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Unsignalized Intersection Analysis (Case Study of Sukahaji - Majalengka Road Intersection)

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ABSTRACT

Road users must pay close attention to traffic signs, Contributing to the safety and well-being of motorists.. Unsignalized intersections are very vulnerable road lanes and can endanger road users. Traffic accidents and congestion are problems that need more attention. Traffic intersections are a major concern for road users, and can certainly help with safety and security. At the crossroads, mountains use traffic signs traffic signs are not exclusive to other countries, as Indonesia has also adopted this practice, especially on highways. Based on this, the researchers wrote a journal entitled "Analysis of Unsignalized Intersections: Case Study of Sukahaji Majalengka Road, Sukahaji sub-district, Majalengka Regency. The objective of this journal is to investigate the contributing factors that elevate the likelihood of traffic congestion and accidents at the Sukahaji Majalengka road intersection This research took place at the intersection of Sukahaji Majalengka road, Sukahaji District, Majalengka Regency. In this research, the technique used is employed is the quantitative method. This method is used to observe and determine how many cars there are identify activities at the intersectionSource of information on vehicle density calculations include first and second data. The output information comes from the direct survey. to the target location using data obtained directly in the field to obtain traffic flow data. The results showed that the unsignalized intersection on Sukahaji road in Majalengka, experienced a high degree of saturation, especially during peak congestion hours. Based on the results of the analysis, it can be concluded that the unsignalized intersection on Sukahaji road in Majalengka, has a significant congestion problem that occurs due to the absence of traffic lights.

1. Introduction

Roads are an important means of transportation that connects various locations such as industrial areas, agricultural areas, and residential areas, and serves as a means of distributing goods and services to the community (Purnama, 2022). Unmarked intersections are critical points in the transportation system and often cause problems. In many parts of the world, such intersections are a major problem due to the high number of traffic accidents. Factors such as improper road geometry, traffic density, and undisciplined driver behavior are often the main causes of accidents at unsignalized intersections. Therefore, detailed analysis of unsignalized intersections is becoming increasingly important to improve road user safety. Commonly seen at signalized and unsignalized intersections (Isradi, 2022).

Traffic accidents are one of the major problems in Indonesia. Accidents, especially collisions between cars, motorcycles and pedestrians, often occur at intersections that are not equipped with traffic lights. In the field, the number of traffic accidents is quite high (Muizz, 2024). Therefore, analysis of crash factors at unsignalized intersections is essential to improve road user safety and reduce fatalities. Collisions at intersections are common, especially collisions with right-turning vehicles (Sheykhfard, 2023). This not only poses a significant safety risk, but also a significant economic burden, such as the costs associated with the timing of collisions, and the energy expended on waiting (Sarker, 2023). The increase in vehicles in West Java, especially in the Majalengka region, has led to an increase in traffic on the highway. Even at unsignalized intersections such as Sukahaji intersection, the poor condition of the road infrastructure is often an obstacle to traffic control. A detailed analysis of the performance of the Sukahaji intersection will provide recommendations for improvements to increase road capacity and road user safety. The occurrence of Traffic problems, such as the increase in the number of car numbers at an intersection affects the capacity of the intersection. Roads are the infrastructure that facilitates transportation in urban, rural, and other areas (Fatimah, 2024).

A signalized intersection is an intersection equipped with a traffic control system based on signal lights, aimed at optimizing vehicle flow (Egan, 2024). The Sukahaji intersection in Majalengka is one of the key points in the region's road network. The highway serves as the main route for vehicles, traffic regulates the flow of vehicles and pedestrians at the intersection (Rachman, 2024). Traffic is dominated by motorcycles and public transport, resulting in frequent congestion and accidents at this intersection. The Sukahaji intersection case study aims to analyze the factors affecting intersection performance and provide recommendations for improvements that are appropriate to local conditions. Due to the geographical location and special characteristics of intersection traffic arrangements, vehicles often accelerate, brake, and stop (Li, 2023). Intersection areas are used by drivers from multiple directions, and the diversity of vehicle movements creates many points of conflict (Qu, 2024).

The purpose of This journal is to research the elements that increase traffic hazards congestion and cause accident at certain hours on Jalan Raya Sukahaji-Majalengka, Sukahaji sub-district, Majalengka Regency. Factors that cause congestion include large volumes of traffic vehicles, lack of discipline, limited economic resources, and improper placement of traffic lights that can cause delays at intersections and traffic queues (Akbar, 2024). This four-lane intersection is very vulnerable and can endanger road users. Traffic accidents and congestion are also issues that require greater focus. "Unsignalized Intersection Analysis: Case Study of Jalan Sukahaji Majalengka, Sukahaji District, Majalengka Regency" is the title of the article that the researcher wants to make based on this. Jalan Sukahaji Majalengka, Sukahaji District, Majalengka Regency" is the title of the article that the researcher wants to make based on this.

2. Literature Review

2.1 Intersection

When two or more roads meet or intersect, this is called a junction., junction. An intersection is important part of a traffic system that helps connect various location and allows the flow of people and products from people and products. A road intersection is an important component of road networks and are essential for route planning, automated driving, and road network construction (Liu, 2022). However, traffic congestion and accidents often occur at intersections, especially those without traffic lights. Finding problems and developing appropriate solutions requires a thorough examination of intersection performance. Study focused on Sukahaji - Majalenka intersection because of frequent traffic congestion. at the Sukahaji-Majalenka intersection because of frequent traffic congestion. intersection is an interesting research topic because of its advantageous position and distinctive traffic features. and distinctive traffic features. Improving traffic efficiency at intersections is essential to achieving traffic efficiency. Efficiency is essential to achieving traffic efficiency (Firmansyah, 2022). A detailed analysis of the Sukahaji intersection is expected to provide a deeper understanding of traffic problems at unsignalized intersections in general. Intersections are prime locations where accidents occur and more lives are lost (Khaled, 2020). Is because of the fact that a number of interrelated factors influence traffic congestion. Interrelated factors influence traffic congestion.

At Simpang Sukahaji, traffic problems in addition to disrupting traffic flow, also have a significant impact on people's lives. This problem has a significant impact on people's lives in addition to affecting traffic flow. Among the negative impacts of traffic problems near intersections are congestion, accidents, and air pollution. crossings include congestion, accidents, and air pollution. Accidents at night are more serious and dangerous (Sumantri, 2022). Therefore, this study studies to find answers that can improve the standard of living of people in the environment around Simpang Sukahaji. looking for answers that can improve the standard of living of people in the environment around Simpang Sukahaji. Although traffic congestion has always been an important consideration in urban planning, the rapid growth in the number of vehicles and the demand for transportation has made it a serious problem that needs to be addressed. always been an important consideration in urban planning, the rapidly growing number of vehicles and the demand for transportation has made it a serious problem that needs to be addressed (Eom, The traffic signal control problem for intersections: a review, 2020).

2.2 Unsignaled Intersection

Unsignalized intersections are where two or more roads meet without any devices for traffic control arrangements, such as traffic lights especially in areas with heavy vehicular traffic, unsignalized intersections are often a major source of congestion and accidents. This condition can disrupt the smooth flow of traffic and endanger the safety of road users. Every intersection is an unsignaled intersection of a way with country roads that allow cars to turn the other direction to continue their journey without traffic lights. Implementation of To reduce the intensity and occurrence of collisions at the crossroads, safety precautions are very important without traffic lights (Y. Rachakonda and D. S. & Pawar, 2023).

An unsignalized intersection is a place where two highways intersect, where vehicles can turn or proceed in the other direction without any traffic signal system. Traffic signals play a very active role in road traffic. Without traffic signals, congestion and accidents will occur. The implementation taking safety precautions precautions are necessary to reduce intensity and the events of accidents at intersections without traffic lights (Rachakonda, 2023). To avoid traffic congestion, traffic lights should be used at intersections that do not have them.

Estimating capacity at unsignalized intersections is usually more complicated than at intersections with traffic lights (Patel, 2020). This situation is caused by an increase in the number of vehicles on the road that exceeds the available capacity. Traffic roads in rural areas and highways often experience traffic jams.especially in cities and towns. Traffic Effects Impacts of traffic congestion possible cause loss and also good also disturbances to driver. To overcome reason behind behind traffic congestion, it is necessary to develop infrastructure, such as highway expansion and securing avoidable paths congestion.

2.3 Traffic

Traffic is a flowing stream of cars, people, etc. means of transportation within a given area or along a given path. Traffic is the set of rules, devices and infrastructure that govern roads. Transportation space includes traffic regulations, signs, and road infrastructure. Social optimization becomes a more efficient road transport strategy (F. Koller, 2021). In this case traffic must be well maintained to achieve more efficient traffic. Roads are essential to many aspects of life, such as social benefits, and economic well-being (Dwiani, 2024). Along with social and economic development, the number of motorized vehicles has increased abnormally, increasing the burden of traffic management (Q. Ma, 2021). Not only the increase in the number of cars, but also for drivers if there is a congestion effect, road congestion will not occur. When traffic is effective, smooth traffic provides comfort for road users. Another expectation is to achieve traffic order, so that all road drivers Obey all laws, including traffic signs and signals regulations issued by the authorities. Maintaining traffic order reduces the risk of collisions. Reduces the risk of collisions.

Traffic management is organizing and controlling traffic flows and infrastructure to ensure effectiveness, security and smoothness operations. Researching affordable traffic control options for choice for reduce emissions and traffic congestion is one of the biggest challenges for transportation authorities, especially in developing countries (Lasenby, 2023). The goal of traffic control is to achieve high degree of accessibility as well as accessibility convenience improve driver safety. Driving safety is important for reducing traffic accidents. Another strategy for solving safety problems is a methodical approach, which has been applied recently by a number of road safety agencies around the world. (A. G. C. M. J. L. J. &. A.-A. M. Montella, 2020). Safe driving is important to reduce traffic accidents.

3. Method

3.1 Types of research

Journals will employ quantitative methodology as its methodology.. Using this quantitative approach, observations are made and the number of cars is counted for identify activities at the intersection. Another way of thinking about the quantitative approach is as a research technique that is as a research technique that examines facts, concepts, and phenomena that can be classified, have a definite relationship, can be measured, observed, and measured, and the symptoms are qualitative and can be accounted for (Pramadita, 2024). One type of research that uses quantitative methods is that which uses quantitative methods provides numerical data and real facts based on scientific methods (S.

Ahmad, 2019). Since vehicle movements are always the same, this approach requires a large amount Using actual data to describe various traffic situations to describe various traffic situations (S. Jeong, 2020).

3.2 Research Location

The research was conducted in Sukahaji District, Majalengka Regency, precisely at the Sukahaji - Majalengka intersection which is not marked.

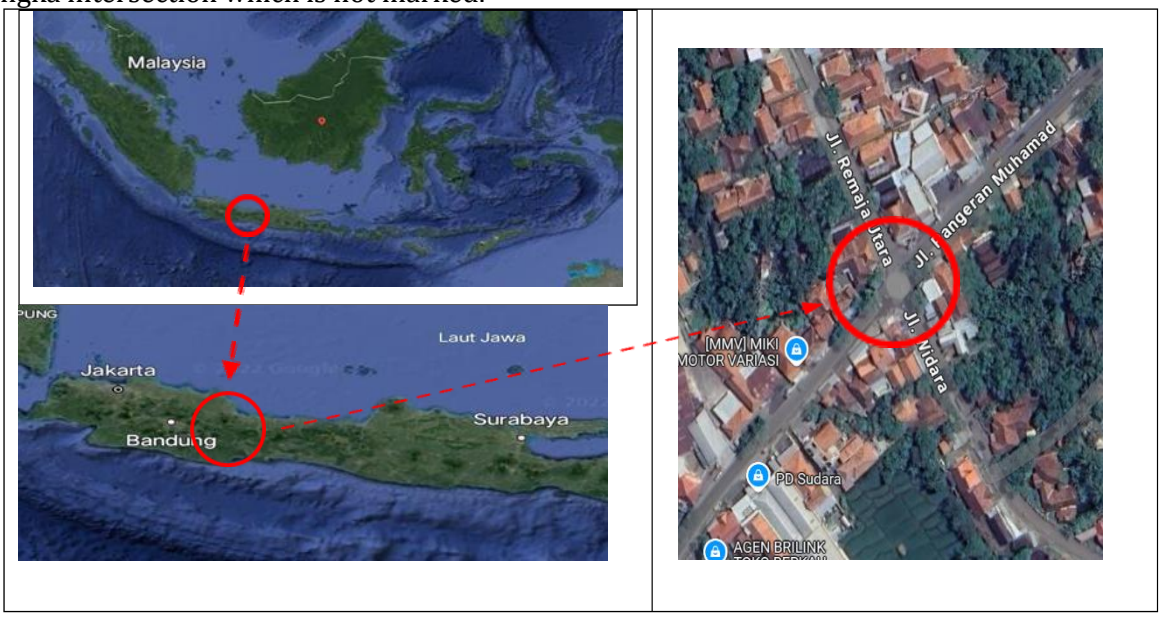

Figure 1. Research location

3.3 Data collection

Secondary information sources Information to estimate traffic flow is collected from primary data sources. collected from primary data sources. data to estimate traffic flow. The output information comes from direct surveys conducted in deliberate goal target area using the results collected on site to determine traffic flow and geometry. A direct survey conducted in the target area uses the information collected on site to determine traffic flow and geometry. The purpose of deliberate goal target reliable materials, information, facts and statements (Q. Aini, 2019). Data collection is used to determine the research questions and outline the research design/plan (S. A. Mazhar, 2021).

The survey was conducted over two days, Monday and Thursday. It is also hoped that this research can raise awareness for road safety as a whole to avoid accidents (Nurhasanah, 2024). Observations of traffic flow were conducted in the morning, afternoon and evening, with a duration of one hour, divided into fifteen minutes. The Sukahaji - Majalengka unsignalized intersection survey was conducted using four different points: the first point on the Sukahaji - Rajagaluh road, the second point on the Sukahaji - Majalengka road, the third point on the Sukahaji - Widara road, and the fourth point on the Sukahaji - North Teen road. In each road section there was one person in charge of counting and recording vehicles.Result and Discussion.

4.1 Geometric Data

Table. 1 Geometry data

No	Approaching	Effective Width	Road Condition
1.	(Sukahaji-Rajagaluh)	7	Mayor
2.	(Sukahaji-Majalengka)	7	Mayor
3.	(Sukahaji-Widara)	5	Minor
4.	(Sukahaji-Remaja Utara)	5	Minor

4.2 Traffic Volume

Table. 2 Survey result data

Traffic flow	Direction	LV		HV		MC		Total Vehicle	
		kend/jam	emp=1,0	kend/jam	emp=1,3	kend/jam	emp = 0,5	kend/jam	smp/jam
A. (Jl. Sukahaji-Rajagaluh)	LT	150	150	15	19,5	324	162	489	331,5
	ST	450	450	21	27,3	460	230	931	707,3
	RT	125	125	35	45,5	685	342,5	845	513
Total		725	725	71	92,3	1469	734,5	2265	1551,8
B. (Jl. Sukahaji-Widara)	LT	264	264	23	29,9	223	111,5	510	405,4
	ST	359	359	45	58,5	281	140,5	685	558
	RT	525	525	31	40,3	344	167	900	732,3
Total		1148	1148	99	128,7	848	419	2095	1695,7
C. (Jl. Sukahaji-Majalengka)	LT	287	287	28	36,4	630	315	945	638,4
	ST	453	453	34	48,1	425	212,5	912	713,6
	RT	629	629	41	53,3	552	276	1222	958,3
Total		1369	1369	103	137,8	1607	527,5	3079	2310,3
Jl. Mayor Total		3242	3242	273	358,8	3924	1681	7439	5557,8
D. (Jl. Sukahaji-Remaja Utara)	LT	123	123	15	19,5	261	130,5	399	273
	ST	208	208	19	24,7	352	176	579	408,7
	RT	246	246	23	29,9	471	235,5	740	511,4
Jl. Minor Total		577	577	57	74,1	1084	542	1718	1193,1
Mayor+Minor	LT	825	825	81	105,3	1438	719	2343	1648,3
	ST	1470	1470	119	158,6	1518	759	3107	2387,6
	RT	1525	1525	130	169	2052	1021	3707	2715
Mayor+Minor Total		3820	3820	330	432,9	5008	2499	9157	6750,9
Rasio Jl. Minor/(Jl. Mayor +Minor)Total									0,6509 UM/MV

Source: MKJI 1997

Derived from the results of traffic volume surveys conducted at field locations over a period of two days and divided into two and divided into two categories, in particular the the entire volume of the flow volume of main roads and secondary roads.The results of traffic flow surveys that have been

conducted for two days with one hour in the morning, one hour in the afternoon, and one hour in the afternoon. Thus Traffic flow review resultstraffic flow review The results of the traffic flow review show thatThe traffic flow review shows that LV is 3820 smp / jam, HV is 4329.9 smp / jam and MC is 2499 smp / jam .Thus the peak flow data results show that. The total for the main road is 5557.8 smp/hr, and the total for the minor road is 1193.1 smp/jam. The peak traffic flow made on Thursday ranges between 4:00 and 5:00 pm. with a volume of 6750.9 smp/jam.

4.3 Capacity

Directions	Base capacity (Co)	FW	FM	FCS	FCsf	FRT	FLT	FMI	Capacity (C)
North	2900	1,19	1	1	0,82	0,84	1,33	0,258	901,985
East	2900	1,19	1	1	0,82	0,84	1,33	0,258	901,985
South	2900	1,19	1	1	0,82	0,84	1,33	0,258	901,985
West	2900	1,03	1	1	0,73	0,84	1,33	0,258	725,555

Source: MKJI 1997

The intersection of four of the four Sukahaji - Matalengka roads produces a basic capacity (Co) of 1/1 UD or 2900. The Sukahaji - Matalengka road produces a basic capacity (Co) of 1/1 UD or 2900. Its height is 1.19 and its width is 7 meters. meters high and 7 meters wide. On the other hand, the width of the west has a value of 1.03 and 5 meters. has a value of 1.03 and 5 meters. The intersection factor between Sukahaji and Majalengka is 50:50 for the median dividing factor and the 1997 MKJI result is 1.

4.4 Level of Service

Table 4. Level of Service

Directions	Traffic Flow (Q) smp/jam	Capacity (c) smp/jam	Degree of Saturation (DS)	Conditions
North	2390,3	901,985	2,650044069	Bad
East	1774	901,985	1,966773283	Bad
South	2098,5	901,985	2,326535364	Bad
West	1555,4	725,555	2,143738242	Bad

Source: MKJI 1997

The vastness of saturation caused by the value of traffic flow in relation to the road capacity determines quality of service from service this intersection. Levels of saturation of saturation caused by the value of traffic flow in relation to the road capacity determines the level of service at this intersection. Based at the level of saturation of saturation caused by the value of traffic flow in relation to the road capacity. Saturation level saturation level caused by the value of traffic flow in relation to the road capacity. As a result, each road segment has a saturation value of 2.65 in the north, 1.96 in the east, 2.32 in the south, and 2.14 in the west. The saturation value is 2.65 in the north, 1.96 in the east, 2.32 in the south, and 2.14 in the west

5. Conclusion

Based on this research, there are significant problems related to congestion on Sukahaji-Majalengka Road. This is due to a combination of factors, including high traffic volume, high traffic flow, unsatisfactory intersection geometry, and low level of user awareness while using the road. Based on the findings of the analysis, some improvements are suggested such as widening road shoulders, adding warning signs, and socializing to the general public about the importance of orderly traffic. "Considering the findings of the analysis, some improvements are suggested such as widening road shoulders, adding warning signs, and socializing to the general public about the importance of orderly traffic.

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