Improvement of an Existing Roadway Based on Economic Aspect: The Case of the Ashulia Intersection

A Project and Thesis submitted in partial fulfillment of the requirements
for the Award of Degree of

Bachelor of Science in Civil Engineering

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APPROVAL

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DEDICATION

Dedicated To Our Family Members

Abstract

Urban regions' growing traffic volumes are having a number of unfavorable repercussions. This study aims to provide a traffic management technique that improves traffic performance on distributor highways under saturated conditions like congestion or air pollution emission. One of the biggest issues in today's transportation system is traffic congestion, particularly on side-by-side curve roads like Ashulia Bazar where there is a conflict of movements between the cars that come from each of its arms. The car direction will shift on a route with parallel curves. Change to a straight road to avoid traffic congestion.

In this investigation, the author utilized VISSIM software's traffic simulation to forecast the lines. The outcomes have been contrasted with the actual outcomes at the site. On August 10, 2022, a survey employing the traffic counting approach was conducted to gather primary data. The analysis's findings show that the average VISSIM line is 122 meters long and the average observation queue is 85 meters. The simulation and the actual findings are found to be identical in all essential respects.

There is, nevertheless, a noticeable difference in the results' deviance. While the average traffic congestion on the side-by-side curve route has less delays overall, the impact on public transportation stays about the same. However, the proposed top-level controller, for which several recommendations have been made, has performed even worse than the coordinated fixed-time controller.

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CHAPTER 1

INTRODUCTION

1.1 Background And Research:

Urban road traffic congestion has remained a prominent issue in cities all over the world. Utilizing traffic simulation software is necessary for the execution of the traffic control measures. Software for different traffic simulations is available. Several of them make use of wireless sensors that can be combined with IVS (ITS). Geographic Information Systems were also connected with the others (GIS). The use of computer software to simulate traffic flow on a road network is known as traffic simulation. An essential technique for assessing the various traffic management options available is simulation of the traffic systems. Numerous research has used traffic simulation software to address the issues with road traffic in various places. The road system in Beijing, China, was simulated using the VISSIM program [1].

On the basis of journey time, speed, queue length, and delay, a number of traffic management scenarios were constructed and assessed. The best option, they discovered, was one-way street management in the central business district. The VISSIM program was utilized in different research [2] to calibrate different traffic situations in Chennai, India. Traffic volume, traffic mix, speed, and signal timing were among the information gathered. They used VISSIM's Visual C++ interface to calibrate the model. Driving behavior, target speed, and acceleration were among the factors calibrated. Based on the analysis of variance, sensitivity analysis was carried out (ANOVA). VISSIM software was used to investigate delay and queue length for an alternative junction design super street [3].

For each design, they used 36 traffic flow scenarios. They asserted that the super street junction design reduced wait times and line length when compared to traditional designs. They discovered that the wait length was reduced by roughly 97.5% while the latency was reduced by 27.39% to 82.26%. Using the VISSIM program, saturation flow and the delay model were created for intersections in Bangalore, India [4]. They claimed that the junction delay could be decreased and that the VISSIM traffic simulation findings were valid. At three crossings at Rivet Stretch, Pune, India, VISSIM software was also used to simulate traffic [5]. They discovered that the journey time may be decreased by adding signals at the roundabout and employing improved signal timings. In different research [6], traffic signal timings were optimized using VISSIM software at a signalized crossroads in CUKUROVA University to shorten wait times and minimize delays. To decrease the amount of time lost and car emissions, they recommended lengthening the green period. On the calibration procedure and comparisons of the various traffic simulation software, several research have been conducted. To enhance the calibration process of the VISSIM model, an effective technique was created [7]. To implement an auto-calibration strategy, they used the particle swarm optimization (PSO) technique. They claimed that the two core elements of the traffic micro-simulation were the automobile following and lane change models. An approach for calibrating vehicle class-wise driving behavior in a diverse traffic environment in Kolkata, India, was established by a study that is comparable [8]. They used the VISSIM program to simulate the research area. Based on a general method, they applied single- and multi-criteria calibration techniques.

The performance metric used was the trip time of the vehicle. 11 software traffic simulators were compared, including AIM SUM, ARCHAISM, CORSIM, MATSIMA, MITSIMLAB, PARAMICS, SIMTRAFFIC, SUMO, TRANSIMS, TRANSMODELER, and VISSIM [9]. They discovered that the AIMSUN, PARAMICS, and VISSIM simulators were more versatile than the other simulators in terms of the coding flexibility in the various infrastructure parts. In contrast to wealthy nations, developing nations like Indonesia have a variety of vehicle types and unique road traffic features. The majority of the traffic is made up of motorbikes, which make up around 80% of the flow. As a result, during the calibration procedure, traffic simulation software like VISSIM must take this circumstance into account. In research on traffic management, the VISSIM program is frequently utilized.

The VISSIM program was used in this study to examine the signalized traffic at the junction of Udayana University Sudirman Campus in Denpasar City, Bali, Indonesia. Bali province's capital, Denpasar City, is witnessing a significant population expansion, primarily due to urbanization. The number of motor vehicles has increased in response to this population growth. Traffic congestion in Denpasar has gotten worse as a result of rising traffic. Nearly all signalized crossings in the center of the city have lengthier lines and delays.

The simulation is quite helpful and can depict how traffic moves on the road in real time. Due to the university's automobiles, the signalized junction at Udayana University Sudirman Campus frequently has long lines and delays. To overcome the issue, a number of traffic control techniques need to be examined. The VISSIM program was utilized in this study to make it easier to evaluate the effectiveness of the junction signal and potential intersection settings.

In order to simulate tiny multi-modal traffic, public transportation, and pedestrians, PTV PLANUNG Transport VERKEHR AG in Karlsruhe, Germany, created VISSIM. The most sophisticated tool for simulating multi-modal traffic flows, including those involving automobiles, trucks, buses, motorcycles, bicycles, and pedestrians, is called VISSIM.

1.2 Objective:

a. This study's goal is to pinpoint the features of traffic jam that happened on particular arterial road segments within the Dhaka Ashulia bazar area.

b. To identify the traffic jam reason.

c. To determine cost of new project.

d. To design a new road.

e. To determine delay time and queue length.

1.3 Research purpose

a. To establish how long the line was at the toll booth before and after the ramp off on the AMPLAS fly over was built.
b. To establish the ideal AMPLAS toll booth service period
c. To use the current system to assess the capacity and service level of the toll gate leading into AMPLAS. The study' findings are used to decide whether AMPLAS can accept cars that comply with Minimum Service Standards at the toll gate (MSS)
d. Offer guidance in the form of a policy to shorten the line at the AMPLAS toll booth. The proposal is made in the form of a VISSIM software simulation of the length of the line at the AMPLAS tollgate.

1.4 Area of study

In order to determine the location of the building where the camera should be installed in order to record the traffic data, a reconnaissance study was carried out starting on August 10, 2022. The busiest times at these intersections were in the morning from 7:00 to 8:00, during midday from 1:00 to 2:00, and in the evening from 5:00 to 6:00. For the month of August 2019 at both the Khejur Bagan junction and the Ashulia bazar crossroads, traffic volume data was collected for 3 hours. At the junction of Ashulia Bazar and Khejur Bagan, a video graphic survey has been finished.

Since there is no suitable elevated location near the Ashulia Bazar intersection, the survey is carried out from the ground level. But at the Khejur Bagan intersection, there is a raised area where you can count the number of moving vehicles. In the result and analysis area, sum them all together to display the volume with percentage data after converting the numbers to PCU/hr. The Transportation Engineering Lab at Daffodil International University has a student version of VISSIM, which is utilized as a microsimulation tool for calibrating and validating the model. Manually gathered geometric data from the survey region were used to create linkages and connectors in VISSIM. In the image, you can see the intersections of Ashulia Bazar and Khejur Bagan.

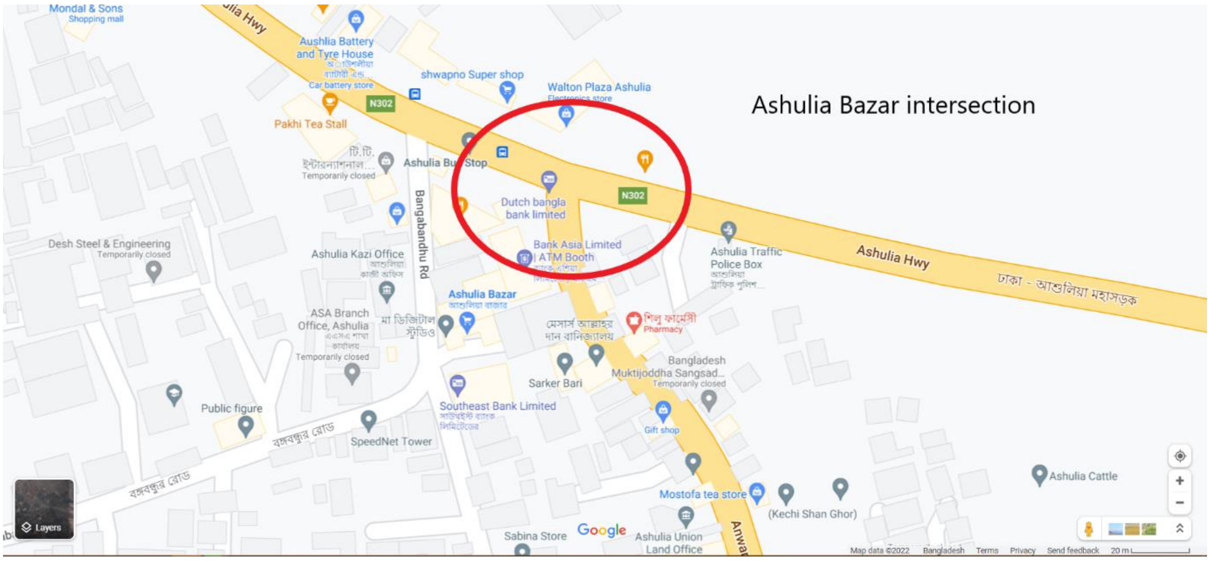


Figure 1.1: Ashulia Bazar Intersection

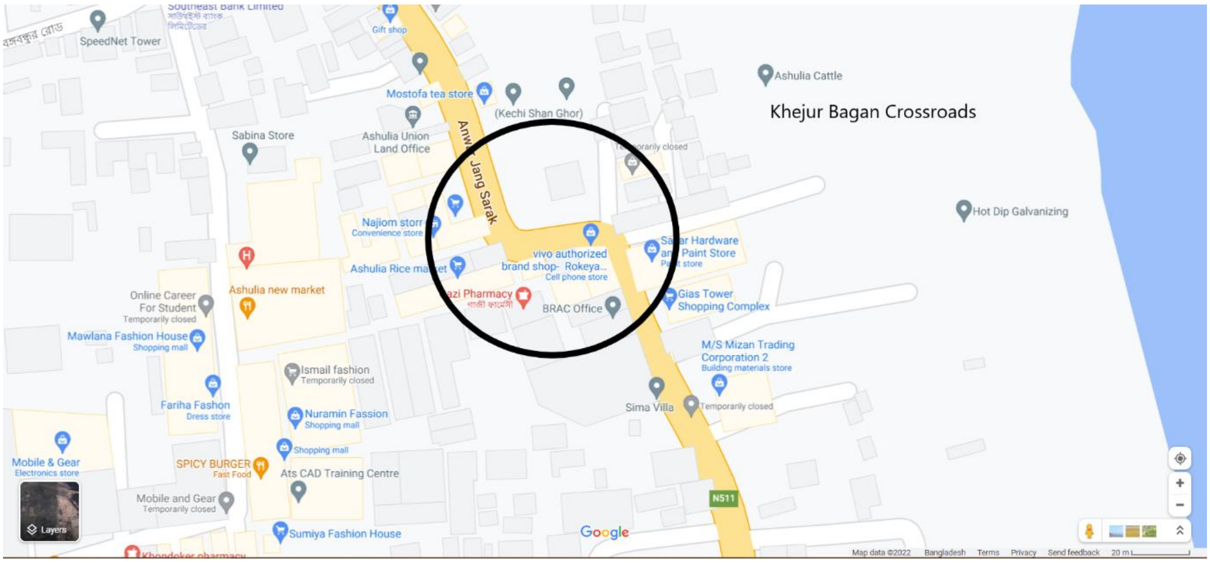


Figure 1.2: Khejur Bagan Crossroads

Data was collected using a mobile phone. In order to gather and quantify data on traffic volume, the video analysis was then performed at a speed that was one-eighth of the real speed. From recorded video, other traffic characteristics may be obtained in addition to traffic volume. When volume is high, this indirect data collecting technique is appropriate. The filmmaking activity needs a suitably elevation location. Data gathered cannot be used right away.

Although the technique is time-consuming and tiresome, the accuracy of the calculations is sufficient. We chose the indirect data gathering approach since it allows us to obtain accurate and precise data. Since changes in average vehicle speed, overtaking maneuvers, and traffic congestion are all directly related to traffic volume, it is imperative that any research project pertaining to transportation, traffic volume, or vehicular composition analysis be conducted.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The design manuals of different nations provide comprehensive documentation on vehicle- or traffic-actuated signal control systems. However, actual test locations cannot be used to gauge the effectiveness of the various tactics. Due to the huge number of potential outcomes, the limits of the current controllers, legal constraints, and user acceptability, neither the diversity of strategies themselves nor the parameter settings of any individual approach can be tested in field trials. In situations like these, simulation has shown to be a useful tool. The signal regulation should be as effective within a particular political framework as feasible for both economic and environmental considerations. The effectiveness of vehicle-actuated signal control is to be assessed via tools. No analytical formulas can be used for this thorough examination due to the random nature of traffic. Complex control techniques react to individual vehicles, as is necessary, for instance, in priority bus and tram systems. Purely analytical modeling techniques are unable to adequately capture these variations in arrival times. An new simulation tool for the design of traffic actuated control systems is called VISSIM, which stands for Traffic in Towns: Simulation in German. VISSIM is a general-purpose computer-based traffic simulation system that accurately represents connections, junctions, and "small" networks. However, the focus of this study is on VISSIM's capabilities as a simulation tool for signal control.

2.2 Travel-Time Reliability Analysis Methods

The simplest and best technique to estimate journey time distribution is to use past trajectory data. Due to data availability issues or inadequate sample sizes, this is typically not practicable. It is equally challenging to investigate how different unreliability sources behave on their own or in combination with one another to determine network reliability. Additionally, using historical data analysis prevents transportation authorities from evaluating new initiatives and plans for enhancing the dependability of transportation networks. An alternate strategy is to use traffic simulation models to create unreliability scenarios based on historical data in order to establish travel-time reliability metrics under varied circumstances. Including Kim. (2013) investigated the effect of weather and events on travel-time variability using a mesoscopic traffic simulation program called DYNASMART-P. They created a framework with three parts: a trajectory processor, traffic simulation models, and scenario manager. In order to account for external causes of trip uncertainty, Scenario Manager populates scenarios. Vehicle trajectories were created by modeling the provided situations in a mesoscopic traffic simulation model. Following additional processing in Trajectory Processor, the generated vehicle trajectories yielded a number of travel-time reliability metrics. The suggested methodology was used to analyze the effects of weather and accidents on travel-time reliability in a real-world network. 6 It is unclear how different weather and incident occurrences were represented in the DYNASMART-P setting, despite the fact that Kim et al. gave insightful information on how to include dependability into planning models (i.e. more like a black box). Additionally, studies that can offer recommendations for incorporating reliability measures into microscopic traffic simulation models that primarily operate on the basis of car-following and lane-changing theories are required.

2.2.1 Reliability Measures

Within a traffic network, travel-time reliability measures the temporal uncertainty that various travelers encounter when traveling from one node to another. Each traveler's selection regarding the trip's departure time, route, and method of transportation might be impacted by it (Wang et al., 2014). Previous research measured the variation in travel times across various time periods using a variety of metrics. The following list of five common metrics of travel-time reliability was provided by the FHWA Office of Operations:

- Travel-time index: the ratio of the mean experienced travel time to the free-flow travel time.
- 90th or 95th percentile travel time: the amount of experienced delay on days with significant traffic congestion.
- Buffer index: The amount of time added to guarantee that travel is generally on time, calculated as the 95th percentile travel time divided by the mean journey time;

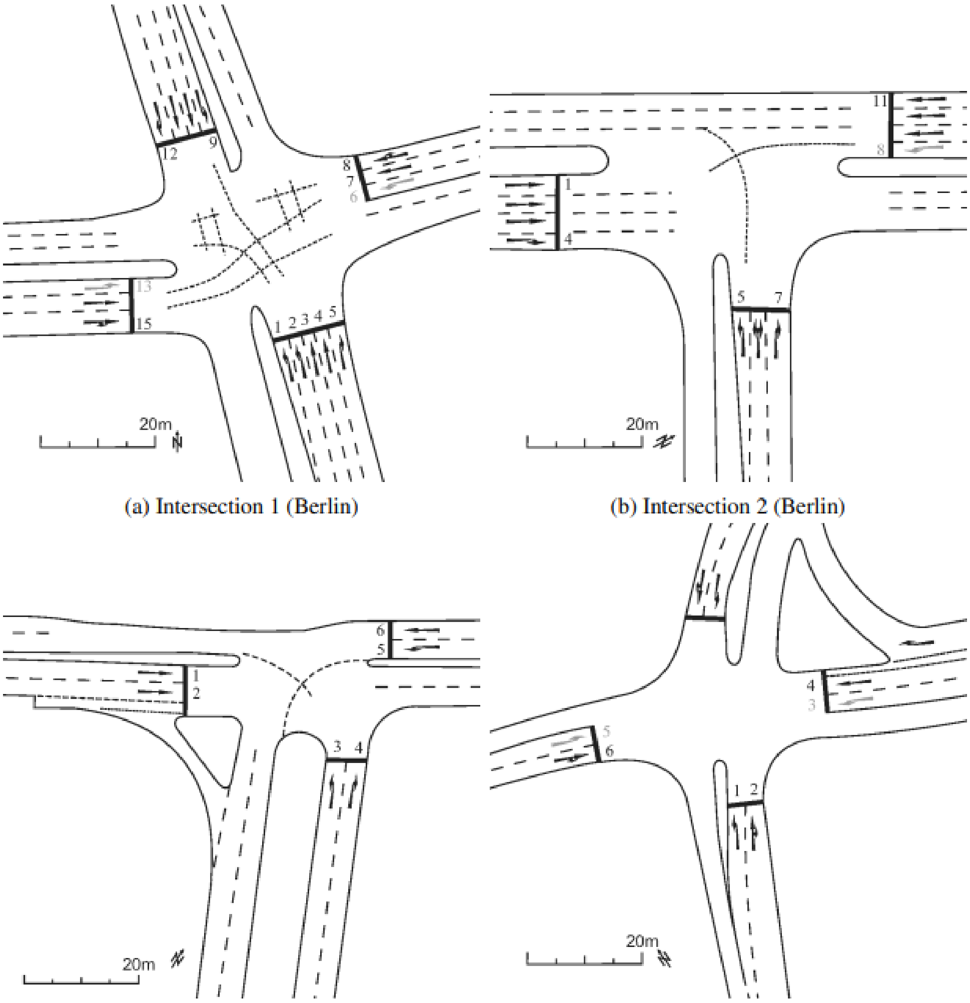
- Planning time index: the amount of time required to prepare for a 95% on-time arrival is calculated by dividing the free-flow travel time by the 95th percentile travel time;
- The percentage of days or hours when the mean speed is lower than a particular speed, or the frequency that congestion exceeds a specific predicted threshold (Chen et al., 2016; Chen et al., 2019; Highlight et al., 2019)

Numerous factors that impact both the supply and demand sides of the transportation system contribute to travel-time variability. Seven factors, including traffic incidents, work zones, weather, special events, traffic control devices, fluctuations in demand, and insufficient base capacity, are recognized by SHRP2 and FHWA as sources of travel time variability.

Utilizing historical information gained directly from probe vehicles, continuous point-based detectors, or data gathered during periodic investigations, several research have attempted to measure travel-time reliability and its geographical and temporal fluctuations (EMAM AND AL-DEEK, 2006; Chen et al., 2003; Recker et al., 2006; Lyman and Bertine, 2008; Chen et al., 2019). For instance, EMAM AND AL-DEEK (2006) estimated the travel-time distribution for a stretch of Interstate 4 in Orlando, Florida, using data from dual-loop detectors. To find the optimum statistical distribution that can suit the journey duration, Weibull, exponential, lognormal, and normal distributions were all evaluated. Using real-world data gathered on a corridor along Interstate 5 in Los Angeles, California, Chen et al. (2003) assessed the events' effects on several travel-time statistics including median, mean, 10th percentile, and 90th percentile trip times. Additionally, they analyzed the mean and standard deviation of travel times for various service levels and discovered that worse service levels are linked to increased travel-time unpredictability.

2.2.2 Simulation Models

The geometry of the crossings, as determined from the videos and aerial photographs, is the foundation for the VISSIM simulation models of the intersections. The modeled access links to the junctions have lengths of around 300 meters. A Poisson-distributed vehicle input with a precision of 5-min intervals was created based on the arrival time stamps tag. Static vehicle routes were employed to simulate turning relations for the same intervals. In VISSIM, road geometry does not directly affect speed; instead, the effect on speed must be explicitly described. We introduced a decreased speed zone for each lane that may be used to adjust the speed. Each vehicle in VISSIM selects a new desired speed within the restricted speed zones. The two-meter-long reduced-speed zones were situated in the center of the intersection. We settled on the standard lane-change behavior and selected Wiedemann 99 as the car-following model. VISSIM faithfully simulated the intersection's fixed-time signal timings.



(a) Intersection 1 (Berlin)

(b) Intersection 2 (Berlin)

(c) Intersection 3 (Karlsruhe)

(d) Intersection 4 (Karlsruhe)

Figure 2.1: Site plans of analyzed intersections

Mallaig, Buck, and Bortsch 5 The investigation made use of the vehicle record assessment from VISSIM. For every phase of the simulation, the record was set up to contain the following information for each vehicle:

- Vehicle number,
- Link and Lane number,
- Second of Simulation,
- Speed

- Vehicle class

We created an automated procedure in MATLAB to extract the time stamps from the car data that matched those from the films. For the simulation, this procedure imitates the video evaluation procedure. As a result, both the measurement and the simulation may use the data mentioned above in the Measurement section.

2.2.3 Network of streets and lines

A one or multilane link is the fundamental building block of the street network. Links and its connections make up the network. Any point on a link is appropriate for a connection. All vehicles, certain types of vehicles (like buses), or a group of vehicles may be covered by it (i.e. only right turning vehicles). Cross sections must be positioned for turning decisions. At the following probability, they start to hold true.

By positioning the signal heads at the locations of the stop lines, signal control is modeled. The fundamental signal control approach includes the signal characteristics. Detectors are utilized for both microscopic and macroscopic measurements, and they detect the traffic for the signal control (such as gap, occupancy, and presence) (i.e., speeds, volumes, travel times). In cities, the required speed is determined by the physical structure of the roadway and its intersections rather than the technological specifications of an automobile. Around intersections, the required speed is often slower. Gap acceptance is used to model partially compatible motions. The waiting positions and gap acceptance values can be customized by the user. A line of stops is what is referred to as a public transportation route. The stops are either next to or on the link.

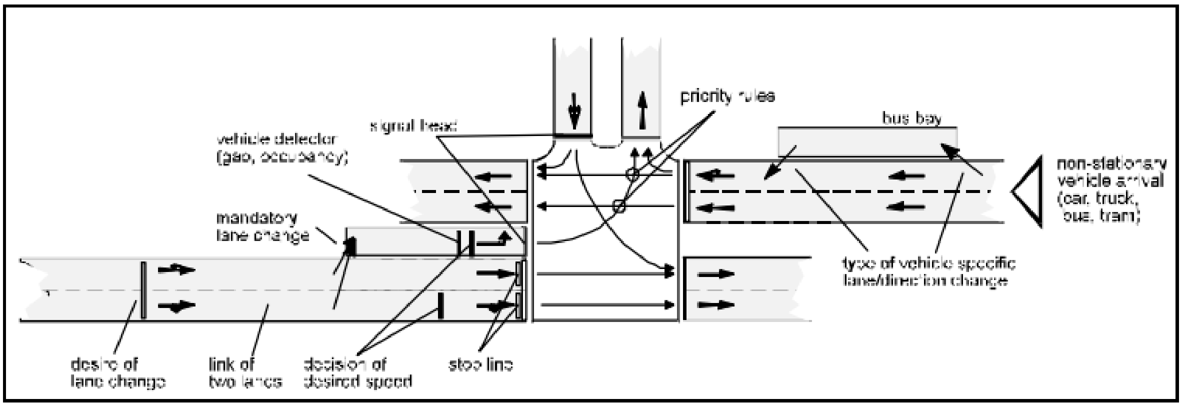


Fig 2.2: Junction being modelled by VISSIM

2.2.4 Vehicle arrivals

VISSIM is required to calculate the arrival time for each vehicle that enters the network at a given place. The entrance points' volumes are user definable. The 5- or 15-min interval values for the arrival profile are entered. VISSIM assumes a POISSON arrival distribution over a single time interval. The following information may be entered:

a. entry points,
b. vehicle composition (car, trucks) of the streams,
c. distribution of arrivals over time,
d. timetable for bus and tram,
e. bus and tram routes.

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2.2.5 Calibration

Geometric delay and control delay are the causes of delay at junctions that are functioning under undersaturated circumstances. Geometric delay is the lag caused by slower-moving cars crossing a junction, particularly during turn maneuvers. The time lost because of junction traffic management is referred to as control delay. The percentage of cycle time during which the cars are halted by a red light is a crucial component of control delay. Another is the line of parked cars. Even after the start of green time, cars are delayed as a result of the artificial queue. These sources of delay, which are mentioned below, are taken into consideration during the calibration. The time to pass the junction is used to calibrate the geometric delay. By altering the target speed of the reduced-speed zones inside of the crossings, this time was calibrated. The amount of time a vehicle spends in the queue is determined by the size of the line in front of it as well as the pace at which it dissipates, as indicated by the base saturation flow rate. The time difference between two cars crossing the stop line, or the saturation headway, is the inverse of the saturation flow rate.

The settings of the car-following model may be used in the simulation to change the headway. Along with the headway, another critical factor is the number of cars in the line in front of the subject vehicle. The total number of cars coming during the cycle time and the percentage of vehicles arriving either during red time or during the period when there is already a line determine the length of the queue, expressed in vehicles. By simulating the actual signal timings in the simulation, the ratio of green to red time is determined. The distribution of cars arriving at a crossroads is unbalanced, particularly in metropolitan settings. Platoons are formed at signalized junctions upstream, and these platoons may arrive during the green or red periods of time.

As a result, one has to accurately recreate the arrival distribution in order to accurately mimic the delay. Three successive stages were taken to complete the calibration, taking into account the headway at the junction, the arrival time distribution, and the time to pass the intersection. Except for a little amount of effect from the headway at the stop line, the three stages are independent of one another. We ran enough simulations in each calibration phase to guarantee reliable findings.

2.3 System architecture of VISSIM

There are two distinct programs that make up the simulation system. The traffic flow model (the core of VISSIM) is the first program, and the signal control model is the second. VISSIM is the master program that transmits detector values to the signal control software every second (slave). The detector readings are used by the signal control to determine the current signal characteristics. When VISSIM gets the signal aspects, the subsequent cycle of traffic flow begins. The simulation is stochastic, fixed time-slice, and microscopic (single vehicle modeling) (1 second intervals). An online animation of the traffic flow and offline reports of the distributions of waiting and travel times are the simulation's outputs. Through standardized interfaces, the traffic flow model and the signal control may interact (i.e., DDE under MS Windows respectively pipes under UNIX). The primary benefit of dividing the two jobs into two programs is flexibility. The signal control technique can be used in VISSIM as long as it is available as a C-program. The entire controller may be linked with VISSIM, even if the signal control is only provided on the controller as Assembler code. The next step is to provide a hardware solution using serial RS-232 connections.

2.3.1 Design of the unsignalized intersections in VISSIM

Microscopic traffic simulation provides a great degree of flexibility and accuracy in describing the behavior of real traffic, and it can graphically depict temporal and geographical fluctuations in the traffic flow (JUNHAO YU AND XIAOFA SHI, 2009). The yield sign intersection, two-way stop sign junction, and all-way stop sign intersection are all evaluated in this article using VISSIM microscopic simulation software. The simulation detector promptly produces the evaluation index.

The unsignalized junction is the study area. Two roads cross it at this point. Each road is two lanes and two ways. We suppose that the major road runs east to west, while the smaller road runs north to south. Each lane has a 3.5m width. As the focus of the study, the yield sign junction, two-way stop sign intersection, and all-way stop sign intersection are chosen. The east-west traffic has precedence to cross the crossing thanks to the priority rule that has been put up in VISSIM. Figure 3 depicts the junction with the yield sign (a). Stop signs have been placed at the smaller entrances. Figure 3 then depicts a two-way stop sign junction (b). Stop signs have been placed at each of the intersection's entrances. Figure 3 depicts a junction with an all-way stop sign (c).

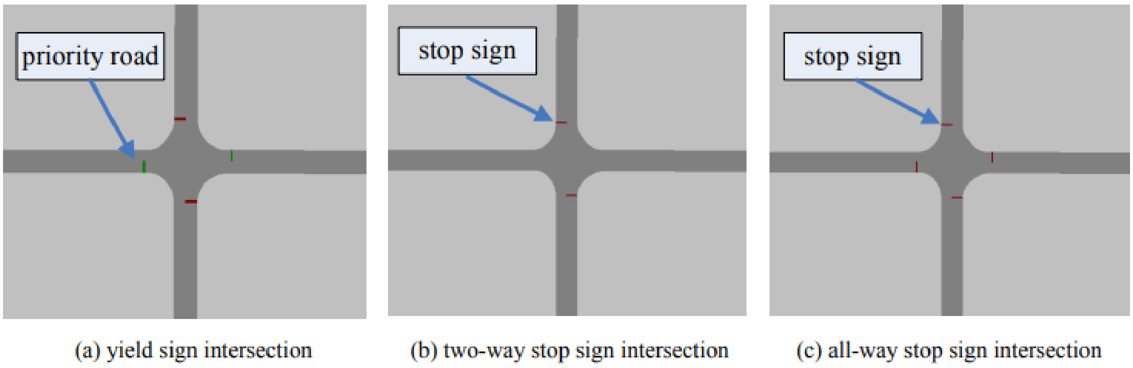

Figure 2.3: VISSIM simulation model for the intersection

2.3.2 Scheduling Considerations

It might be difficult to create a project schedule for a VISSIM project since VISSIM does not function with standard engineering work plan methodologies. A consultant may not be able to commit to an aggressive timetable even if they have a big number of skilled employees. The work needed to create the network must follow a fairly linear critical path, especially in the early phases, in order for it to be done properly. Typically, only one modeler should be operating on the network at a time in order to ensure consistency throughout situations. ODOT mandates many check-in points along the coding process before starting the next stage of model development in order to promote this linear approach. This lessens the requirement to maintain consistency while also making the same adjustment in various network files in response to agency feedback. It also enables ODOT to continue participating in the coding procedure.

2.3.3 Staffing Plan

The consultant must provide a thorough staffing plan as part of the Project Methods and Assumptions document that contains the following information:

- Names of all individuals contributing significant effort to the project
- A brief summary of their VISSIM experience
- Their role within the project (such as leading data collection or scenario development); and
- The office where the majority of their work will be done.

This staffing plan's goals are to keep ODOT informed about the model developers and to guarantee that all model scenarios are created sequentially from the same source files and never concurrently. To improve knowledge of the study area and facilitate field observations, it is also preferable to have at least one modeler based in Oregon. If there are personnel changes

2.4 Time Dependent Delay Models

Three delay components—uniform delay, random overflow delay, and continuous overflow delay—are included in analytical models for the calculation of delays at signalized junctions.

Uniform Delay

Randomness in the arrivals is disregarded for uniform delay as a constant arrival rate is assumed. The following circumstances determine the discharge rate, which ranges from 0 to saturation flow: (18)

- Zero during the red interval,
- The saturation flow rate during the part of green when there is a queue,
- The arrival rate during the part of green when there is no queue.

The first term in Webster's equation provides the formula for uniform delay for a degree of saturation less than 1.0. (2).

2.4.1 Random Overflow Delay

Actual vehicle arrivals fluctuate randomly (18), and this variability results in overflows in some signal cycles. If this keeps happening for an extended length of time, the oversaturated conditions cause a constant overflow delay. The overflow delay component was stated by AKCELIK (19) as a function of the average overflow queue. The overflow's impact is influenced by the saturation level over a specific time frame.

2.4.2 Continuous Overflow Delay

Vehicles that are unable to discharge during the signal cycle due to the arrival flow being larger than the capacity face continuous overflow delay. Continuous overflow delay is inversely correlated with saturation level and analysis time T. Due to its deterministic queuing approach, continuous overflow delay is sometimes known as "deterministic overflow delay" or "deterministic delay." The fixed temporal operation of a signal determines the constant arrival rate and capacity that are assumed by the deterministic model. The model assumes that the queue length starts out at zero and rises linearly for the duration of the analysis period.

Under severely crowded situations, the deterministic or continuous overflow model is a critical predictor for estimating the delay and the queue, but it is an inappropriate model for moderately congested conditions.

2.4.3 Time Dependent Delay Models

When calculating delay at signalized crossings, time dependent delay models provide more accurate findings. The coordinate transformation method outlined by Kimber and Hollis is used to develop them as a combination of the steady state and deterministic models. P.D. Whiting invented the method in order to calculate the random delay expression for the TRANSYT computer software. The steady state curve is subjected to the coordinate transformation, which smoothest it into a deterministic line by making it asymptotic to the deterministic line. Therefore, time dependent delay models forecast delay without discontinuity at the saturation level for both undersaturated and oversaturated circumstances.

2.5 Traffic Modeling

The vehicles using the infrastructure must be described once the physical layout of a modeling system has been defined. Public transportation vehicles will go along preset routes with stops, however private cars may look for unique routes. It is best to model buses on irregular services, such sightseeing buses, as private transportation.

2.5.1 The traffic flow model

The quality of the traffic flow model at the system's core has a significant impact on the system's performance. This kernel includes the lane-changing and car-following models. The car-following model, also known as the spacing-model, defines how a vehicle moves when its driver intends to go faster than the speed of the vehicle in front of it. The lane-changing algorithm models the tendency of cars to overtake when more than one lane is available. VISSIM employs the psychophysical model of WIEDEMANN (1974; see also LEUTZBACH/WIEDEMANN, 1986; LEUTZBACH, 1988) rather than a deterministic car-following model. The similar idea is described by FRITSCHE (1994) in a more contemporary publication. The fundamental concept of psycho-physical spacing models is perception thresholds. The driver of a vehicle is connected to the vehicle as an element (DVE).

A quicker vehicle (Dive) is approaching a slower one in Figure 2. The Dives advances more quickly than the DVEI before it. When Driver J hits his own threshold, which depends on spacing and speed differential, he starts to slow down. Driver j will slow down below the present speed of DVEI because he is unable to recognize endless tiny speed changes and regulate his speed well enough. J will rev up his acceleration as soon as he crosses the opposing threshold. This causes a bunching effect that can be seen in different traffic situations.

This psycho-physical model's challenge begins with the thresholds' random distribution. To simulate the traffic in a realistic manner, as is done at the University of Karlsruhe, continuous measurements of various traffic situations on motorways and city streets are necessary. To represent the lane-changing behavior, which greatly relies on the kind of street, a complex set of rules must be used. Legally, the near-side lane on highways must be used as often as feasible across Europe. This rule is invalid on urban highways since one of the key factors in choosing the current lane is the direction of the upcoming turn. When a quicker DVE approaches a slower one in the same lane, it looks to see if it can move to a different lane and gain an advantage. As a result, it respects up to six more cars every second (Figure 3).

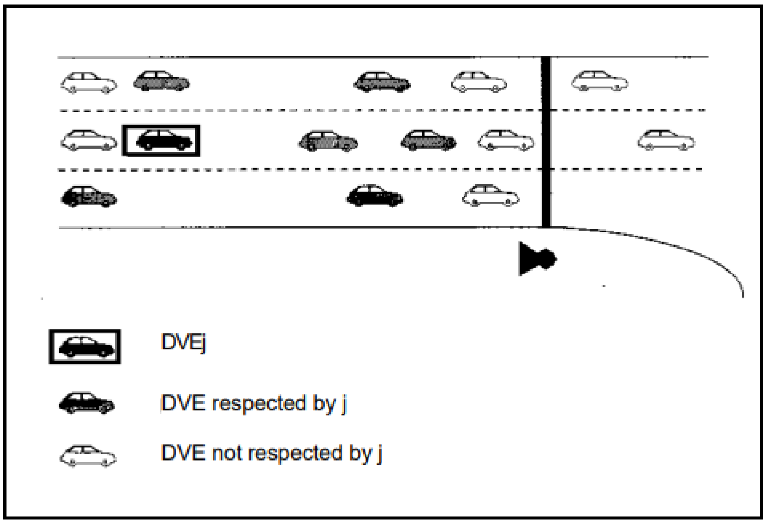

Figure 2.4: Each vehicle regards up to six neighboring vehicles

A collection of parameters that describe the aforementioned traffic flow model may be used to describe each DVE. The values come from user-defined distributions and are selected at random. The three categories of the most crucial DVE parameters are as follows:

1. Technical description of a vehicle ·

- vehicle length and type (car, truck, bus, tram, pedestrian)

- maximum speed
- maximum acceleration and deceleration as a function of speed
- present position within the network
- present vehicle speed and acceleration

2. Behavior of a DVE ·

- desired speed of the driver
- perceptual threshold of the driver (ability to estimate differences in spacing and speed, desire of safety and perception of risk)
- acceleration as a function of present speed and desired speed of the driver

3. Interaction between several DVE´s ·

- Pointers to the DVE´s direct in front and rear on the same and the neighboring lanes
- Pointers to the present link and the next intersection
- Pointers to the next traffic light

2.5.2 Traffic Signal Control System

The objective of traffic signals is to increase the capacity of an intersection, its safety and provide a good level of accessibility to the road users by assigning the right-of-way for all users of the transportation network, including vehicles, bicycles and pedestrians (WALDSTEDT, 2014). Its use has proven to be very effective when the demand on the intersection legs is high. A wide variety of traffic signal control systems is available, and they can be classified in different ways.

A signal control mode can be isolated, when the signal timing is based only on the demand of the approaches for that intersection, or coordinated, when the signal timings are based on all the other adjacent traffic signals to improve the flow through them. A signal control mode can also be classified as fixed-time, when the cycle time and phase time is always the same and based on historical data, or vehicle-actuated, where the cycle time is variable and the green time is based on the detection of vehicles approaching the intersections. A more thorough study of the different urban signal control strategies will be carried out in the next chapter. Traffic lights started operating in the city of Amsterdam in the year 1932 at LEIDSEPLEIN (LINDERS, 2012). Since then, the number of signalized intersections has grown exponentially over the years, following the expansion of the city.

Some of the intersections were actually removed, especially in the center, due to the decrease in the traffic demand There are currently 440 signalized intersections in Amsterdam, represented. They are divided in two systems, one controlled by Siemens and one controlled by Vials. From these intersections, around 100 are part of KWALITEITS Centrale, a tool to analyze the performance of the intersections. There are three different control modes under which the intersections in Amsterdam work: rigid (star), semi-rigid (half-star) and vehicle actuated. Most of these intersections work with an isolated vehicle-actuated control logic. Here, the green periods are related to the traffic demands detected at the inductive loops from each approach. When the vehicle is detected at one of the approaches, it gives a minimum green time that is then extended as more vehicles approach the intersection, up to a maximum green time. If there is no vehicle at one of the approaches, the controller will skip that stage. Thus, the cycle time of this strategy is variable. The rigid scheme refers to the fixed-time controller defined previously. In the semi-rigid controller, the cycle time is fixed, but the green time of the main direction can be extended when there are no vehicles detected on the conflicting direction. These are mostly used in a coordinated way to create a green wave in an arterial road, as in Weesperstraat and Wibautstraat.

2.5.3 Integrated Traffic Control Strategies

Traditionally, control techniques for each type of traffic measure have been developed and implemented individually, which may result in the actions taken by each of them being counterproductive. The integrated control techniques are equivalent to a controller for an urban-freeway network that combines several traffic measures including traffic signal control, ramp metering, variable message signs, and route guiding systems. The intricacy of the network size and the numerous factors that must be considered for each metric are this strategy's key drawbacks (Papa Georgiou et al., 2003). Therefore, this is now only possible with store-and-forward models that have the agility to compute the application of the method in real-time. The first integrated control strategy was IN-TUC, which combines a user-optimal route guiding strategy with the ALINEA ramp metering approach and the TUC signal control strategy. The PPA project in Amsterdam serves as the greatest illustration of integrated control. A user-optimal route guidance approach, ALINEA for ramp metering, and the TUC technique for signal control. The PPA project in Amsterdam serves as the greatest illustration of integrated control.

2.5.4 Data Collection Plan

In Section 3, the common data formats required for a VISSIM project are thoroughly described. The Data Collection Plan should be submitted for ODOT assessment in accordance with the project requirements described in the preceding sections and the field visit. The complete list of all suggested data gathering methods for the project must contain the following:

- Types of data collected
- Locations of data collection
- Time increments of data collected

2.5.5 Project Methods and Assumptions

The Project Methods and Assumptions document will be created once all the procedures in this part have been finished in order to offer an overview of the methods for finishing the project and any known assumptions before modeling starts. The assumptions made specifically for VISSIM during model construction will be stated in a subsequent paper (Calibration Methodology and Results Report). The project methods and assumptions document must contain the following details:

1.Project Description

The project description will contain, but not be limited to, the project's goal, the project's problem statement, a history of the project, the project's location, and the project's financial condition.

2. Tools for Operations Analysis

In addition to VISSIM, other analytic tools could also be used in this. This section will list the tools that will be used on this project, their versions, and the tasks that each tool will be utilized for.

3. The study and model areas

Depending on the network in the area, the research area and the model area may be different sizes. It is necessary to document the causes of the differences between the two. The list of important calibration locations will also be included here.

4. Analysis Years/Modeling Periods

The years and analysis intervals that will be utilized for the study are listed in this section. There must be a flow chart showing how these models are created (see Appendix D for an example of the flow chart).

5. Data to be Collected

The Data Collection Plan as described in Section 2.6 will be summarized in this section.

6. Data Usage

The data that will be utilized for model development and calibration purposes will be listed in this section.

7. Targets for Calibration

What calibration targets will be utilized for this project will be described in this section.

8. Choosing Effectiveness Measures (MOEs)

For each model, there are particular MOEs that must be gathered, and depending on the project, data may also need to be collected for other MOEs. What MOEs will be gathered is described in this section.

9. Premises

Any known presumptions that will be applied to both current and future year models are included in this section. Roadway upgrades that will be projected in future options, signal timing assumptions for future circumstances, methodology and assumptions used to predict future volumes, and current and/or anticipated transit speeds are a few examples.

10. Deviations and Explanations

The rationale for any known deviations from conventional procedure that are necessary to accomplish the project should be provided. It is significant to highlight that the Calibration and Results report, which will be delivered with the Calibrated models, will include documentation of the VISSIM calibration-specific alterations found during model development.

11. Project Calendar and Staffing Schedule

The project timetable, staffing strategy, milestones, and deliverables that are anticipated to be submitted are all summarized in this section.

The scope of work for developing the model will be defined (or improved upon) using the Project Methods and Assumptions document. It should be noted that after the scope of work has been decided upon in this process, the project budget should be finalized.

2.5.6 Field Visit

The consultant must make at least one site visit to the study region as part of the scoping phase to identify any project-specific factors not previously mentioned. These might comprise, but are not restricted to:

- Lane inequities (e.g., dual turn lanes or drop lanes)
- Bottlenecks in the upstream or downstream
- Important wait times

These project-specific factors will assist in deciding if the model region has to be expanded past the original research area. They can also aid in deciding what information has to be gathered, what standards should be used to calibrate the model, and where that calibration should take place.

2.6 Traffic congestion

The goal of this study is to concentrate on the actual causes of peak-hour traffic congestion. Since the causes vary from case to case and are specifically tied to the road under consideration, traffic congestion is a local issue rather than a general one. Since the causes might differ from one location to another, even within the same city or nation, not all the causes and remedies can be applied universally. In actuality, each of the below-mentioned reasons of traffic congestion has an impact on the others. Causes include

a. Parking in parallel in order to parallel park, you must position your car in the direction of traffic. Parking is permitted in the study area in an A-B direction, but not in a B-A direction. It is evident that parallel parking significantly impacts traffic flow, particularly during rush hours when illegally parked cars form a second parallel row, reducing the number of lanes to just one.

b. Number of automobiles in general, the number of automobiles in the Kurdistan area is higher than the capacity of the roads; this number is continuously rising despite the fact that the number of roads and traffic infrastructure have not developed to a sufficient level. In KOYA, the number of automobiles is rising quickly, and the condition of the roads is poor.
c. The width of the road Street width fluctuates as it travels down the road; it is not continuous. The roadway is 27 meters wide at its broadest point and 23 meters wide at its narrowest point.
d. There are a number of clinics, offices, a school, governmental and public buildings, and a bank on the street; at peak hours, this has an impact on traffic flow.
e. New housing in the city was constructed without planning. Without building roadways to connect these new places, new quarters are simply added to existing ones. Older quarters' roadways are completely necessary for new quarters. There is a lot of traffic on this route as a result of this. You might say that KOYA was developed at random; there is no significant city planning.

2.6.1 Criteria of an appropriate congestion

Measure For a measure of congestion, a variety of features have been offered. Turner (1992) studied congestion indicators and proposed that measures to quantify the level of congestion should I deliver comparable results for different systems with similar levels of congestion, (ii) accurately reflect the quality of service for any type of system, and (iii) be straightforward, well-defined, and easily understood and interpreted among various users and audiences.

According to Turner et al. (1996), choosing the right set of congestion measures necessitates considering the environment in which they will be used since the environment has an impact on the succeeding phases of congestion measurement in terms of step, accuracy, and technique.

A congestion index should, according to Levinson and Lomax (1996), I be simple to communicate, (ii) measure congestion at various analysis levels (a route, subarea, or entire urban region), (iii) measure congestion in relation to a standard, (iv) provide a continuous range of values, and (v) be based on travel time data because this type of measure can be used for multimodal analysis and for analyses that include,

Barnet et al. (1998) found three problems with assessing congestion that need to be fixed. It should I be based on publicly available data, (ii) reflect the whole range of highway performance, and (iii) Enable comparison between different metropolises.

According to Lomax et al. (1997), the perfect congestion measure would have the following characteristics: I clarity and simplicity (understandable, unambiguous, and credible); (ii) descriptive and predictive ability (ability to describe existing conditions, predict change, and be forecast); (iii) statistical analysis capability (ability to apply statistical techniques to provide a reasonable portrayal of congestion and replicability of result with a minimum of data collection requirements); and (iv) gene expression (applicability to various modes, facilities, time periods and scales of application).

The following criteria will be used to evaluate the congestion measures in the following sections, taking into account the many desired qualities for a congestion measure proposed by the aforementioned scholars.

- exemplifies simplicity and clarity.
- provides a description of the level of congestion
- enables comparisons between metropolitan regions.
- It offers an endless range of values.
- includes time for travel.
- It has to do with reducing traffic on public transportation.

2.6.2 Measures of traffic congestion

Four broad categories can be used to classify measures of traffic congestion: (i) basic measures; (ii) ratio measures; (iii) level of service; and (iv) indices. Each set of measures is covered in detail in the sections that follow. Congestion control measures have been identified for this purpose, and their advantages and disadvantages have been examined.

2.6.3 Measures of traffic congestion relief of public transport

In metropolitan regions, public transportation is crucial for mobility, especially in the central business districts (CBDs) of large cities and other locations with a high concentration of employment (Black, 1995; Downs, 1992; Cervero, 1988; PUSHKAREV AND ZUPAN, 1977). During peak travel times, public transit systems can handle a sizable number of journeys, significantly increase total transportation capacity, and relieve pressure on crowded road networks. Public transportation use has been discussed in a number of articles (KITTELSON ET AL, 2003; Meyer and Gomez-Ibanez, 1981; Meyer and Miller, 2001; Rosenbloom, 1978; VTPI, 2005) as a method for reducing congestion. To evaluate the impact of public transportation on relieving congestion, no prior research has offered a systematic or all-inclusive analytical approach. Using certain streamlined techniques, several research have looked into how public transportation affects traffic congestion. Three studies that evaluated how much public transportation reduces congestion are reviewed in the sections that follow.

2.6.4 Regression analysis with congestion index and public transport supply

By using multiple regression models, Hahn et al. (2002) attempted to use supply-related factors (freeway and main arterial lane miles, public transportation supply) and demand-related factors (population density, land area) to explain the congestion of these types of roadways. A backward elimination approach was used to do the regression of a dependent variable (travel rate index) on a number of predictors with a threshold of significance of 0.05. Combined bus transit service revenue miles and combined TRI have a positive link for the combined freeway and arterial travel rate index (TRI) model. According to Hahn et al. (2002), a positive link between combined bus transit service revenue miles and combined TRI appears to defy expectations (i.e., increasing the availability of public transportation is typically regarded as a tactic for reducing traffic congestion.) They recommended a more thorough investigation in order to comprehend the effects of the supply of bus transportation on highway traffic congestion.

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2.7 Queuing theory

A service activity traversing a queue causes the traffic flow process to be interrupted. By using queuing systems to anticipate various features, this theory offers crucial information that is required to resolve the aforementioned issues.

2.7.1 Queue Length Sensing Model

The queue length sensing technique suggested in this study must adhere to the following prerequisites: (1) GPS and wireless transmission equipment are required for connected vehicles; (2) It is assumed that roadside units (such as signal controllers) can accurately obtain information such as a connected vehicle's ID and location; (3) At least one connected vehicle must be present in the motorcade in each entrance lane; and (4) This paper makes the assumption that all participating vehicles—connected and unconnected—are standard automobiles. In order to enable the prompt transfer of information to the roadside unit in the event of equipment failure, the first condition necessitates that the GPS precisely pinpoint the lane of a vehicle. It also necessitates that the wireless transmission device develops an emergency treatment plan. The second criteria is for the roadside unit to reliably interpret data that connected cars send in real-time, send it back to the vehicles in a timely manner. Because the strategy investigated in this research is suitable to the cooperative vehicle infrastructure environment, the third requirement mandates that each motorcade consist of at least one linked vehicle. The queue sense of all disconnected cars is not taken into account in this work. The use of conventional detection techniques (like the loop detector) to handle this circumstance and the use of information fusion technologies to complete the sensing operation are both mentioned in certain publications. The fourth criteria do not take into account the kind of a vehicle because it believes that all automobiles are standard vehicles. But in reality, various vehicle types must be converted in accordance with the vehicle conversion coefficient. The aforementioned fundamental factors can significantly lessen the difficulty and complexity of problem inquiry. We intend to lessen the restriction of hypothesis conditions and broaden the method's potential applications in the future. The queue length sensing model is constrained by the four fundamental requirements mentioned above. First, signalized crossings must be the sensing scene. Second, the model can only be used in two types of traffic situations: mixed traffic environments, where both connected and non-connected cars are present in the motorcade, or all-connected traffic environments. As a result of the model's assumption that traffic moves through the junction in waves, it may also be used to estimate how long the line will be in the entry lane. The real-time queue length sensing model proposed in this research is based on the aforementioned assumptions and constraints. The two sensing techniques—BP neural network-based sensing and shockwave-based sensing—respectively estimate the queue length and combine the benefits of two sub-models with various rates of penetration to create a combined sensing model with a better degree of accuracy.

2.7.2 Discipline queue FIFO (FISRT IN FIRST OUT)

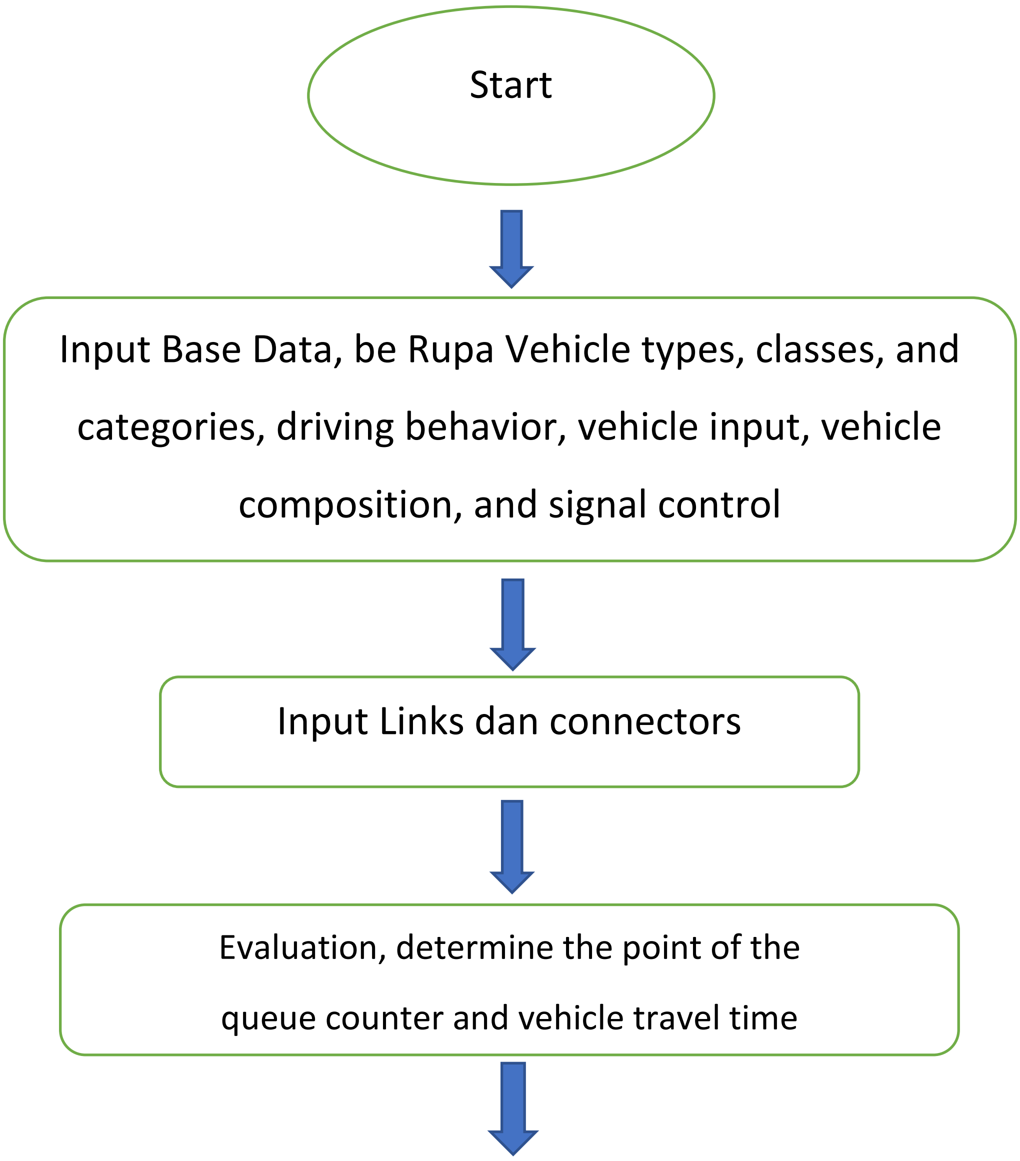
The line of cars that gathered in front of the toll gate serves as an illustration of the FIFO discipline.

CHAPTER 3

METHODOLOGY

3.1 Introduction:

The traffic counting approach was employed in this study. On the north side of the Mirita crossroads, Turban Campus, traffic counts are manually conducted. To determine which routes are commonly traveled, the kind of vehicles that use these roads, and the volume of traffic per unit of time (vehicles/hour), traffic counts are performed. When calculating the amount of traffic, the geometry of the route and the state of the surrounding area are also noted. Additionally, simulations were run using the VISSIM program using data from traffic counting as the input. A flowchart of the simulation that was run is shown below.



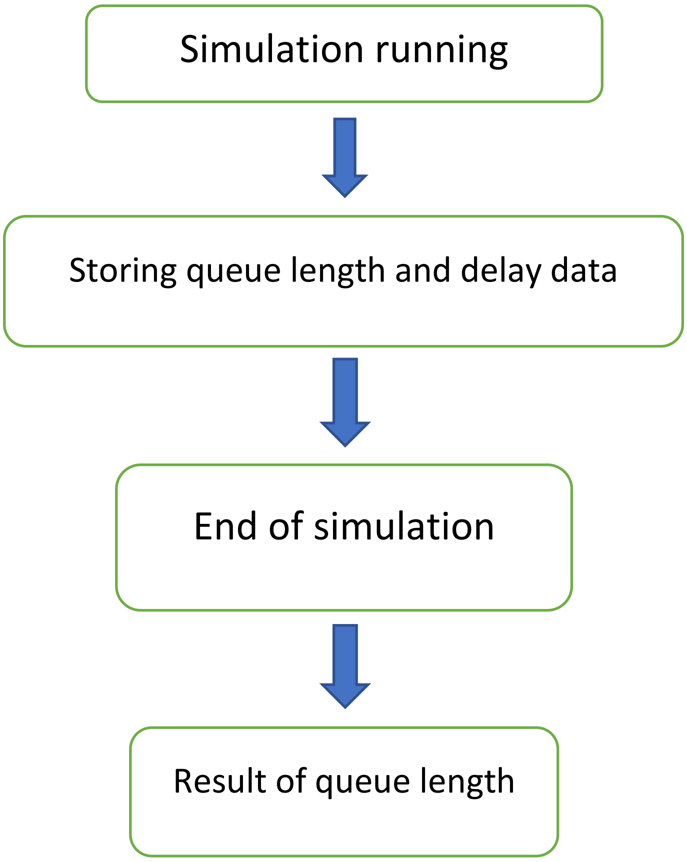


Figure 3.1: Flowchart Simulated Vissim

3.2 Data Collection:

A well-constructed and validated traffic simulation model may yield a wide variety of data. The computation of the average delay per vehicle for a certain movement (left, straight, or right) at a junction OR the delay of the entire intersection is the most fundamental and necessary data for traffic engineering research. According to the information in CIV 371, the degree of service is often determined using the delay as a significant indicator of an intersection's efficacy (LOS). This lesson demonstrates a fundamental technique for gathering delay information and calculating intersection LOS.

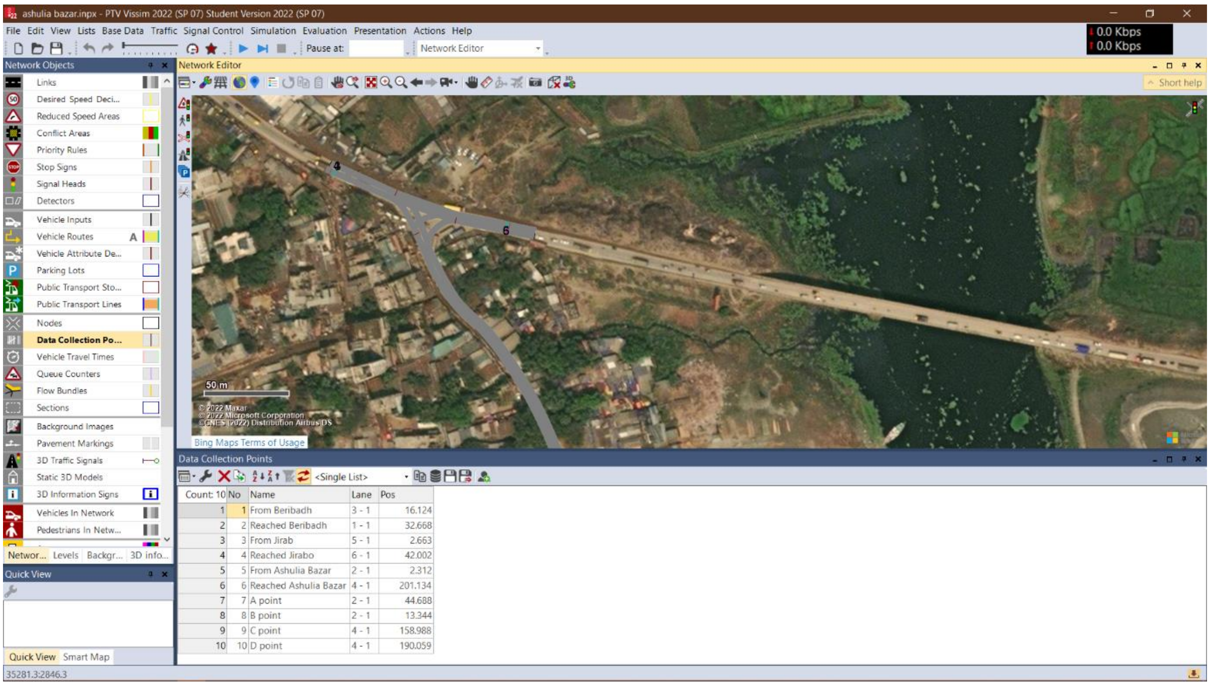


Figure 3.2: Data collection point

Vehicle Types:

a collection of cars with comparable technical specs and physical driving habits.

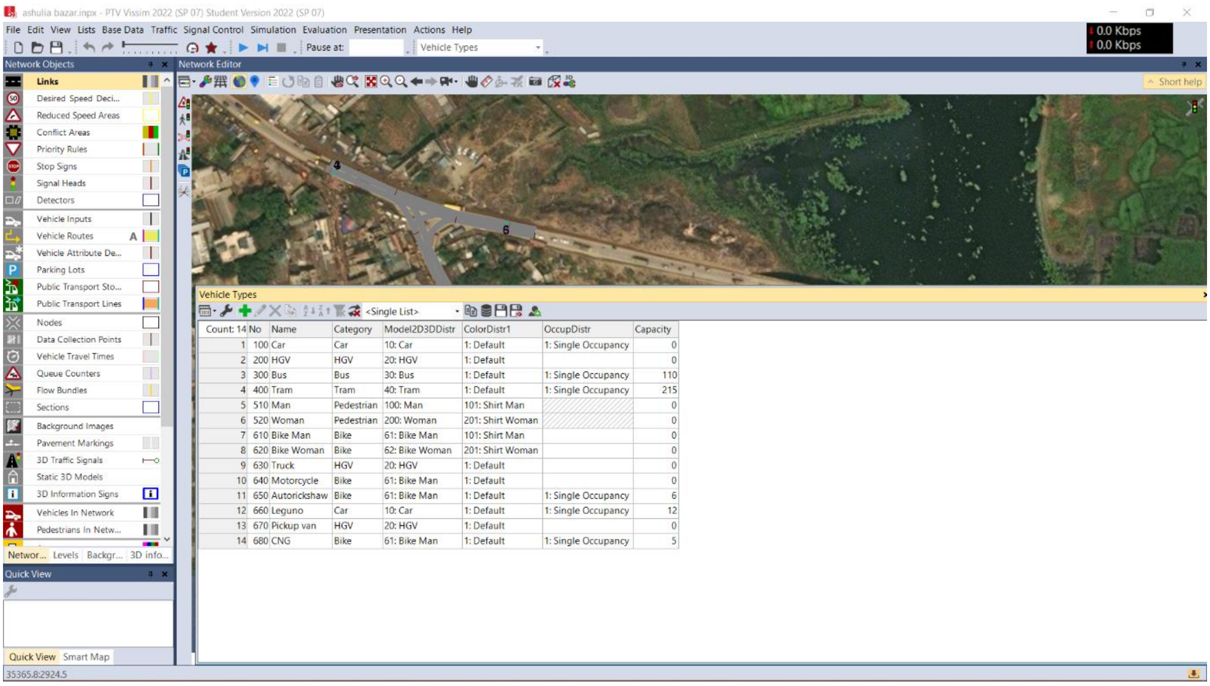


Figure 3.3: Links of Vehicle Types

Vehicle Classes:

One vehicle class combines one or more vehicle types. In one vehicle class, speed, assessment, and route choice are all combined.

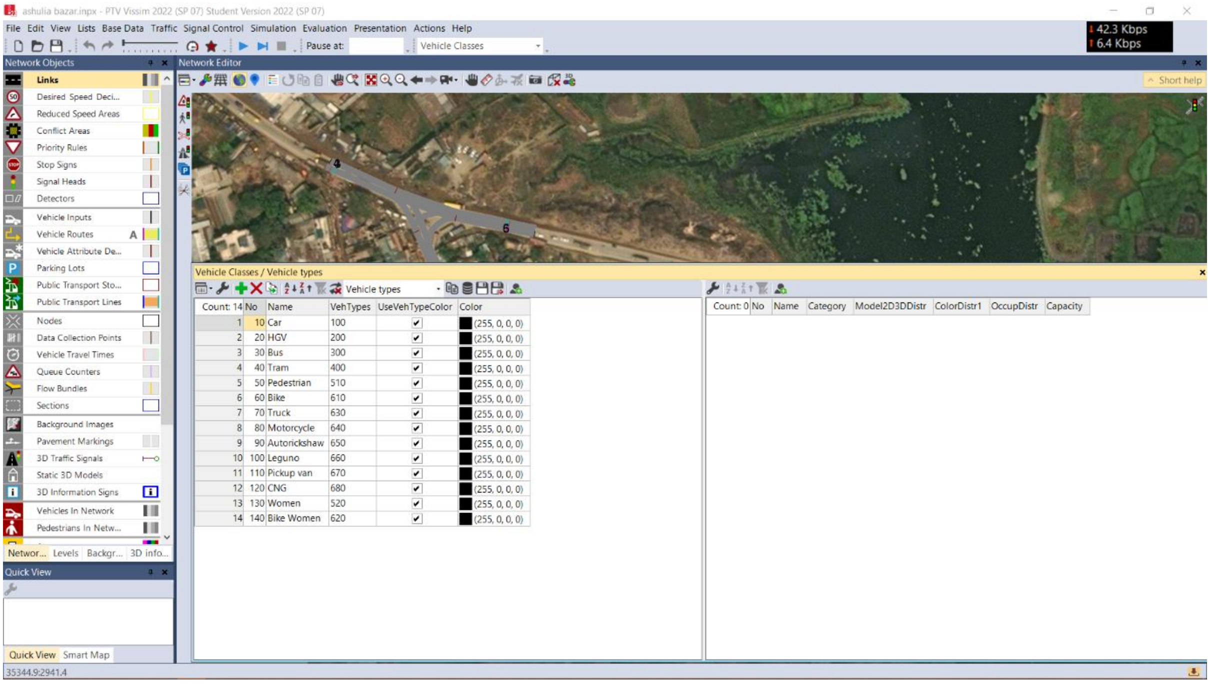


Figure 3.4: Links of Vehicle Classes

Vehicle Input:

According to the findings of the field study, enter the volume of traffic (vehicles/hour). Simulation has ended. result of the wait time and queue length.

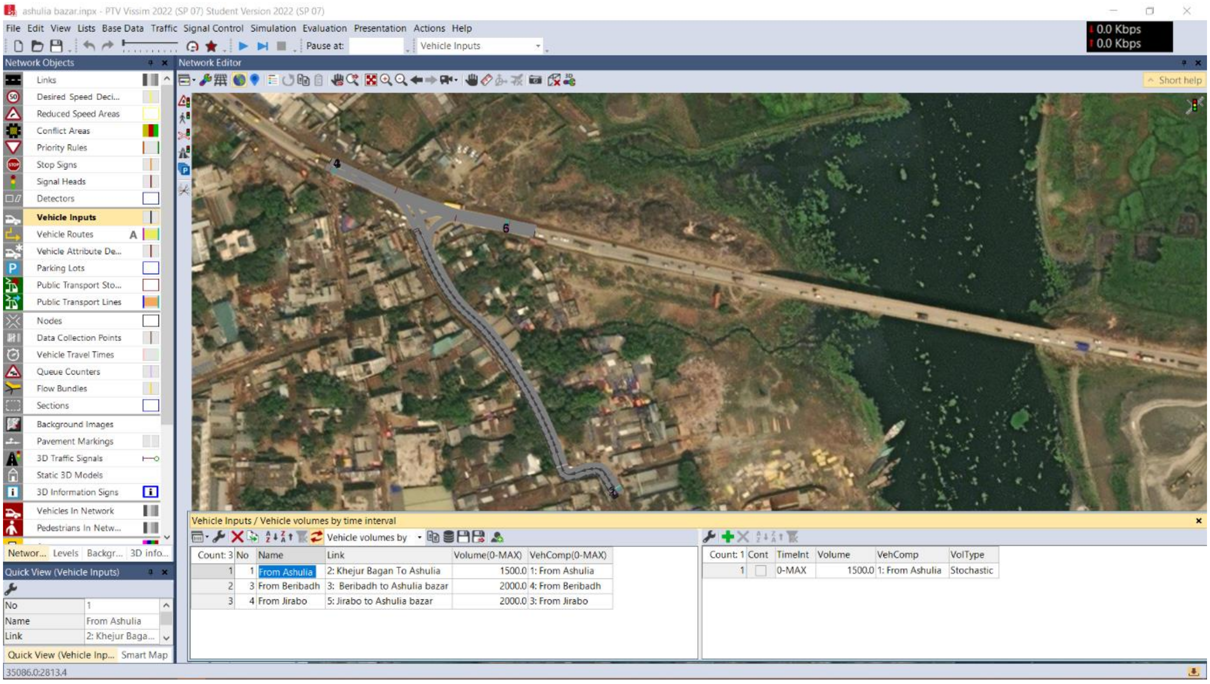


Figure 3.5: Vehicle Input

Vehicle Composition:

calculating the proportion of each type of vehicle to the current traffic patterns.

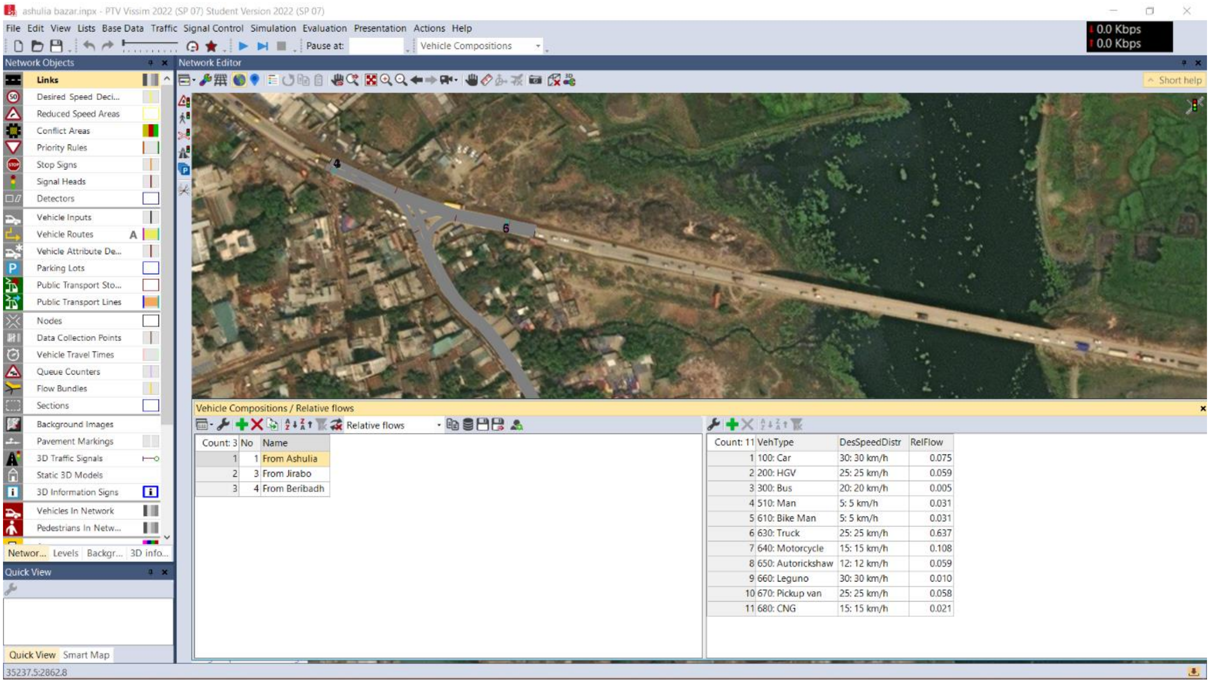


Figure 3.6: Links of Vehicle Composition

Driving Behavior:

driving behavior based on the kind of road network, the class of the vehicle, and the vehicle category.

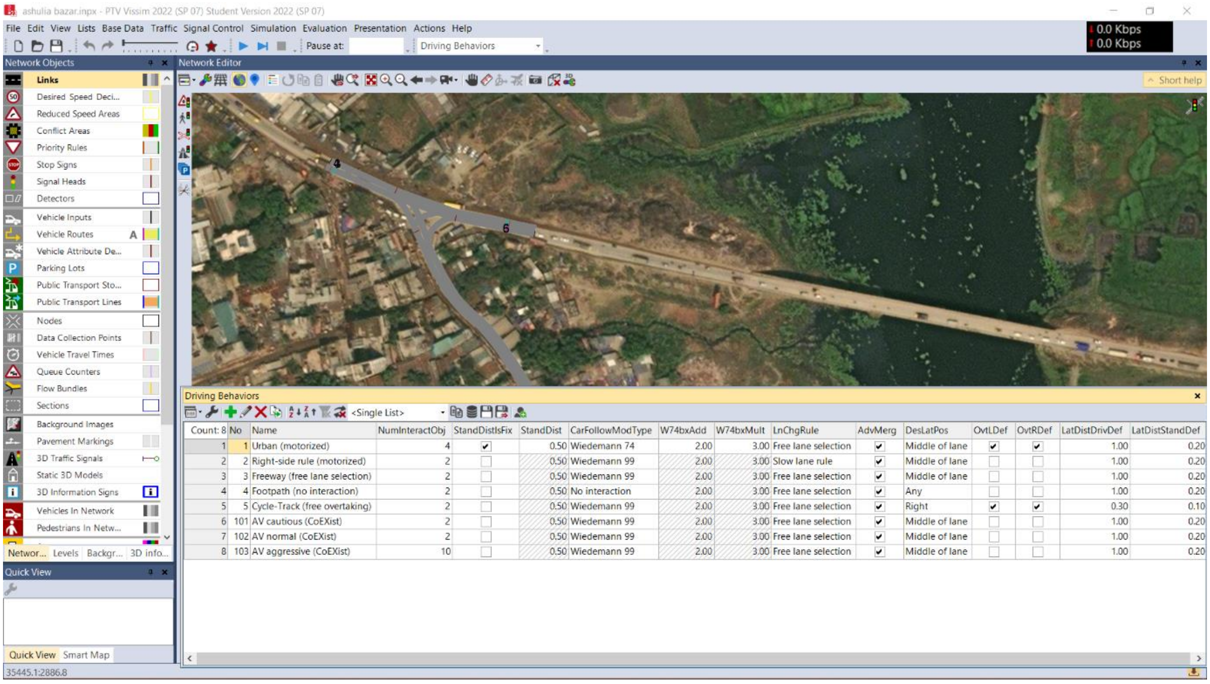


Figure 3.7: Links of Driving Behavior

Signal Control:

a device for simulating a field signal phase.

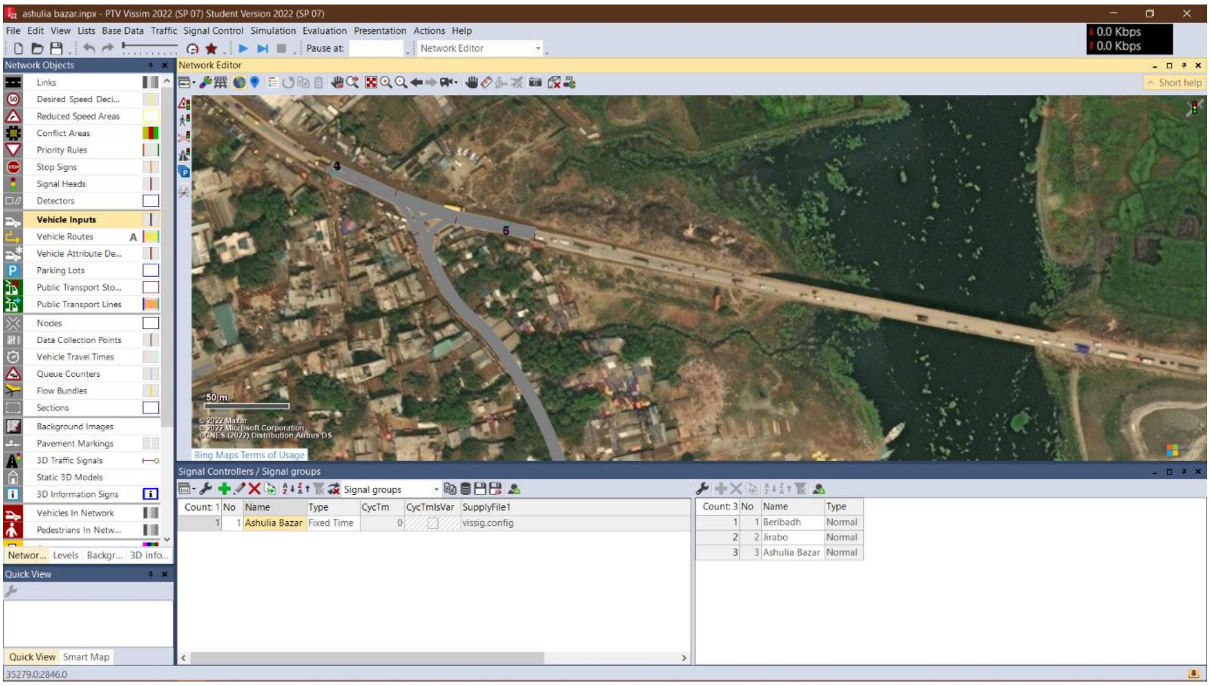


Figure 3.8: Vehicle Input of Signal Control

Links and Connectors:

The road network's geometric input, such as the lane count and road width.

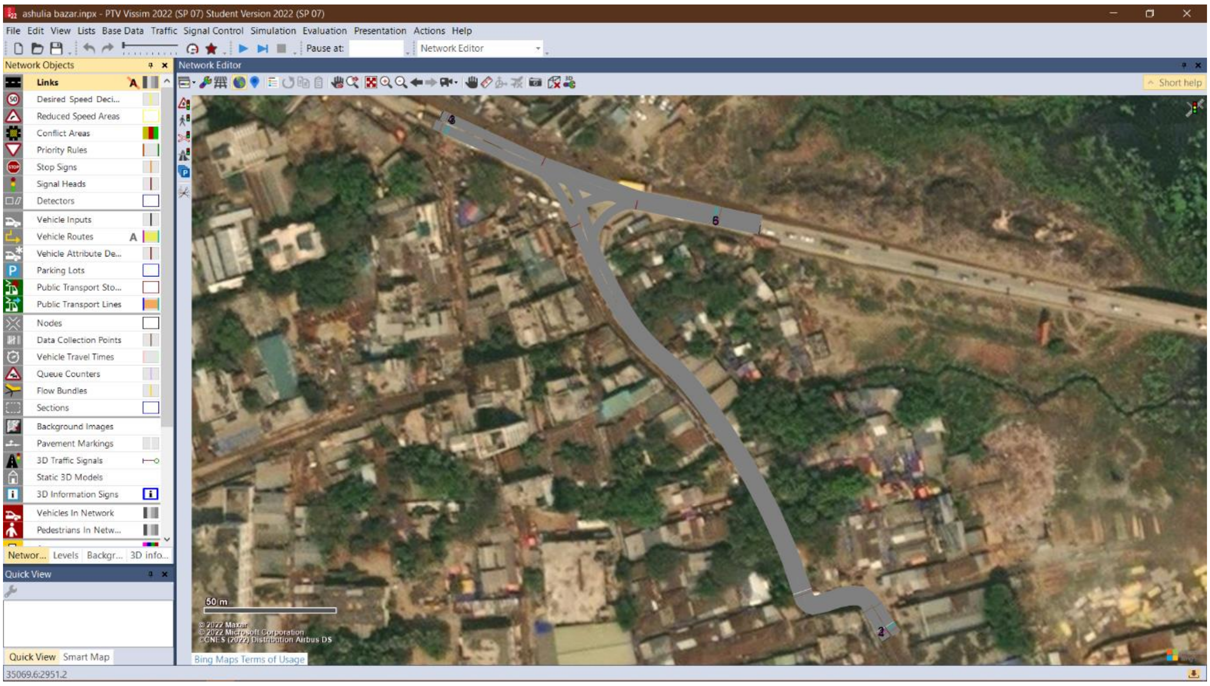


Figure 3.9: Links and Connectors

Vehicle Route:

Partial and Static Routes Relative Flows are used to define how many in all vehicle routings.

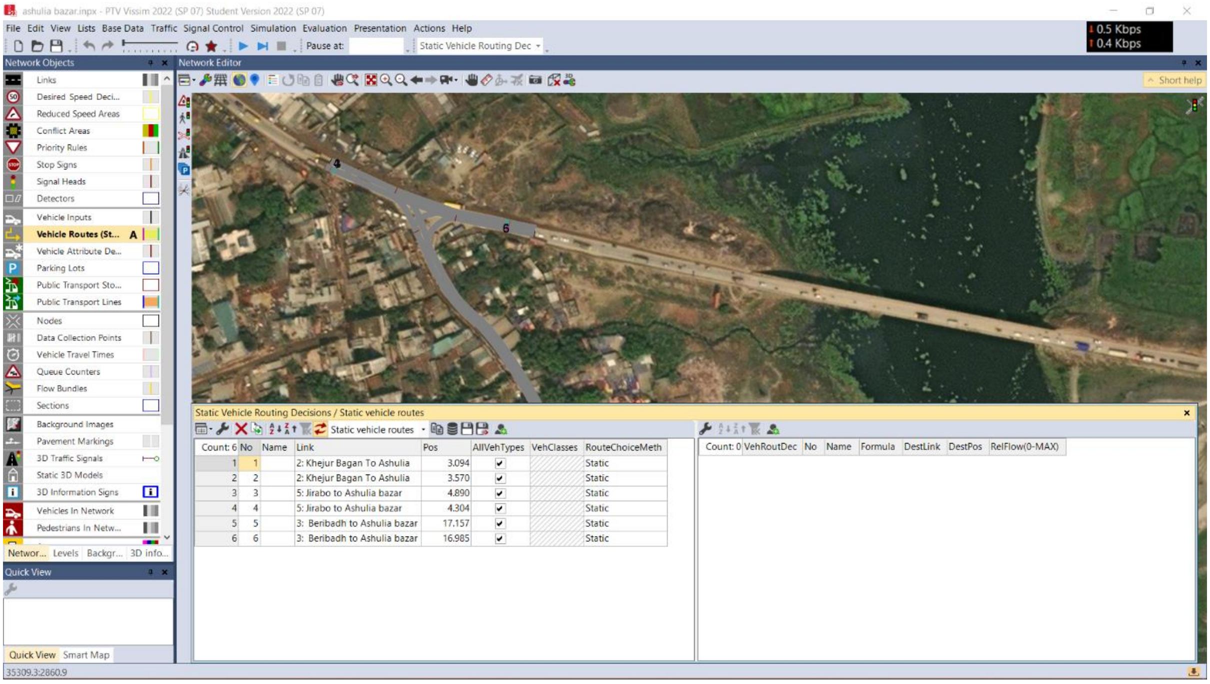


Figure 3.10: Vehicle Route Static/Decisions

Vehicle Travel time:

Relative Flows are used to define how many in all vehicle routings. Choosing the beginning point for a vehicle's journey to a certain location allows for the calculation of the trip time. When traffic is heavy, the travel time may also be computed to determine the delay value. Simulation has ended. result of the wait time and queue length.

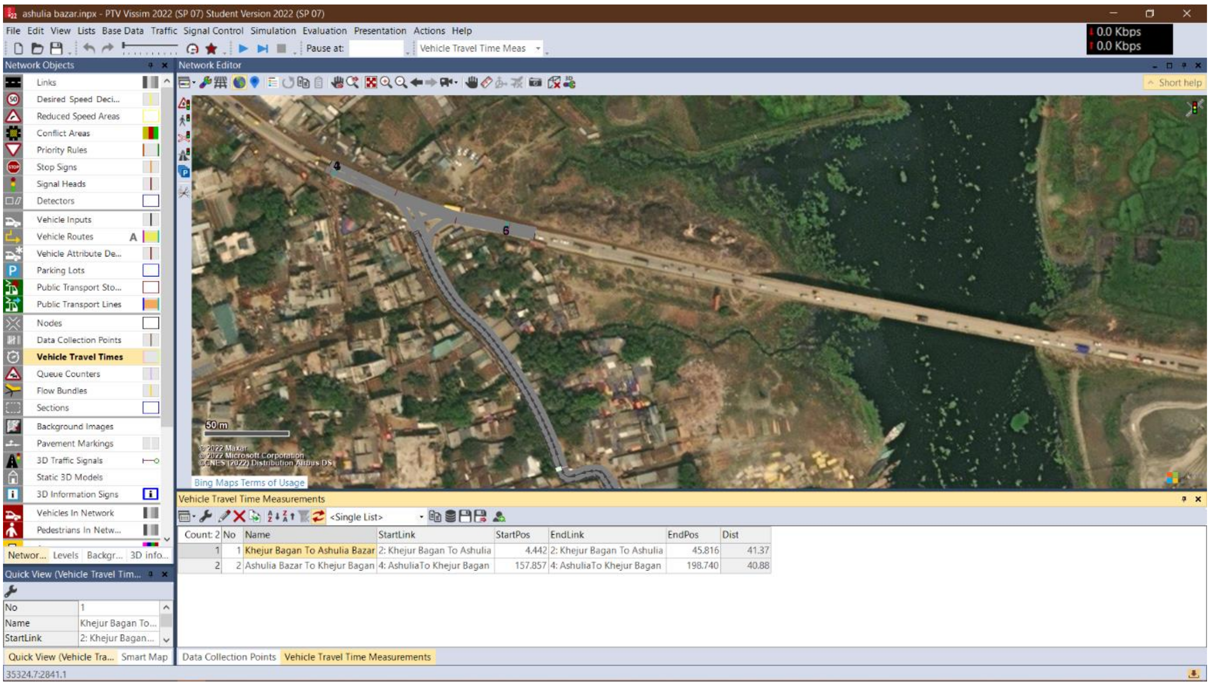


Figure 3.11: Vehicle Travel time of Measurement.

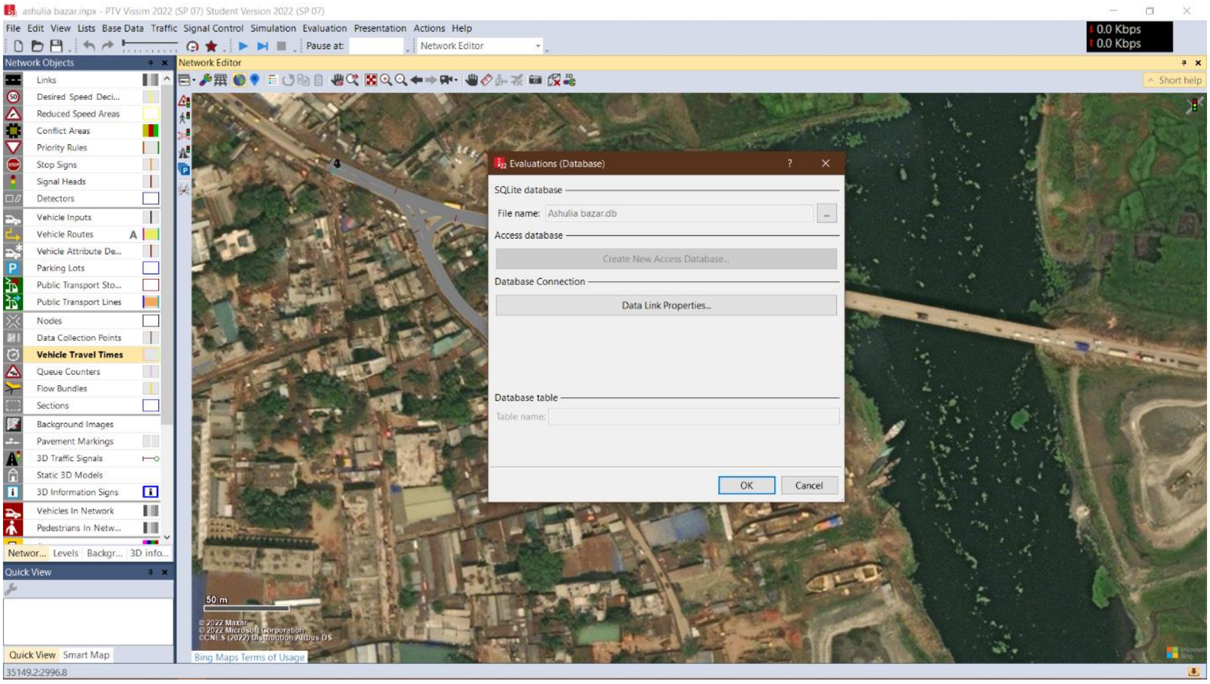


Figure 3.12: Vehicle Travel time of Evaluation

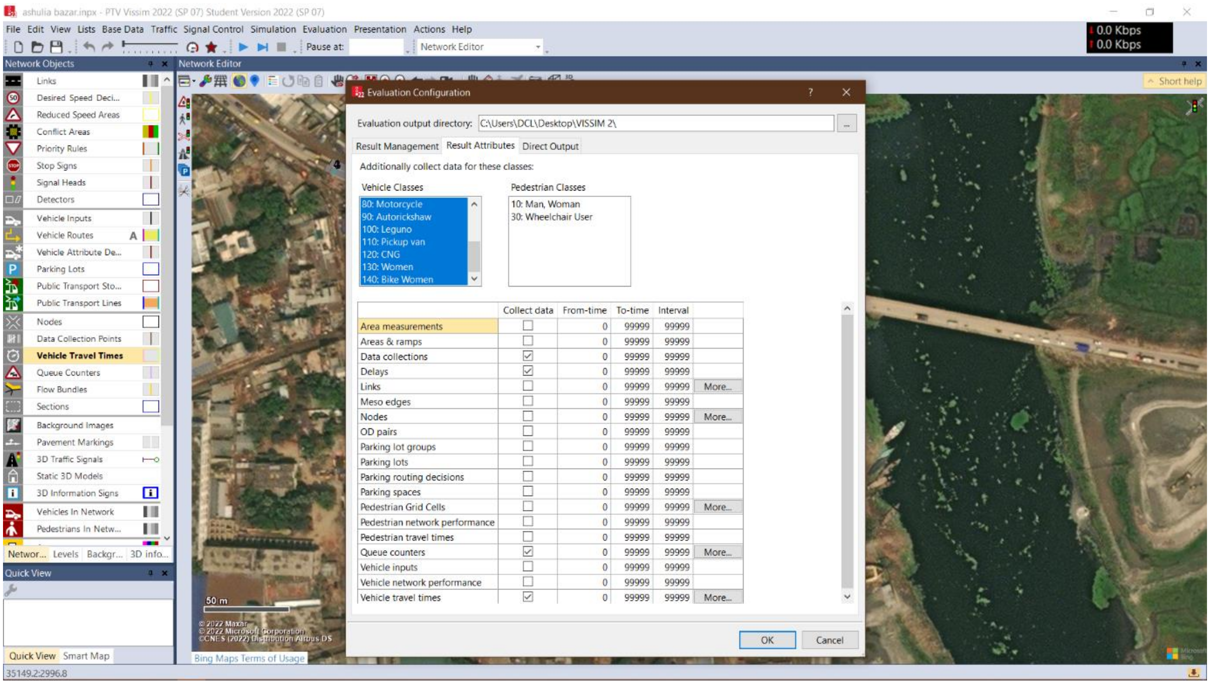


Figure 3.13: Vehicle Travel time of Evaluation configuration

Simulation run:

is in accordance with a time lapse factor. It displays the number of simulated seconds per genuine second. The speed of the simulation has no bearing on the outcomes. During the simulation run, the simulation speed may be adjusted.

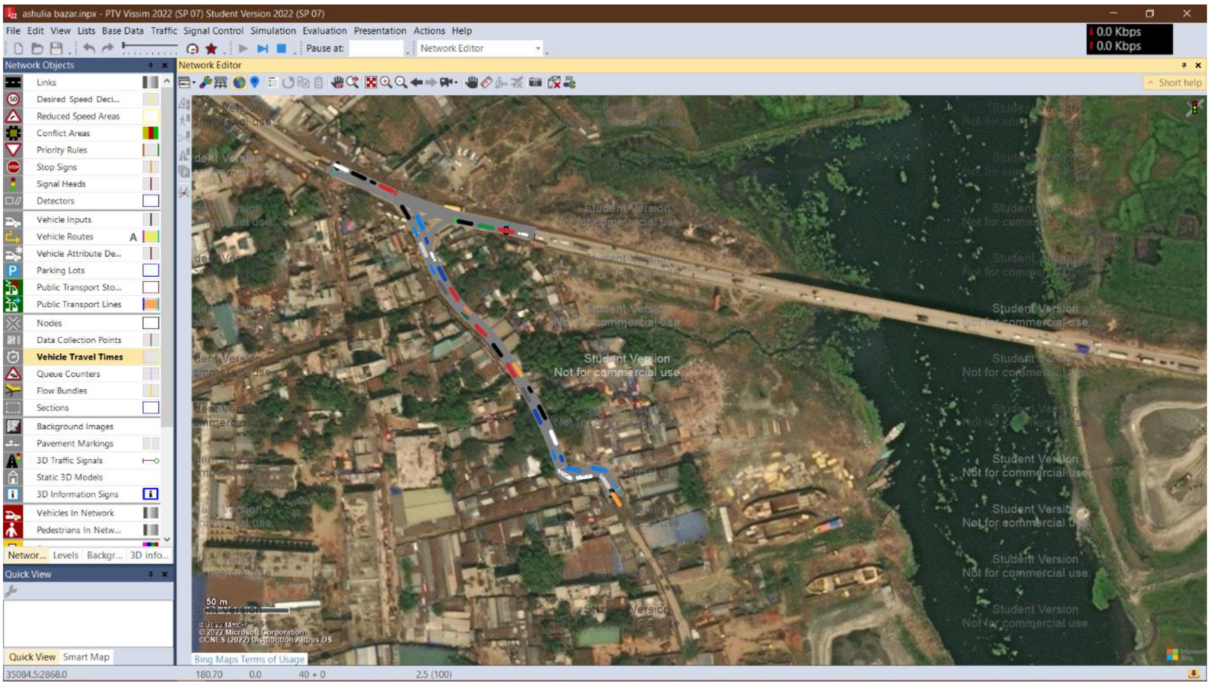


Figure 3.14: Vehicle Travel time Evaluation of Simulation run.

CHAPTER 4

DATA ANALYSIS

4.1 Introduction:

This chapter provides an overview of the calculation of our collected data from VISSIM software. We calculate the emission and fuel consumption etc. We also estimate the costing of our project. End of calculation we can know the profitable time. We calculate 3 roads vehicles fuel consumption and making the emission.

4.2 Calculation:

4.2.1 Land and new road cost:

Land need for Project

Area=Length × width=55 × 20 × 10=110,00=272 SOTOK

Total cost for buying land=272 × 150,000,0=408,000,000 taka

Prepared new road cost =900,000,0×1.1=990,000,0=100,000,00 taka approx.

Other cost=320,000,00 taka

Total cost for new road=450,000,000 taka

Table 4.1: GHG Emission

Calculation of all petrol and diesel vehicular emission for driving mode change

Project case (AADT)	Mode of driving	Tim e s	CO rate[a] mg/s	Emissi on ton/yea r	NO rate[a] mg/s	Emissi on ton/yea r	HC rate mg/s	Emissi on ton/yea r
Without project	Cruise	2. 5	10	8.98	2.50	0.90	2.50	0.54
	Deceleration	2.83	7.5	7.64	2.83	0.51	2.83	0.41
	Delay	68.79	1.5	37.06	68.79	2.47	68.79	6.18
	Acceleration	2.78	22.5	22.47	2.78	1.50	2.78	1.10
Total				76.15		5.38		8.23
With project	Cruise	2. 5	10	4.34	2.5	0.54	2.5	0.26
	Deceleration	5.67	7.5	7.38	5.67	0.49	5.67	0.39

	Delay	68.48	1.5	17.81	68.46	1.19	68.46	2.97
	Acceleration	5.56	22.5	21.70	5.56	1.45	5.56	1.06
With project	Cruise	6.37	10	11.83	6.37	1.48	6.37	0.71
Total				63.06		5.15		5.39
[a]Source: Frey et al. 2001								

Article: An economic analysis of the proposed Dhaka–Chittagong Expressway in Bangladesh with the viewpoint of GHG emission reduction

Source: Takeshi MIZUNOYA, UNIVERSITY OF TSUKUBA, JAPAN
mizunoya.takeshi.ff@u.tsukuba.ac.jp

We count all Petrol, Diesel, CNG, LPG driven vehicle like bus, truck, car etc. we only use delay time

Table 4.2: Emission of Before Project

Uttara Road

CO Emission	1,776	72	1.5	191,808	mg/s
NO Emission	1,776	72	68.79	879,631,4.88	mg/s
HC Emission	1,776	72	68.79	879,631,4.88	mg/s

Ashulia West Road

CO Emission	1,820	93	1.5	253,890	mg/s
NO Emission	1,820	93	68.79	116,433,95.4	mg/s
HC Emission	1,820	93	68.79	116,433,95.4	mg/s

Charabag Road

CO Emission	1,729	65	1.5	168,577.5	mg/s
NO Emission	1,729	65	68.79	773,096,4.15	mg/s
HC Emission	1,729	65	68.79	773,096,4.15	mg/s

Total 569,556,24.4 mg/s

Table 4.3: Emission of After Project

Uttara Road

CO Emission	1,776	47	1.5	125,208	mg/s
NO Emission	1,776	47	68.79	574,203,8.88	mg/s
HC Emission	1,776	47	68.79	574,203,8.88	mg/s

Ashulia West Road

CO Emission	1,820	51	1.5	139,230	mg/s
NO Emission	1,820	51	68.79	638,508,7.8	mg/s
HC Emission	1,820	51	68.79	638,508,7.8	mg/s

Charabag Road

CO Emission	1,729	38	1.5	985,53	mg/s
NO Emission	1,729	38	68.79	451,964,0.58	mg/s
HC Emission	1,729	38	68.79	451,964,0.58	mg/s
			Total	336,565,25.5	mg/s

Emission reduce= (569,556,24.4-336,565,25.5) = 232,990,98.9 mg/s

4.2.2 Fuel consumption

Fc fuel consumption, *N*traffic number/volume of traffic, *T*tt travel time, *v* vehicle's average speed, and *Fe* fuel efficiency.

Table 4.4: Fuel consumption of Before project

Uttara Road

$F c = N\text{traffic} \times T\text{tt} \times v/Fe$

Vehicle Types	*N*traffic	*T*tt	*v*	*Fe*	*F c*	
Truck	268	0.02	20	10	10.72	liter/hour
Bus	286	0.02	25	12	11.91667	liter/hour
Car	230	0.02	25	15	7.666667	liter/hour
LEGUNA	81	0.02	10	8	2.025	liter/hour

Pickup van	514	0.02	20	10	20.56	liter/hour
Bike	397	0.02	20	30	5.293333	liter/hour

Ashulia West
Road

Truck	278	0.03	20	10	16.68	liter/hour
Bus	290	0.03	25	12	18.125	liter/hour
Car	250	0.03	25	15	12.5	liter/hour
LEGUNA	70	0.03	10	8	2.625	liter/hour
Pickup van	510	0.03	20	10	30.6	liter/hour
Bike	422	0.03	20	30	8.44	liter/hour

Charabag Road

Truck	220	0.018	20	10	7.92	liter/hour
Bus	252	0.018	25	12	9.45	liter/hour
Car	293	0.018	25	15	8.79	liter/hour
LEGUNA	83	0.018	10	8	1.8675	liter/hour
Pickup van	494	0.018	20	10	17.784	liter/hour
Bike	387	0.018	20	30	4.644	liter/hour
				Total	197.6072	liter/hour

Table4.5: Fuel Consumption Of After Project

Uttara Road

Truck	268	0.013	20	10	6.968	liter/hour
Bus	286	0.013	25	12	7.745833	liter/hour
Car	230	0.013	25	15	4.983333	liter/hour
LEGUNA	81	0.013	10	8	1.31625	liter/hour
Pickup van	514	0.013	20	10	13.364	liter/hour

Bike	397	0.013	20	30	3.440667	liter/hour

Ashulia West
Road

Truck	278	0.014	20	10	7.784	liter/hour
Bus	290	0.014	25	12	8.458333	liter/hour
Car	250	0.014	25	15	5.833333	liter/hour
LEGUNA	70	0.014	10	8	1.225	liter/hour
Pickup van	510	0.014	20	10	14.28	liter/hour
Bike	422	0.014	20	30	3.938667	liter/hour

Charabag Road

Truck	220	0.01	20	10	4.4	liter/hour
Bus	252	0.01	25	12	5.25	liter/hour
Car	293	0.01	25	15	4.883333	liter/hour
LEGUNA	83	0.01	10	8	1.0375	liter/hour
Pickup van	494	0.01	20	10	9.88	liter/hour
Bike	387	0.01	20	30	2.58	liter/hour
				Total	107.3683	liter/hour

Total fuel saves = (197.6072-107.3683) =90.2389 liter/hour

Every day working hour 10 hours approx.

So total fuel saves per day 90.2389 ×10=902.389 liter/day

Total fuel saves per year 902.389 ×365=329,371.985 liter/year

Total money cost saves per year=329,371.985×135=444,652,17.98 taka (135tk per liter fuel)

If we make this project then we can make this costing money after (450,000,000÷444,652,17.98) = 10.12 years. After 10 years 2 months this project gives us profit.

VISSIM After and Before Road

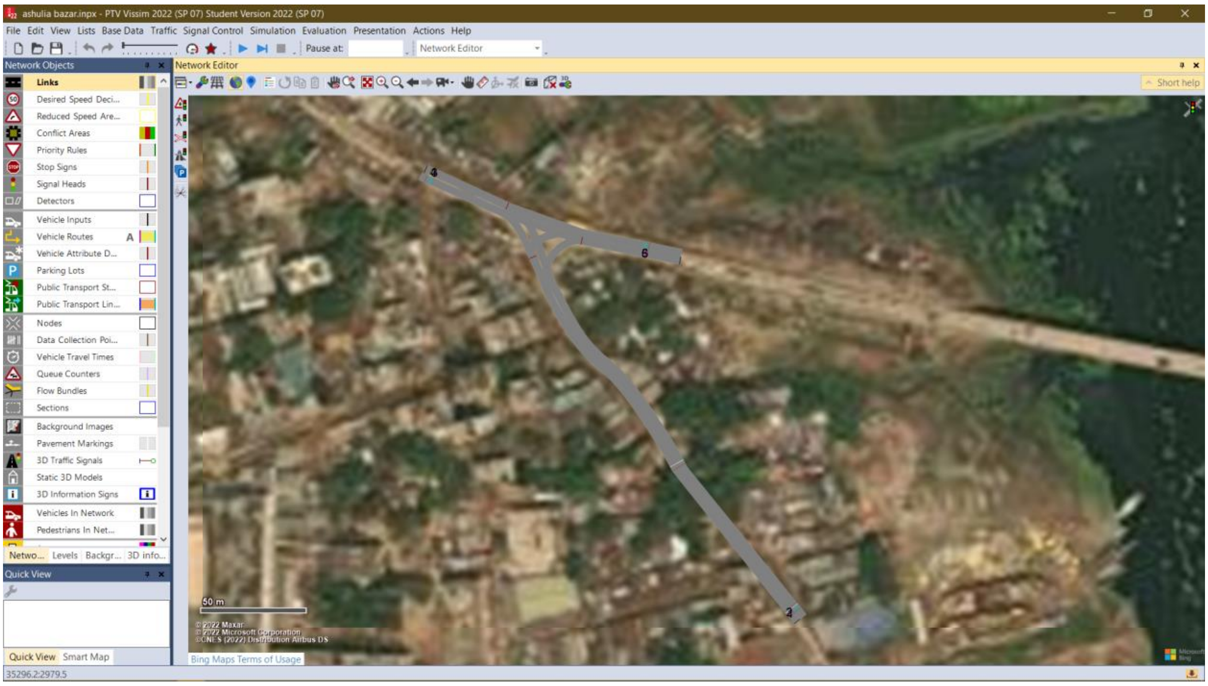


Fig 4.1: VISSIM After Road

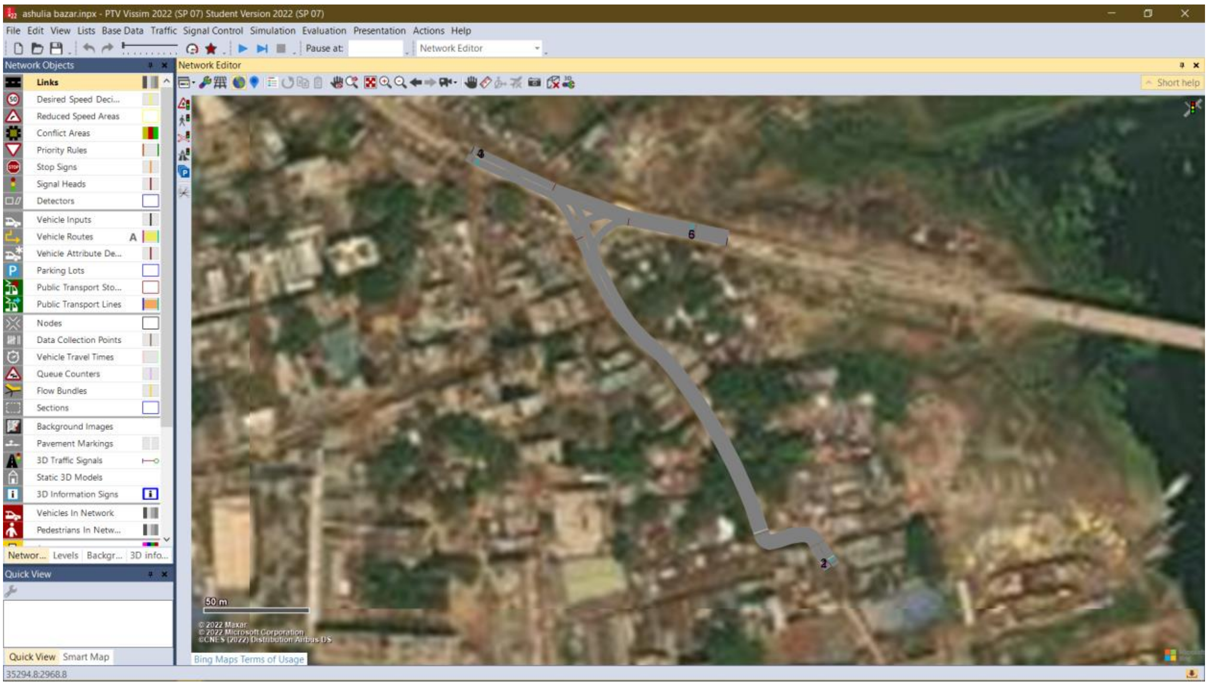


Fig 4.2: VISSIM Before Road

CHAPTER 5

RESULT AND DISCUSSION

5.1 Result:

Simulation

The data given afterwards indicate the mean value of this one simulation, which were each run once with a simulation time of 600 seconds and various seeds. For total flows of 1000, 1500, and 2000 vehicles per hour, various flow ratios were employed. It was assumed throughout the experiments that each car had the necessary hardware to transmit and receive data.

Ten times per second, or at a frequency of 10 Hz, information is sent between the system and the vehicle.

Of course, measuring the delay on a longer stretch of road would be more accurate, but doing so would significantly slow down calculation speed since the algorithms would have to take into account more vehicle and combination combinations. The only part that is measured is the one where the delay is actually minimized.

Delay:

The resulting cumulative delays were 60 minutes Observing the simulation results with a total flow of 2000 veh/h, it is clear that the delay rises with decreasing flow ratio for the traffic signal and nearly remains constant for the algorithms.

There is one glaring tendency that can be seen: As the flow ratio rises, the gap between the signalized intersection and the reducing algorithms widens. That might be explained by the fact that only when a vehicle is approaching does the low demand on one approach trigger the green phase.

Therefore, the method with the larger demand often discharges the entire cycle length. The reducing algorithms' tendency to vary the discharging orientations is most likely the primary factor, though. As a result, the junction has greater capacity and the overall delay does not get longer as the ratio decreases.

The difference in delay between the emission- and delay-minimizing algorithms is virtually nil.

In the signalized instance, the delay likewise grows with increasing ratio when looking at the simulation with 1500 veh/h. A greater decline than in the 2000 veh/h example is shown for the algorithms.

The cause is the same as what was previously stated. Keep in mind that the variation for the 1500/150 ratio is quite modest, indicating that the less complex adaptive traffic control method is virtually as effective as the reducing algorithms. The pattern seen in the 1,000 vehicles per hour example is also noticeable here. In this instance, there isn't much of a difference between the two minimization methods.

The simulation with 2000 vehicles per hour did not test the traffic signal because the intersection is already congested. As previously mentioned, if the combination is always alternating, the intersection's capacity for the algorithms can reach about 3600 vehicles per hour. As a result, evaluations of the two systems were done. If you look at the curves, the overall delay gets shorter.

Although it fluctuates somewhat in the final two ratios, it may be regarded as consistent throughout all flow ratios.

The delay produced by the emission minimizing method is somewhat more than the delay minimizing algorithm for all three total flows, but the difference is essentially insignificant.

Cost of project

In our project total estimated cost 45 Crore. After 10 years and 2 months this project going to be profitable. We make the costing money by fuel consumption. When we straight the CHARABAG road then we get three road jam free. Like ASHULIA west road and Uttara Road. We get more working hour. Before making project, fuel consumption 197.607 liter/hour. But after the project this fuel cost down to 107.368 liter/hour. Total save 90.239 liter/hour.

Emissions:

The emissions were calculated using data from ARTICLE of an economic analysis of the proposed Dhaka–Chittagong Expressway in Bangladesh with the viewpoint of GHG emission reduction Md. Zia Uddin1 · Takeshi Mizunoya2, the organization TAKESHI MIZUNOYA.

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Before the project make the total emission is 569,556,24.4 mg/s. After the project this emission going down 336,565,25.5 mg/s. Total 232,990,98.9 mg/s reduce. which consists of different modules that calculate the emissions based on speed and acceleration of the simulated vehicles. The reference emissions per vehicles are based on typical vehicle composition on ASHULIA roads. The traffic emissions that can be calculated include CO, NO and HC. Since CO is by far the most important, only this emission is shown in the results. The emission curves follow also a similar trend as the delay. A relation between the two dimensions is traceable. The scale though is smaller than in the total delay comparison: Where the delay could be reduced till a factor of 10 in the extreme case, the emissions for the ATC are maximum twice the value of the minimizing algorithms The emission minimizing algorithm has almost the same values as the delay minimizing algorithm.

The reason is that along with sharing the same framework, minimizing the Av has in the majority of the cases the same effect as minimizing the delay. Obviously, it depends also on the position of the vehicles, as the same speed difference causes a larger delay if applied early on the approach rather, just before the intersection. But in the most cases, the combinations picked are probably the same. So only the small number of different combinations makes the negligible difference both in the delay and in the emissions. Nevertheless, compared to the adaptive system, a relevant improvement is observable.

5.2 Limitation:

Every study has its drawbacks. Our research has certain limitations as well. There is...

1. We are using the student edition of VIISIM. Because of this, we are only able to perform simulations that last 600 seconds and links longer than 1000 meters. We were unable to use so many settings in VISSIM.

2. The most recent emission rate was unavailable. As a result, the emission's exact value was unknown.

5.3 Discussion:

According to the findings of this study, a car playing on an existing straight road will cause a delay at junctions. Additionally, the lost time would increase with the increase in the number of vehicles. As a result, there will be instances of traffic standstill, which will cause the network to crash. The urban road building will reduce travel time loss at the junctions on the straight existing route, according to this study's findings.

This project will replace the curved road by forbidding motorized interference on the straight section, cutting down on overall travel time and vehicle operating expenses. At the end of the day, the project's external economies or benefits are added by the savings in travel expenses and vehicle running expenses.

Reducing travel time boosts transportation dependability and adds value. Less route uncertainty forces passengers and freight operators to modify their trip routing in response to demand and lowers possible delay contingency costs, which directly affect service costs and product prices in the marketplace. The comparison of the excess fuel burn reduction for the cars losing time at the curve road when utilizing the straight road and the amount of fuel savings generated after the straight road construction is one of the study's unique conclusions. At the end of the day, include the external economies or savings in travel time and vehicle running costs. By reducing fuel usage in this industry, wasteful foreign currency expenditure may be avoided and instead invested in other promising industries, as necessary. In addition to increasing the foreign currency reserve, it will also help the GDP expand. GHG emissions sharply decline as a result of decreased gasoline use. GHG emissions from idle cars have significant effects on heavier trucks. Heavy-duty vehicles including pickup trucks, buses, trucks, trailers, etc. have changed in emission due to the enormous quantity of heavy vehicles on this route. The study calculates the societal cost of reducing GHG emissions for several engine types (EFI and MFI). The new pro-jest adds a possible environmental benefit from the societal cost reduction of vehicle emissions. The majority of economic operations, at least from Bangladesh's perspective, are situated near to roads. The reduction in GHG emissions will contribute to the health benefits for the locals and economically disadvantaged people living close to the corridor. It is important to note that the reduced emissions will stabilize the ideal roadside temperature, enhance road environment and lessen their impact on global warming. Ashulia Bazar Road is extremely prone to traffic jams because of several interventions and heavy mixed traffic. We have a lot of working hour savings. that increases our GDP.

5.4 Conclusion:

In comparison to an adaptive traffic control system, the results indicate a general improvement in delay and emissions. The given algorithms generated better outcomes, particularly when the demand for both techniques was similar. An adaptive traffic control system is usually the superior option if the flow ratio is large.

- The results indicated that the emission minimizing method, which was based on an overly simplistic assumption, was almost as effective as the delay minimizing method.
- GHG emission effect on our environment poorly. So we should decrease it.
- We must reduction of fuel uses. Day by day internationally fuel market price going high.

The results indicated that the emission minimizing method, which was based on an overly simplistic assumption, was almost as effective as the delay minimizing approach. It is advised to employ a more thorough assessment of the combinations if additional study is needed. Theoretically, the all-module-equipped vehicles might exchange data about their unique emissions and so make it easier to choose the ideal combination, but the road's curvature must be converted to a straight section. In this situation, external vehicle control undoubtedly makes a junction more effective, but it is still possible that vehicles with low emissions might be punished in terms of delay since they create less CO. Additionally, it is possible to anticipate the sequence with the lowest emissions using currently available emission models, although these intricate models sometimes require additional data, such as the mass of the vehicle. But based on the findings, let's suppose that, for the most part, reducing the delay should likewise have a favorable impact on emissions. Increasing the capacity at Ashulia Bazar might be risky, but can also be utilized at Ashulia Bazar as a "buffer" with shifting needs. For instance, during peak hours, lowering its might temporarily enhance capacity.

It is advised to make the path straighter and apply more specific criteria when choosing the optimal combination for further investigation. Additionally, testing on hardware requirements and processing performance must be conducted to determine the viability of handling increasingly complicated crossings.

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