Volume Capacity Ratio (V/C) $=\frac{Volume}{Capacity}$

$=\frac{915}{915.75}$

$= 0.99$

Here,

Average vehicle speed V=20 km/hr

Reaction Time t = 2.5s

Average length of vehicle L= 4m

Co-efficient of friction μ= 0.4

4.2.2.4 West Bound

Table 4.10: West Bound off Peak Hour Vehicle

Vehicle	Veh/15 min	Veh/hr	PCU Factors	Total
Bus	4	16	3	48
Car	55	220	1	220
Microbus	16	64	3	192
Pickup	9	36	3	108
CNG	45	180	0.75	135
Utility	1	4	1	4
Motorcycle	46	184	0.75	138
Bicycle	7	28	0.5	14
				859

Volume Capacity Ratio Calculation:

Total Volume (PCU) = 859

Average center to center spacing of vehicle,

$S=0.278vt+\frac{v2}{254\mu}+L$

$=0.278*19*2.5+\frac{(19)^2}{254*0.4}+4$

$= 20.76$

Capacity $=\frac{1000v}{s}$

$=\frac{1000*19}{20.76}$

$= 915.22$

Volume Capacity Ratio (V/C) $=\frac{Volume}{Capacity}$

$=\frac{859}{915.22}$

$= 0.94$

Here,

Average vehicle speed V=19 km/hr

Reaction Time t = 2.5s

Average length of vehicle L= 4m

Co-efficient of friction μ= 0.4

Table 4.11: Level of Service of different direction for Peak and off Peak hour

Peak Hour			Off Peak Hour		
Bound	**Ratio**	**LOS**	**Bound**	**Ratio**	**LOS**
North	0.948	E	North	0.82	D
South	1.008	F	South	0.958	D
East	1.67	F	East	0.99	E
West	1.60	F	West	0.94	E

4.3 Summary

From the analysis we can see that the existing roadway condition is not suitable for free flow of traffic. The level of service is not that good and this will cause discomfort to the passengers. Although the off peak hour condition is slightly improved than the peak hour condition. The peak hour condition is mostly due to surge of traffic on that area. Again, the North-South roadway performs slightly better than the East-West roadway. This is due to the bigger traffic volume on the East-West roadway than North-South.

Chapter 5
Conclusion and Recommendations

5.1 Conclusions

The ultimate goal of this research was to analyze the Level of service of the Panthapath signal during peak hour and off peak hour. The letter "F" represents that the Level of service in this intersection is not ideal. The road will have traffic jam and cause driver frustration and time waste. This congestion problem is merely a reflection of the existing traffic operating condition of the city. Though in the off peak hours the traffic conditions improves slightly and becomes D type but that's not enough for smooth traffic maneuver. Between the two traffic ways the North-South roadway performs slightly better than the East-West roadway. This is due to heavy traffic volume in the East-West roadway and narrowing of the road way due to illegal parking of vehicles.

5.2 Limitations and Recommendations for Future Works

Level of Service of an existing roadway is an important part of traffic studies is necessary for planning and management. Further studies are required to get thorough knowledge on the roadway condition. Uses of advanced scientific methods and technologies regarding traffic studies are required to get more precise data. Traffic volume should be reduced by introducing better public transportation facilities. Furthermore, this research recommends proper planning, designing of a road networking by analyzing the current roadway capacity and future demand. Local Government Authority, Roads and Highways Department should take proper management initiatives to improve the existing roadway condition.

References

Abdulla Al Kayf, L. F. A. P. A., 2018. Estimating Traffic Volume to Identify the Level of Service in Major Intersections of Rajshahi, Bangladesh. *Lupine Publishers.*

Anon., 2020. *Planning Tank.* [Online]
Available at: https://planningtank.com/transportation/level-of-service

Board, T. R., 2006. *Highway Capacity Manual.* Washington: s.n.

Hossain, S. D. &. Z., 2018. TRAFFIC VOLUME STUDY of Bangladesh. *Academia*.

M. M. Khanam, M. M., 2019. Determination of the Level of Service at Major Intersection: A Case Study on Traffic More Intersection Area, Pabna, Bangladesh. *Proceedings of International Conference on Planning, Architecture and Civil Engineering.*

Robertson, H. D. 1., n.d. *Robertson, H. D. 1994. Spot Speed Studies..* s.l.:Robertson, H. D. 1994. Spot Speed Studies. In Manual of Transportation Engineering Studies, ed. H. D. Robertson, J. E. Hummer, D. C. Nelson. Englewood Cliffs, N.J.: Prentice Hall, Inc., pp. 33–51..

S.M. Mim, M. A. S. N. N. N. A. S. F. T. S., 2020. *Determination of Level of service of selected intersections in dhaka city using HCM.* s.l., s.n.