APPLICATION OF INTELLIGENT TRANSPORT SYSTEMS ON MOUNTAIN HIGHWAYS

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ABSTRACT

In this article, various factors affecting the movement of cars in the mountainous areas located in the territory of our Republic, including the complex topography of mountainous regions and the amount of seasonal precipitation, are shown. Introducing the use of VMS (variable message signs) in order to optimize the movement of vehicles and prevent possible accidents, the world experience in their use and their advantages are highlighted.

KEYWORDS

longitudinal slopes with a small radius, intelligent traffic, VMS (Variable message road signs), Electronic VMS, neon signs

INTRODUCTION

One of the main problems of the current era of globalization is the problems related to traffic, that is, road transport plays an important role in the rapid development of the economy of countries by performing cargo, passenger transportation and other special services, as well as the complexity of the process of traffic on roads, as a result of which traffic accidents occur. is also the reason for the increase in the number. That is, the death of people and material damage caused by traffic accidents continue to have a negative impact on the country's economy.

As a result of the increasing number of automobiles from year to year, traffic on our roads is becoming more complicated, which causes an increase in road traffic accidents. In the current era of globalization, modern intelligent transport systems are used to regulate traffic and prevent road traffic accidents. is conducting scientific research work on the use of the scale. [1]

OBJECT AND METHODS OF RESEARCH

About 22% of the territory of Uzbekistan is a mountainous region. The complex topography of mountainous regions has a great impact on the safety of vehicles. On mountain roads, the presence of continuous large longitudinal gradients, small radius on the plan, and the presence of curves with bad visibility force drivers to change the mode of movement abruptly, which causes accidents. [2]

The safety and speed of vehicles are greatly affected by small radius turns of 2-3 turns per 1 km of mountain highways.

One of the most important problems to be solved in the transportation of goods and passengers through mountain roads is to ensure the safety of goods and passengers by ensuring the safe movement of vehicles in different climatic conditions of mountain roads. is a problem. Roads in the mountains are very different from each other in terms of traffic

conditions. In mountainous regions, the geometric parameters of the road, that is, first of all, the width of the carriageway and the plan of curves, force the creation of roads. [2-3]

RESULTS

As the mountain passes above sea level, precipitation increases, air temperature and atmospheric pressure decrease, solar radiation increases, fog thickens, and relative humidity increases.

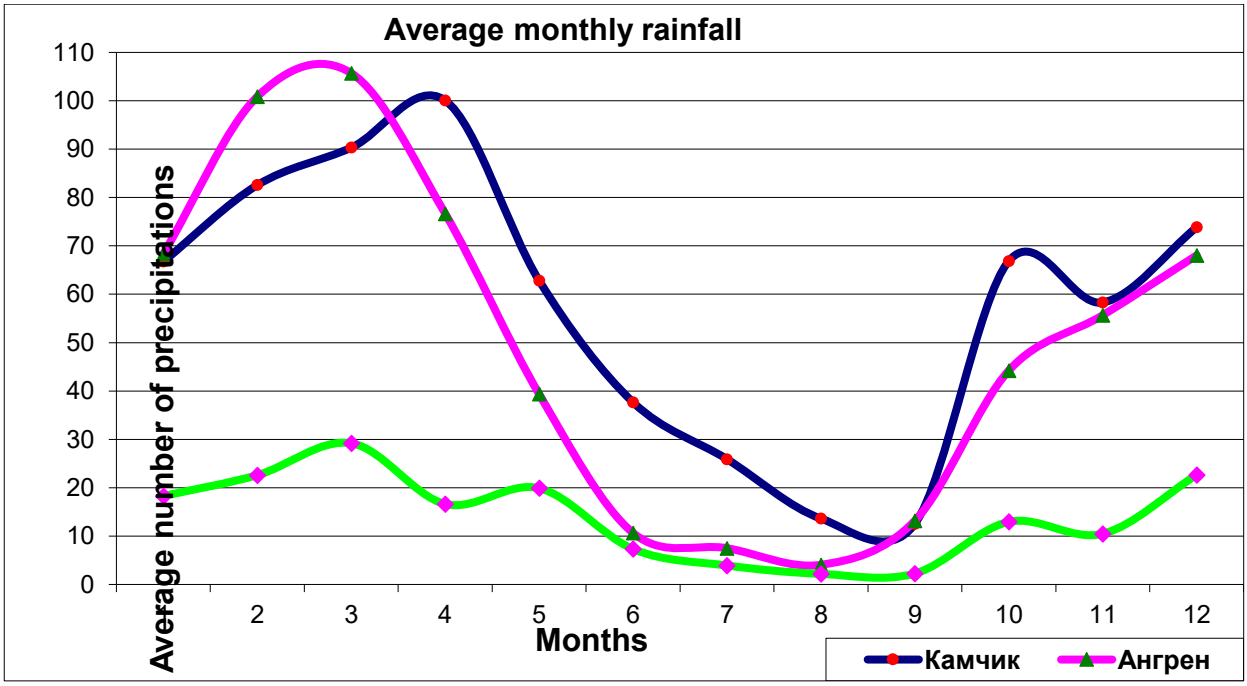

Figure 1. Changes in the amount of precipitation in Kamchik Davan, Angren and Pop districts by month.

In mountain conditions, the intensity of meteorological factors and the duration of their impact on the road lead to the following consequences:

- due to the deterioration of the adhesion properties of the pavement, the mechanical effect of cars on the road structure also changes;
- engine power decreases due to a decrease in atmospheric pressure, an increase in resistance to movement;
- Contamination of the carriageway, roadsides, engineering structures, snowfall, formation of rutted lanes, loss of visibility of the carriageway and roadsides, tracks covered by snow;
- Meteorological visibility will decrease due to fog thickening, precipitation and increased solar reaction;
- technical operational qualities of the car (systems ensuring ease of movement and safety: brakes, steering, visibility, alarm systems) deteriorate;
- deterioration of road and weather conditions negatively affects the driver's neuro-emotional stress.[4]

Changes in traffic conditions with increasing altitude on mountain roads require changes in driving modes of vehicles and this can have a negative impact on safety. [5]

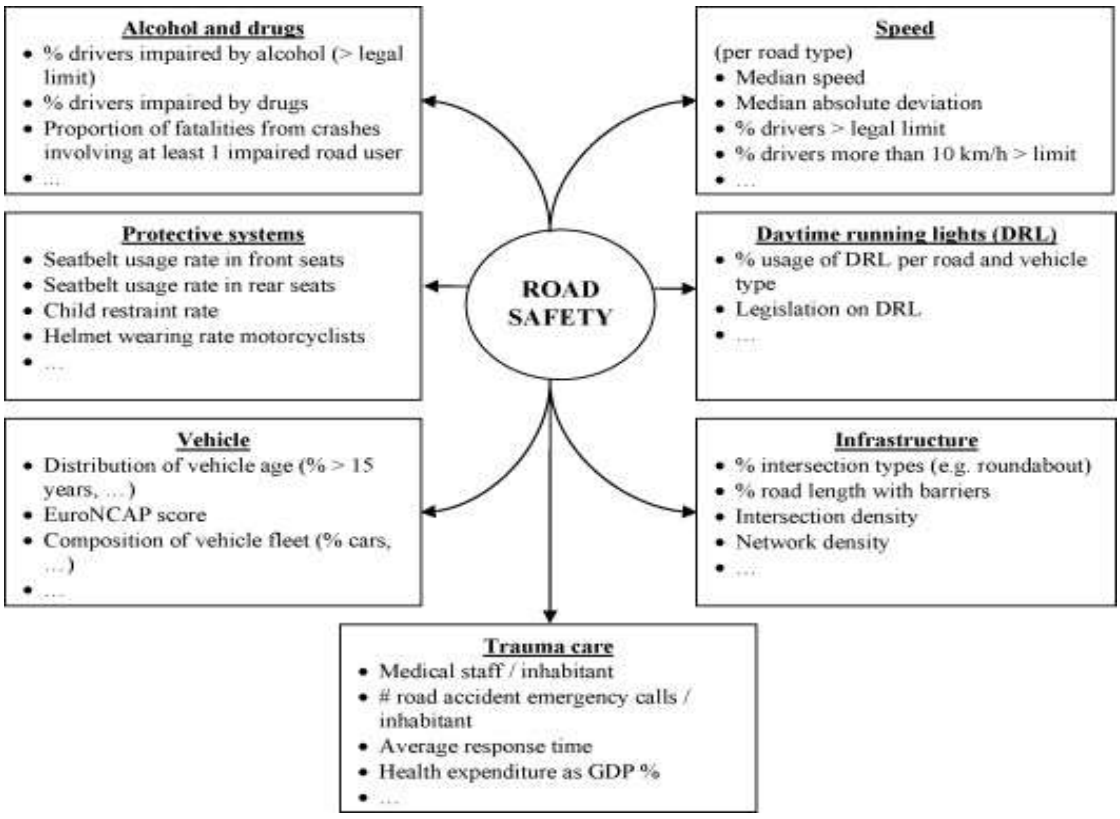

Figure 2. Various factors affecting road safety.

VMS is also known by various other names including:

DMS: Dynamic Message Signs;

SMS: Sensitive Message Signs;

EMS: Electronic Message Symbol;

VAS: Vehicle Activated Signs.

VAS is a sign that detects and warns, for example, speeding vehicles when approaching turn or speed limits, or high vehicles when approaching low bridges. VMS is usually connected to a controlled control center. The controller transmits information via one-to-one communications links, a local area network, or radio link for display in coded form. VMS types range from simple one- or two-line text message signs to full graphic displays that can include up to variable characters. A sign designer must consider a number of factors, including sign size, sign height, legibility, contrast, and viewing angle. The messages must be understandable to the majority of drivers. Due to the more complex requirements of traffic management and the need to provide additional information to drivers, the use of VMS is increasing. VMS currently uses three common types of technology. Electromechanical signs include two-sided turntables or three-sided prisms. Reflective disc signs consist of a matrix of discs that are black on one side and fluorescent on the other. A momentary application of electrical current magnetically "flips" the disk between the "on" and "off" states. These signs are ideal for displaying a combination of letters or symbols as a message. Illuminated signs typically use fiber optic, magnetic disk, or light emitting diode (LED) technologies. The main advantage of these signs is that a greater range of messages can be displayed than reflective technology signs. LEDs are solid-state devices that can produce very good reliability with minimal maintenance. Further developments may lead to applications based on liquid crystal display (LDS), matrix array, liquid dot matrix and micro-shot technologies. Technologies can be combined within the same label. When used as warning signs, it is common for them to be

fitted with amber lights. VMS are often used with other technologies, such as a variable message display that can show a different price for different times of the day, or if a camera if connected to a monitoring device, the price is different depending on the level of traffic on the road. Two main limitations of VMS efficiency are the limitation of the panel for displaying information (the number and size of symbols and icons) and the temporal accuracy of the information provided. riligi. Only limited information can be provided to the driver. Another problem is that displayed messages may not be fully understood by all drivers, and therefore icons are preferable to text messages. [6]

DISCUSSION

Taking into account the above problems, one of the most important tasks is to introduce the use of VMS (Variable Message Signs) when driving on mountain roads. Variable (also variable, electronic, or dynamic) road signs are electronic road signs used in Japan, the United Kingdom, Germany, and several other European countries. Such signs warn of traffic jams, accidents, and terrorist attacks. Used to announce speed limits in roadworks zones or a specific segment of motorway. In urban settings, VMS (Variable Message Signs) are used in information systems to provide parking guidance and direct drivers to available parking spaces. They can also ask vehicles to take alternative routes, limit speed, warn about the duration and location of incidents, inform about traffic conditions or display general safety messages. [7]

High-variable message signs come in three form factors today: front entry, back entry, and entry. Maintenance on a front-access variable message sign is accomplished by lifting the sign open from the front. Most smaller VMSs are in the anterior access form factor and are usually placed in major arteries today. The rear-entry form factor is similar to the front-entry form factor, except that maintenance is done from the back of the sign, and a medium-sized speaker is typically mounted along (instead of on top of) highway lanes. used for message symbols. A form factor input is a newer input where the maintenance of the sign is done from inside the sign. A major advantage of the crossing form factor is that lane closures are not usually required for sign maintenance. [7]

VMS are divided into several types:

1. "Reduce Speed" neon signs (1950-2010 obsolete and replaced).
2. "Variable message signs" (trilon-rotating drum signs that can be used to close roads or divert traffic)
3. Electronic VMS: signs displaying remotely controlled messages; messages are sent from the State Traffic Control Center, signs are automatically updated.
4. Variable speed limit signs - used to change speed limits in work zones and emergency situations.

Figure 3. Electronic VMS: signs displaying remotely controlled messages

While early models of VMS required an operator to be physically present to program the message, newer models can be reprogrammed remotely via a wired or wireless network or cellular connection. A full panel message usually includes a problem statement indicating the incident, roadworks, stalled vehicle, etc.; location statement indicating the location of the incident; an impact statement showing lane closures, delays, etc., and an action statement showing what to do next. These symbols are also used for AMBER Alert messages and in some states for Silver and Blue Alert messages. In some locations, VMSs are installed with permanent, semi-static displays that show estimated travel times to major transportation destinations such as major cities or major highway intersections. [8]

Early variable message signs included illuminated words (often using neon tubes) to indicate the type of event, or signs that used rotating prisms (trilons) to change the displayed message. These were later replaced by dot-matrix displays, usually using egg-crate, fiber-optic, or flip-disk technology, capable of displaying a much wider range than earlier static variable message signs. Since the late 1990s, the most common technology used in new installations for variable message signs has been LED displays. In recent years, some new LED variable message signs have the ability to display color text and graphics.

Variable message symbols are divided into three subgroups: character matrix, string matrix, and full matrix. Character matrix In VMS, each character is assigned its own character matrix, with equal horizontal spacing between them, usually two or three rows of characters. In a full-matrix VMS, the entire icon is one large dot-matrix display, allowing for different fonts and graphics. A line matrix VMS is a hybrid of the two types, divided into two or three rows like a character matrix display, except that each row is one long dot matrix display instead of being divided horizontally into each character.

Variable Message Signs (VMS) are used by Traffic Management Centers (TMS) to send information to travelers to inform drivers of incidents, travel times, detours, special events and other useful road conditions or travel information. are permanently mounted or portable electronic roadside signs controlled by remote control. A VMS can be used to host a variety of

demand management and passenger information strategies, including queue warnings, variable speed limits, route selection, and dynamic lane marking. A VMS is typically hosted in a central location such as a TMS. connected, where symbols are controlled remotely and can be quickly changed to provide current information. A VMS is particularly useful for providing advance notice of locations where travelers must move or make route decisions. Because VMS messages can only be seen when drivers drive by, strategic placement of signs, especially permanently installed signs, is critical. Portable VMS can be used to display traveler information messages for special events or other temporary conditions, such as road construction. When not used to display traveler information, VMS can display public service announcements, seat belt information, can be used to display messages. However, because overuse of VMS can cause drivers to ignore posted messages, many agencies strictly limit the types of messages that can be displayed, limiting VMS to only important passenger information or safety messages. VMS makes sense for locations where travelers need information on a regular basis (such as access to mountain passes) or before locations where travelers must make route decisions. They can also support active traffic management strategies where having a means of providing information about travelers along the route is a key element of the strategy. Portable VMS are useful for informing travelers about temporary conditions during road construction and special events. In addition, variable message signs (VMS) are digital road signs used to inform motorists of specific temporary events and real-time traffic conditions. l signs. Signs are often connected to a control center controlled by a local area network or radio link. Variable Message Signs (VMS) are an integral part of Intelligent Transportation Systems. The purpose of using VMS is to provide mandatory and supposedly advisory information to drivers at the roadside. VMS can be used for a variety of purposes, with the potential benefits of reducing driver stress, reducing travel time and increasing traffic safety. VMS can prompt drivers to change speed, change lanes, reroute, direct to an existing parking space, or provide information about current or future may request to be notified of changes in traffic conditions. The information is designed to help drivers choose appropriate routes to avoid traffic and reduce driver anxiety. In general, it is difficult to measure the merits of characters. VMS is often used to inform drivers about traffic, upcoming events, and unexpected delays, and it can reduce driver stress. Signs can be particularly useful where they can inform drivers of alternative routes or stop-and-go areas to avoid further delays, but this makes VMS an integral part of a wider and more expensive traffic monitoring system. may require. One major study shows that drivers want to use VMS more. There is clear evidence that properly designed VMS will not distract drivers. Where VMS signs are installed, the number of speed limit violations can be expected to decrease. Overall, there is still no clear evidence of the security benefits of VMS. The main barrier to implementation is cost. There may also be some concerns about the visual impact of the new characters. However, by reducing the number of stationary road signs, a properly designed VMS can reduce negative aesthetic impacts. VMS costs include purchase, operation, and maintenance. Approximate capital costs are £500,000 for 12 VMS, but costs vary significantly depending on the type of sign and the relevant data and sensors required to calculate the relevant message to drivers. Variable message signs (VMS) are an integral part of ITS (Intelligent Transportation Systems). VMS can be used where more flexibility is required than is offered by fixed direction or advisory signs. VMS is used to deliver real-time traffic information to drivers to optimize traffic safety and efficiency. In its simplest form, a variable

message sign can be a hand-operated device that says "full" or "empty" on board, as seen in controlled parking lots. Commonly VMS is the term used for computer-controlled electronic signage. Regardless of the complexity of the technology, the message displayed on a VMS must be understood by everyone, so the quality of the message is of the utmost importance. [9]

CONCLUSION.

The operating conditions of vehicles in mountain conditions have their own characteristics and have a negative impact on traffic safety. The level of use of intelligent transport systems in ensuring traffic safety in mountain conditions is low. There are a number of advantages of introducing and using variable traffic signs on mountain highways. Due to the changeable mountain weather conditions and high rainfall, mountain vehicles face various challenges. For example, the recommended speed limit for cars and trucks in sunny weather is not the same as the recommended speed limit for cars and trucks when it is raining, snowing, or frozen. The implementation of VMS in practice serves to prevent such problems that may arise.

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