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Traffic speed study on technical to Shyamoli road of Dhaka City, Bangladesh

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Abstract
Visitors designing functions designing strategies and methods to accomplish the secure and time-productive development of people and products on streets. The safe and time-effective development of individuals and merchandise is reliant upon site visitors flow, that is straightforwardly related to the site visitors characteristics. Site visitors velocity is a enormous list to gauge the site visitors popularity, and ongoing and unique visitors pace forecast is a sizeable piece of constructing a clever transportation framework. Another site visitors pace prediction version in light of the mixture of consideration machine and chart convolutional mind community is proposed to clear up the problems of ran-dimness, nonlinearity and spatial-worldly connection of visitors speed. At remaining, the proposed version is joined with 5 different benchmark fashions to foresee site visitors pace on two freely handy visitors velocity datasets. The exploratory consequences display that the precision of the proposed model is 75.1% and 86.6% on the 2 datasets that is around 3% better than the exactness of the excessive-level benchmark model. This demonstrates that the proposed version has excessive exactness and soundness and might deliver logical premise to site visitors on the board. The three essential barriers of a site visitors stream are volume, pace, and thickness. Without a hint of possible preparation and visitors to the board of the city, the continued avenue framework can't cook the future requirements of the city. Walker and vehicle volumes have expanded altogether particularly currently because of the distinction inside the financial aspects of the working-magnificence households, the continued work concentrates on traffic qualities in the town of Dhaka at one selected want intersection. In this painting, accentuation was given on visitors quantity and the exam become brought out via vital visitors stream critiques at school Entryway to specialized in Dhaka town. Site visitors flow is focused on by means of manual strategies. For higher comprehension of the present day status of traffic circulate on the intersection, visitors evaluation is directed. With the assistance of the records assortment, an endeavor have been made to recognize the visitors designs at some stage in numerous time spans. Site visitors light at that intersection is additionally a situation to the site visitors flow traits. Consequently, the consequences from the modern evaluation are beneficial in controlling the frenzy hour gridlock at the Crossing factor and moreover in recommending a part of the restoration measures to further develop the site visitors well being within the locale. Medicinal measures like enlarging the street, evolving four-path to six-course or through giving extra open vehicle can be recommended in light of the outcomes of the work.

Keywords: Traffic designing, traffic speed, traffic stream, transportation framework

Introduction
Speed is a big share of the character of stage and safety of Street Corporation. Pace is the pace of development of car in distance consistent with unit time. A not-unusual unit of velocity is kilometers every hour (kph) or miles every hour (mph). Basically there are two kinds of speed: The time-suggest speed and the space-mean velocity. Area suggest velocity is the duration of an avenue segment separated by way of the regular travel season of a few vehicles over this precise location. The time-suggest velocity (spot speed) is the typical spot pace of some cars expected at a given spot. (Roshandeh AM, Nesheli MM, Puan 2009) [37].

Traffic pace expectation is possible of the maximum essential listen in rush hour gridlock research nearby location. Powerful visitors velocity expectation is crucial for the benefit of each road clients and site visitors the board corporations. Essentially, speed forecast is a component inside the institution of site visitors records expectation. With the statistics accessibility by means of using sensible Transportation Framework (ITS), traffic researchers have fostered numerous traffic records forecast techniques, such as facts pushed measurable and AI fashions. One general difficulty in this subject is how to pick the precise forecast approach. Currently, pertinent investigates mostly partition into two wonderful divisions: Parametric demonstrating and non-parametric displaying.

The traditional method of visitors safety evaluation has been to establish relationships among the traffic characteristics (E.G., flow, velocity), roadway and environmental conditions (E.G., geometry of the throughway, weather conditions), driving force characteristics (E.G., gender, age), and crash incidence. The inability of most of the models advanced the use of this approach is they rely on mixture measures of traffic pace (E.G., pace restriction) and volume (E.G., AADT or hourly volumes) and therefore are not sufficient to identify the real-time black spots Q (I.E., locations having an excessive chance of crashes), created because of the interplay of ambient traffic conditions with the geometric characteristics of limited-access highway segments. (Abdel-Aty and Pande, 2005) [1].

Traffic designing use designing strategies and procedures to accomplish the secure and time productive development of individuals and merchandise on street. The safe and time talented improvement is difficulty to visitors move that is associated with traffic attributes. The vitally 3 obstacles of site visitors movement are quantity, velocity and thickness. Pace is a good sized transportation thought because it connects with safety, time, solace, consolation, and monetary factors. Spot pace research are utilized to decide the rate conveyance of a site visitors circulation at a particular location. (Yuhan Jia, Jianping Wu, and Yiman Du, 2016) [38].

Literature Review

To plot a road there are explicit street additives that also up in the air of those are the quantity of paths, path width, middle sort and width, duration of velocity increase and deceleration paths for on and exit ramps, want for truck mountaineering paths for streets with steep tiers, bend radii predicted for automobile turning, and the street arrangement predicted to provide great pausing and passing sight distance (Mannering and Kilareski, 1998) [41]. The mathematical highlights of the road, for example, even and vertical association sight distance and plenty of the time, cross-phase, are delicate to the plan pace. A niche speed take a look at is made by means of measuring the individual speeds of a pattern of the cars passing a given factor (spot) on a avenue or toll road. These character speeds are used to estimate the velocity distribution of the entire site visitors circulate at that region under the conditions prevailing on the time of the study (Lee C, Saccomanno F, & Hellinga B, 2003) [39]. Visitors architects and organizers want data approximately visitors. They need records to plot and oversee road and site visitors framework. They make use of the data for arranging and making plans site visitors places of work, choosing mathematical norms, economic research and assurance of wishes. They make use of this to legitimize warrant of traffic light devices, as an example, signs, traffic lighting, asphalt markings, faculty and walker intersections. The additionally make use of this statistics to concentrate on the viability of offered plans, diagnosing given circumstances, and monitoring down becoming arrangements, determining the influences of projected structures, adjusting and approving visitors fashions. Transportation framework is a powerful framework. Statistics about visitors must be constantly refreshed to live up with always converting transportation framework. Records should be accrued and investigated methodically to get delegate data. Visitors research are the technique for obtaining information approximately visitors. That is a green technique to amassing statistics to be utilized for exceptional visitors designing purposes. (Currin TR, 2001) [40].

Elements of traffic research

Visitors research encompass

- Inventory of road visitors physical functions.
- Visitors circulate characteristics: Volume, pace, density, Occupancy studies and so on.
- Capacity studies of streets and intersections.
- System utilization research: Tour time and put off, O-D survey.
- Tour demand-home interview survey.
- Avenue user's fee-value of tour time, automobile operating value.
- Parking deliver S call for research.
- Axle load survey.
- Mass transit performance and utilization studies.
- Traffic injuries research.
- environmental effect studies of shipping.

Secure velocity: It's miles the eighty fifth-percentile velocity at or below which eighty-five percentage of the traffic is transferring. The most commonplace software of the cost is its use as a main element in determining the velocity restrict for a toll road segment. That is usually used as a baseline for establishing the velocity (primarily based on a niche velocity look at) [10-12].

Design velocity: It is the 98th percentile speed decided on to decide the various geometric layout functions of the roadway. Chapter Twelve of the MDT avenue layout manual presents specific layout pace standards for diverse situations.

Median speed (50th Percentile velocity): Median velocity is the velocity represented by means of the center value when all statistics velocity points are arranged in ascending order. For spot pace studies, it represents the 50th-percentile driving force. In simple phrases, the rate that similarly divides the distribution 12 of spot speeds; 50 percentage of determined speeds are better than the median; 50 percent of found speeds are decreased than the median [10, 11].

Modal speed: Modal spot speed is the speed cost that takes place maximum regularly in a sample of Velocity measurements.

Tempo: It is more than a few velocity commonly taken in 10mph or 15 kmph increment.

Pace Limits: The restrict that is limited in such values wherein top restriction is at eighty-fifth percentile. Speed and decrease limit is at 15th percentile pace. Common descriptive information

Mathematics imply: The arithmetic imply is the most commonplace degree of important tendency. It is Determined via summing all the records factors and dividing it via the sample length.

Frequency Distribution: Frequency distribution demonstrates at what speeds most people of the drivers are travelling for a given location. It may additionally be used to fast-examine two or extra. Sample websites.

Ordinary Distribution: The regular distribution may be constructed from statistical formulation but, basically, it is a distribution that falls under a bell curve. A bell curve is defined as a curve in which its maximum factor is at the median velocity.

Pattern length: Pattern size is the minimum variety of readings required to reap a desired stage of Self-belief.

Thirteen
Widespread deviation [10, 12]: A degree of the way a long way fact spreads around the suggest cost, indicating the diploma of dispersion of the statistics.

Journey velocity: Travel velocity is the effective pace of the car on an adventure among two points and is the gap among points divided via the whole time taken for the vehicle to finish the travel consisting of any forestall time.

Modal pace: Modal is the single price of the speed that is most probably to occur. A vertical line dropped from height of the frequency distribution curve directly to the horizontal axis gives the modal velocity.

Tempo: Tempo is described as the 10 mph increment in velocity wherein the very quality percent of drivers are found. A10 mph is scaled from horizontal axis. Keeping this template horizontal, vicinity and stop of the lower left side of the curve and pass slowly along the curve.

Eight unfastened float paces: The favored pace of drivers in low amount conditions and in the absence of visitors control tool.

Elements affecting loose go with the flow speed
Width.
Lateral clearance.
Range of lanes.
Element friction.
Interchange density.
Geometric layout.

Weather (the quantity of bargain in loose-go with the waft Speed is straight away associated with the severity of the weather event).

Visibility: A visitors pace take a look at is conducted to evaluate common and instant speeds of a certain roadways. Speed is one of the maximum vital characteristics of traffic and its measurement is a common necessity in traffic engineering studies. It's far a basic degree of traffic and roadway performance. Useful facts for avenue design, improvement may be carried out thru those studies. Most of the instances it impacts the visitor in selecting routes or transportation modes particularly public modes [7]. Velocity look at from outer view can be appeared just a practical utility of physics and information but in broadest sense, it results each corner and corner of visitors management and maneuvers. However to go further with that it is vital to know definitions that relates velocity to traffic organizing and running.

Research Method: Pace is a crucial measure of the satisfactory of travel and safety of road networks. Velocity is the fee of movement of vehicle in distance in step with unit time. The main motive of this observation is to de site visitors parameter, particularly pace. Spot velocity measurements are most often taken at a factor of roadway beneath situations of free waft. The motive is to decide the speeds that drivers pick out, unaffected with the aid of the life of congestion. This information is used to decide well-known speed tendencies, to help determine affordable speed limits and to evaluate protection.

Location: Place of the spot for visitors pace survey is selected to be from Technical to Shyamoli.

Date: Records for speed examination was collected on October five, 2020.

Time: The time became from nine: 00 am to ten: 00 am.
Weather circumstance: It becomes a sunny day.

Remark: Categorised vehicle Counts.
Distance for Spot velocity: 50 ft.

Data Collection
Records series is the technique of amassing and measuring information on variables of hobby, in installed systematic fashion that permits on, to reply stated studies questions, test hypotheses, and ate effects. The information collection issue of studies is common to all fields of look at which include bodily and social Sciences, humanities, enterprise, and so on. While methods vary by subject, the emphasis on ensuring accurate and sincere collection remains the equal.

Table 1: Spot speed observation of technical to Shyamoli 50 ft(s)

Car No	Distance (km)	Time (sec)	Time (hr.)	Speed (kmph)
1	0.01524	1.75	0.0004861	31.35
2	0.01524	1.86	0.0005167	29.49
3	0.01524	2.25	0.000625	24.38
4	0.01524	1.60	0.000444	34.29
5	0.01524	1.45	0.0004028	37.84
6	0.01524	1.90	0.0005278	28.87
7	0.01524	1.12	0.0003111	48.99
8	0.01524	2.30	0.0006389	23.85
9	0.01524	1.70	0.0004722	32.27
10	0.01524	1.55	0.0004321	35.27
11	0.01524	1.20	0.0003333	45.72
12	0.01524	1.50	0.0004167	36.57
13	0.01524	1.35	0.000375	40.64
14	0.01524	1.85	0.0005139	29.66
15	0.01524	1.90	0.0005278	28.87

Data Collection Table
Direction: Technical to Shyamoli.
Date: October 5, 2020.
Time: 9:00 am to 10:00 am.
Sample Type: Car.

Table 2: Spot speed observation of Shyamoli to technical 50 Ft (s)

Car no	Distance (km)	Time (sec)	Time (hr.)	Speed (kmph)
1	0.01524	1.70	0.0004722	32.61
2	0.01524	1.80	0.000543	30.08
3	0.01524	1.95	0.0005517	28.43
4	0.01524	1.30	0.0003611	42.65
5	0.01524	2.10	0.0005833	26.40
6	0.01524	1.90	0.0005278	29.17
7	0.01524	1.85	0.0005139	29.97
8	0.01524	2.50	0.0006944	22.18
9	0.01524	3.0	0.0008333	18.48
10	0.01524	2.10	0.0005833	26.40
11	0.01524	1.90	0.0005278	29.17
12	0.01524	1.60	0.0004444	34.65
13	0.01524	1.57	0.0004361	35.31
14	0.01524	1.90	0.0005278	29.17
15	0.01524	1.95	0.0005417	28.43

Data Collection Table
Direction: Shyamoli to Technical.
Date: October 5, 2020.
Time: 9.00 am to 10:00 am.
Sample Type: Car.

Table 3: Travel speed observation of technical to Shyamoli.

Car no	Distance (km)	Time (sec)	Time (hr.)	Speed (kmph)
1	1.6	910	0.2528	6.33
2	1.6	975	0.2709	5.91
3	1.6	895	0.2481	6.45
4	1.6	875	0.2430	6.58
5	1.6	978	0.2717	5.89
6	1.6	1080	0.3000	5.33
7	1.6	740	0.2056	7.78
8	1.6	840	0.2333	6.86
9	1.6	1025	0.2848	5.62
10	1.6	910	0.2528	6.33

Table 4: Travel speed observation of Shyamoli to technical

Car no	Distance (km)	Time (sec)	Time (hr.)	Speed (kmph]
1	1.6	910	0.2528	6.33
2	1.6	920	0.2556	6.26
3	1.6	855	0.2375	6.74
4	1.6	875	0.2708	5.91
5	1.6	960	0.2667	5.99
6	1.6	1014	0.2817	5.68
7	1.6	975	0.2708	5.91
8	1.6	985	0.2736	5.85
9	1.6	1010	0.2805	5.70
10	1.6	1005	0.2792	5.73

Data Analysis
Spot Speed Data Analysis: We observed for 50 ft distance by stopwatch method to calculate spot speed.

Spot Speed Calculation
Technical to Shyamoli

Table 5: Spot speed Technical to Shyamoli 50ft (S) direction.

Vehicle number	Speed (kmph)
1	31.35
2	29.49
3	24.38
4	34.29
5	37.84
6	28.87
7	48.99
8	23.85
9	32.27
10	35.27
11	45.72
12	36.57
13	40.64
14	29.66
15	28.87
Total	=508.06

Average spot speed: 508.06÷15 = 33.87 Kmph

Table 6: Spot speed Shyamoli to technical 50 Ft (5) direction

Vehicle number	Speed (kmph)
1	32.61
2	30.80
3	28.43
4	42.65
5	26.40
6	29.17
7	29.97
8	22.18
9	18.48
10	26.40
11	29.17
12	34.64
13	35.31
14	29.17
15	28.43
Total	=443.99

Average spot speed: 443.99÷15= 29.6 kmph

Technical to Shyamoli direction

Table 7: Travel speed Technical to Shyamoli direction.

Vehicle number	Speed (kmph]
1	6.33
2	5.91
3	6.45
4	6.58
5	5.89
6	5.33
7	7.78
8	6.86
9	5.62
10	6.33
Total	= 63.08

Average Travel speed: 663.0896 ÷10= 6.308 Kmph

Shyamoli to Technical direction

Table 8: Travel Speed Shyamoli to Technical direction.

Vehicle number	Speed (kmph)
1	6.33
2	6.26
3	6.74
4	5.91
5	5.99
6	5.68
7	5.91
8	6.85
9	5.70
10	5.73
Total	= 60.10

Average Travel speed: 60.10÷10 =6.01 kmph

Table 9: Frequency distribution Table from Technical to Shyamoli.

Speed range (kmph)	No of Veh. (F)	Mid speed, v (Kmph)	% Frequencies	Cumulative% frequencies	V×F
0-10	0	5	0	0	0
10-20	0	15	0	0	0
20-30	5	25	33.33	33.3	125
30-40	8	35	53.4	86.7	280
40-50	2	45	13.3	100	90
50-60	0	55	0	100	0
Total	15		100.00		495

Frequency and Cumulative Frequency Calculation

Weighted Average Speed: 495 ÷ 15 = 33 kmph

Table 10: Frequency distribution Table Shyamoli to Technical.

Speed range {Kmph)	No of vesh. (F)	Mid-speed, V (Kmph)	% Frequencies	Cumulative% Frequencies	V*F
0-10	0	5	0	0	0
10-20	7	15	46.67	46.67	75
20-30	5	25	33.33	80.00	125
30-40	3	35	20.00	100.00	105
40-50	0	45	0	100.00	00
50-60	0	55	0	100.00	00
Total	15		100		305

Weighted Average Speed: 305 ÷ 15 = 20.33 kmph

Speed Histogram
Technical to Shyamoli

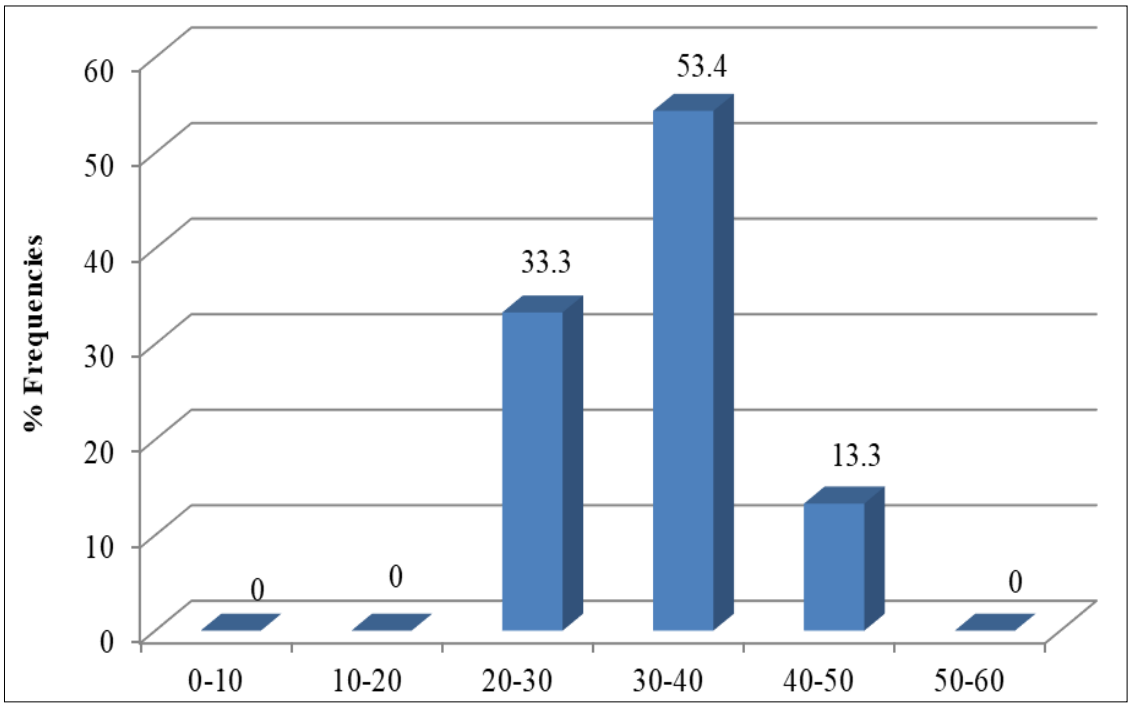


Fig 1: Histogram for Technical to Shyamoli.

Speed Histogram
Shyamoli to Technical

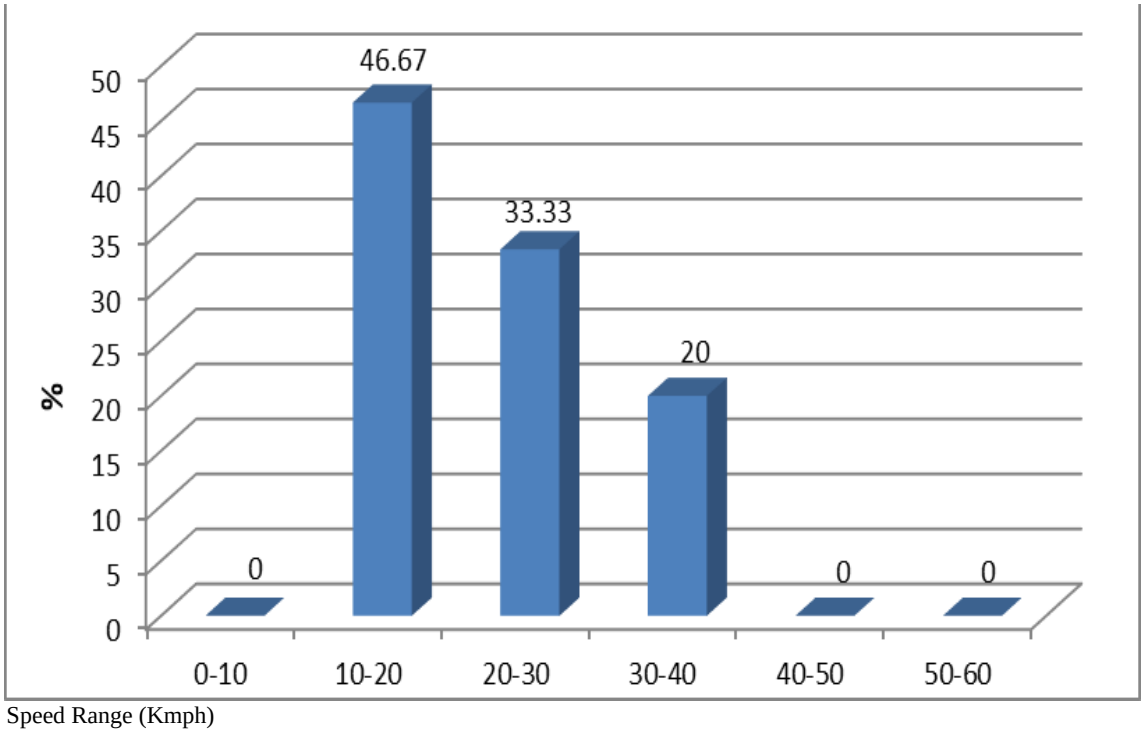
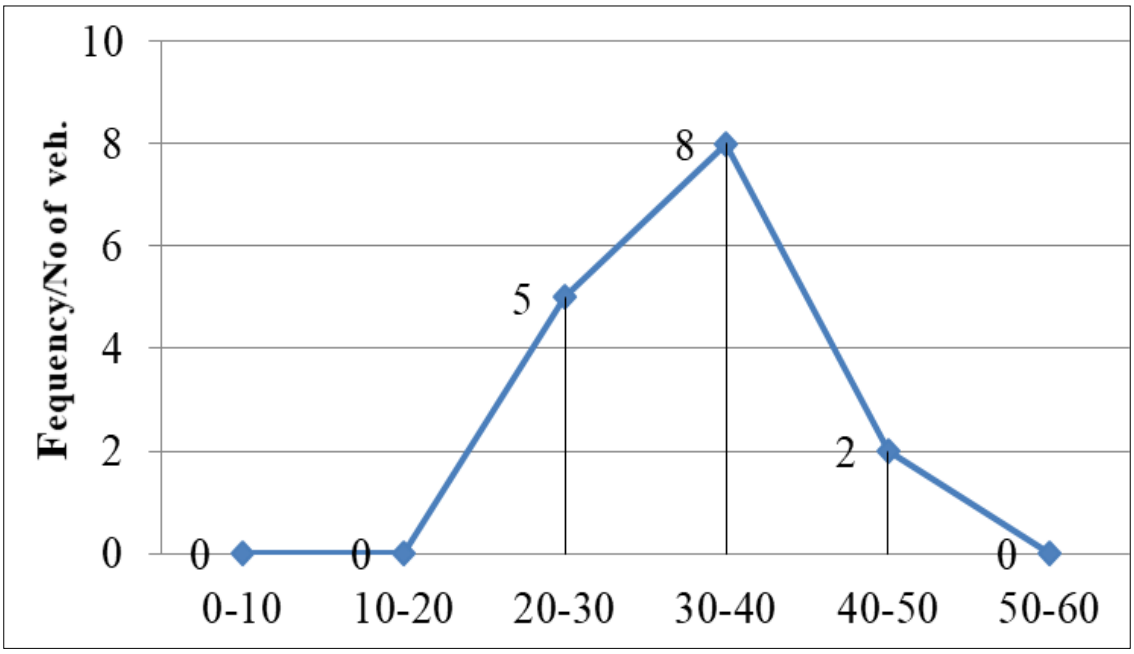


Fig 2: Histogram for Shyamoli to Technical

Frequency Distribution Curve
Technical to Shyamoli

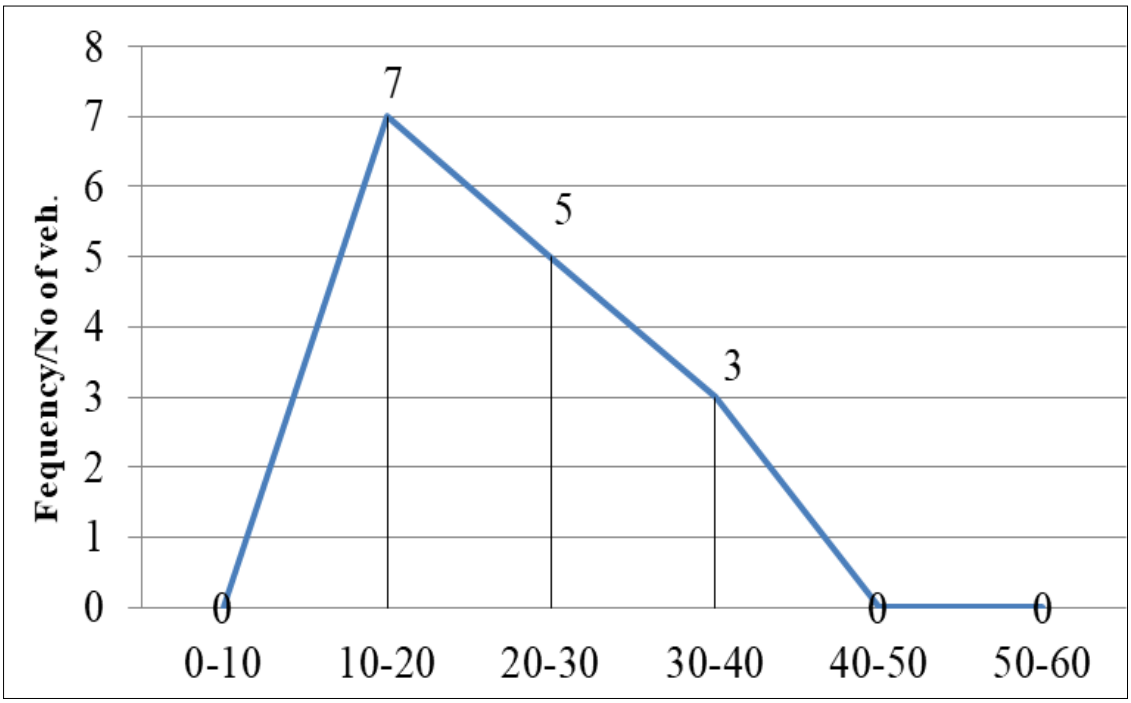


Mid Speed (Kmph)

- Pace: 25-45 Kmph
- Model Speed: 35 Kmph

Fig 3: Frequency distribution curve from technical to Shyamoli

Frequency Distribution Curve
Shyamoli to Technical



Mid Speed (Kmph)

- Pace: 25-45 Kmph
- Model Speed: 35 Kmph

Fig 4: Frequency Distribution Curve from Technical to Shyamoli.

Travel Speed Data Analysis

Travel Speed Data Technical to Shyamoli

Table 11: Travel Speed Data Calculation Technical to Shyamoli.

Car no	Speed (Kmph)
1	6.33
2	5.91
3	6.45
4	6.58
5	5.89
6	5.33
7	7.78
8	6.86
9	5.62
10	6.33
Total	63.08

Total speed = 63.08 kmph, No. of car = 10, Total time = 2.563 h

Distance travel by each car =1.6 km

Table 12: Travel Speed Data Calculation from Shyamoli to Technical.

Car no	Speed (kmph)
1	6.33
2	6.26
3	6.74
4	5.91
5	5.99
6	5.68
7	5.91
8	5.85
9	5.70
10	5.73
Total	60.10

So, The Space Mean Speed is lower than the time Mean Speed.

Time Mean speed from war drop relationship.

Formula

Variance, $\partial s^2 \frac{(speed\ of\ car - SMS)2}{Total\ No.of\ Cars - 1}$

Standard Deviation = $\sqrt{\sum \quad variance}$IMS & SMS calculation:

Table 13: TMS & SMS relations Table from Technical to Shyamoli

Car No	Speed (Kmph)	TMS (kmph)	SMS (kmph)	Variance	Deviation I
1	31.11	33.87	30.43	0.06	8.18
2	29.49			0.63	
3	24.38			2.61	
4	34.29			1.06	
5	37.84			3.92	
6	28.87			1.73	
7	48.99			24.60	
8	23.85			3.09	
9	32.27			0.24	
10	35.27			1.67	
11	45.72			16.99	
12	36.57			2.69	
13	40.64			7.44	
14	29.66			0.04	
15	28.87			0.17	
	=508.06			=66.94	

Table 14: TMS & SMS relations Table from Shyamoli to Technical.

Car No	Speed (Kmph)	TMS (kmph)	SMS (kmph)	Variance	Deviation I
1	32.61	29.60	26.66	2.52	6.29
2	30.80			1.22	
3	28.43			0.22	
4	42.65			18.26	
5	26.40			0.004	
6	29.17			0.45	
7	29.97			0.78	
8	22.18			1.43	
9	18.48			4.77	
10	26.40			0.018	
11	29.17			0.45	
12	34.65			4.54	
13	35.31			5.34	
14	29.17			0.45	
15	28.43			0.22	
	=443.99			=39.67	

Findings and Discussion

→ Technical to Shyamoli

- The most % frequency 53.Four which lies among 30-40 kmph speed variety.
- Time mean pace (TMS) = 33.87 kmph.
- Area mean pace (SMS) = 30.43 kmph.
- Variance = 66.Ninety 4 kmph.
- Deviation = 8.18 kmph.

→ Shyamoli to Technical

- The most % frequency is forty six.67 which lies among 10-20 kmph tempo range.
- Time imply velocity (TMS) = 29.6 kmph.
- Area mean speed (SMS) = 26.66 kmph.
- Variance = 39.67 kmph.
- Deviation = 6.29 kmph.

Conclusions

The ability to predict traffic speed accurately and continuously is a key component of creating a framework for smart transportation. Traffic speed is an important metric for assessing the status of traffic. According to the exploratory results, the suggested model's precision on the two datasets is 75.1% and 86.6%, respectively, which is

around 3% more precise than the high-level benchmark model. At a chosen necessity crossroads, Dhaka. In this paper, emphasis on traffic volume was highlighted, and the investigation was conducted using crucial traffic stream inspections at school entrances to specialists in Dhaka city.

Recommendations

- Access control will increase the speed of the vehicles.
- Proper signalization of the road section would help to Increase the Level of Service (LOS). Scattered parking hindered the collection of data and so, parking control is recommended.

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