Implementation Method CUSUM To Determine The Accident Prone Areas in Web Based

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Abstract.

At the Unit Laka Lantas Polres Lhokseumawe determining accident-prone areas on roads in Lhokseumawe still using manual systems. Determination of accident-prone areas are less effective because the police Unit Laka Lantas Polres Lhokseumawe just using the data of the last year and had to repeatedly calculate manually accident-prone areas based on the number of human casualties. In this study the system implementation CUSUM method (Cumulative Summary) to determine the accident-prone areas designed using the web-based programming language PHP. In this system there are three processes to determine areas prone to accidents, the accident rate calculations based on the weighted severity, blacksite calculations using the Z-Score method for determining areas prone to accident blackspots and calculations using the CUSUM method to determine the critical points of an accident. The data used are secondary data obtained from the Police Unit Laka Lantas Polres Lhokseumawe years 2009-2013.

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Retracted
1. Introduction

Along with the increase of population in the city of Lhokseumawe each year causes the transport demand is also increasing, will indirectly increase the risk of growing traffic problems, such as congestion and accidents, which will have an impact on the decline in the performance of the service road. Traffic accidents, according to Law No. 22 in 2009 was an event on the highway unexpected and unintentional involve with or without other road users, which resulted in human casualties and property loss. Traffic accidents generally occur due to various factors such as: violations or acts not careful users (drivers and pedestrians), road conditions, vehicle conditions, the weather and an unobstructed view. Traffic violation is high enough and private vehicle ownership is increasingly rising, it will indirectly lead to traffic accidents[1].

Based on data from Lhoekseumawe City Police, during the period 2009 - 2013, there were approximately 160 people who died due to traffic accidents, and 3,154 others were injured (light, medium, or heavy). Under these conditions, the city of Lhokseumawe government must immediately address this, because many people assume the crash was not a factor because the fate of the other factors. But on the other hand according to the viewpoint of transportation causes of traffic accidents is in addition to the human factor that does not obey traffic rules are also influenced by the geometric factor of road and traffic arrangements. From these data it is necessary to attempt to reduce the number of accidents. As an initial step necessary to determine accident-prone areas (black site) using the Z-Score and accident-prone spots (black spots) using Cusum (cumulative Summary)[2].

Cusum (Cumulative Summary) is a method that can be used to identify the black spots. Blackspot is a point on accident-prone roads (black site). Cusum is a standard statistical procedures as a quality control to detect change from mean values. Cusum of calculation can be known a point where the road is an accident-prone spot or black spot [3]. So far the determination of accident-prone areas by Laka Police Unit Lhokseumawe only based data on the number of accidents that occur based on last year's data. According Austroads (1992), determination of accident-prone areas should ideally take into account historical data. When referring to the Austroads (1992), is not currently available data is systematically accident-prone areas (black site) and accident-prone points (blackspot) in Lhokseumawe City. In addition, people can not know which areas become accident-prone areas in the absence of a web-based system to determine the accident-prone areas in the city of Lhokseumawe[4].

Chen have proposed the Gamma CUSUM for online customer churn prediction[5]. In this implementation, according to Abdullah et al. must consider about the safety and efficiency and will be know with benchmarking process[6] and also the resources involved in the process[7] and for answering the question we must implement an innovative solution[8]. The performance of CUSUM is significantly influenced by the sensitivity to the presence of seasonal trends in the data considered[9].

Talking about the seasonal trend in the data, then the process of classification of data is an important thing to do. It should be noted that data classification is a process for retrieving minority data which is an interesting pattern to analyze[10]. That's why we must consider about the class imbalance problem[11] and the data sensitivity[12].

2. Related Works

Ospina et al. have used CUSUM in basic anaesthesia procedures and obtain satisfactory results[13]. Sibanda and Sibanda used the CUSUM chart method as a tool for continuous monitoring of clinical outcomes using routinely collected data[14]. The research of Chetouani get a satisfactory results in implementing CUSUM Test for Detecting Abrupt Changes in the Process Dynamics[15]. The research of Schuh et al. used CUSUM Control Chart in real-time occupational safety monitoring. The frequency of accidents within a subset of historical accident data is identified. The performance of the Poisson CUSUM tables and the exponential CUSUM (time between events) is compared in the illustrative example to show that shorter aggregation periods and timing between events lead to earlier indications of increased accident frequency[16] [17] [18].
3. Research Methodology
In determining the accident-prone areas first step is to find the value of the Z-Score to determine vulnerable road traffic accidents (black site). Z-score is used to standardize the data is the number of accidents each road segment to ensure comparability between the accident on a road section of one over another road. Z-Score calculation using numerical computation result of traffic accident. After the calculated Z-Score for growth in the number of accidents in recent years, namely in 2013, will now be calculated Cusum method.

Literature study, conducted by collecting and read and understand the relevant reference regarding Accident Prone Area also collects theories from multiple sources such as library books, articles from the internet, journals, and reference of final project regarding the CUSUM method. As for crash data as the data source of the accident victim, the data of roads, the number of accidents, the other received from Lhokseumawe Police Unit Laka. Interview. Retrieving data via interviewing or orally directly with data sources, either through a face to face or by telephone. Of respondents answers summarized by researcher. Analysis system, Authors analyze problems for a process regional determination Troubled Accidents applied previously and perform comprehension particular.

3.1. CUSUM Formula
The method of calculation results can be known a point where the road which is the point of hazardous or black spot. Cusum value can be searched by the formula:

1. Finding the mean value (W) Calculation to find the mean value of secondary data, as follows:
   \[ W = \frac{\sum X_i}{n} \] (1)

2. Finding Value Cusum Accident First Year (S0) Calculation to find the value of the first year cusum accident is to reduce the number of accidents each year with a mean value

3. Finding Value Cusum Accident Year Next (Si) To find the value cusum accident the next year is to add value cusum first year with the result of reducing the number of accidents and the mean value of the next year, namely:
   \[ S_i = S_{i-1} + (X_i - W) \] (2)

3.2. Z-Score Evaluation
Z-Score calculation for growth in the number of accidents per year are as follows.

1. Searching for an average data
   \[ \bar{X} = \frac{\sum X}{n} \] (3)

2. Finding Standard Deviation
   \[ S = \sqrt{\frac{\sum (X - \bar{X})^2}{n}} \] (4)

3. Finding Z-Score
   \[ Z_i = \frac{X_i - \bar{X}}{S} \] (5)
4. Results and Discussion

4.1. Results
In the process of computer-based system design, problem analysis plays an important role in making the details of the application to be developed, the analysis of the problem is a step in understanding the issue before taking action or decision final settlement. During this determination by the accident-prone areas Laka Police Unit Lhokseumawe is still done manually based on data from the past year. The system is currently running felt still less effective and efficient because it must calculate it manually every year and will slow down the performance of Laka Police Unit of Lhokseumawe. With the support of this system, Unit Laka Police Lhokseumawe can manage and update online accident data and can identify accident-prone areas (black site) and points prone to accidents (black spots) and can display it online to the public both inside and outside the city Lhokseumawe.

Public Form is a form that can be accessed by the public or society. Society does not need to log into the system. The public can see information on the number of human victims on the roads in the city of Lhokseumawe. It also can view information areas prone to accidents and accident-prone points on the road section of Lhokseumawe and can see a map of the area road Lhokseumawe city that never happened a traffic accident. The Public Form can be seen in Figure 1.

4.2. Discussion
Based on the calculation method of the Z-Score, the lowest value of Z-Score is worth -1.42 ie on roads Jl Bukit Indah Padang village Muara Sakti One. While the value of Z-score of 3.40 is the highest worth on roads Jl. Medan -Banda Aceh Village Panggoi Muara Dua. The result of the calculation of the number of accidents in more detail in Annex Blacksite Print Out Calculation Method Using Z-Score On Roads in the city of Lhokseumawe.

5. Conclusion
From the results of the design and implementation methods cusum (cumulative summary) to determine the web-based accident-prone areas in the city of Lhokseumawe, the author can draw conclusions:
1. This system is used to determine the accident-prone areas based on web in the city of Lhokseumawe. In addition, this system can also be used to determine the critical points of accidents on roads in the city of Lhokseumawe. In the process of decision making using Z-Score
to determine Blacksite (accident-prone areas) and methods Cusum (cumulative Summary) to determine Blackspot (accident-prone points).

2. With this system it is part Laka Police Unit Lhokseumawe easily be able to determine areas prone to accidents on the roads in the city of Lhokseumawe. This system can also be accessed by the public so add information to the public about the accident-prone areas on roads Kota Lhokseumawe.

3. Based on the calculation method of the Z-Score and methods Cusum acquired areas that have the highest accident rate of vulnerability is Jl. Medan Aceh -Banda Panggoi Muara Dua Village in Sta 266 - Sta 267 (km 266.00 - 267.00 km). While the region has the lowest accident rate of vulnerability is Jl. Desa Bukit Indah Padang Muara Sakti One in Sta 0 - Sta 1 (km 00.00 - 00.01 km).

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