THE NECESSITY OF ORGANIZING VIDEO SURVEILLANCE SERVICES ON AUTOMOBILE ROADS OF UZBEKISTAN

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Annotation: This article provides a scientific rationale for the nationwide measures being implemented in Uzbekistan to regulate automobile traffic and reduce road accidents, emphasizing that organizing high-quality video surveillance services is among the most effective and proven methods. The paper also analyzes the issues related to the implementation of video surveillance services, which have been successfully introduced in developed countries, under the specific conditions of Uzbekistan.

Keywords: video surveillance systems, road traffic safety, intelligent transport systems, digital management, highways, transport infrastructure, regulatory and legal framework, technical standards, preventive control, road traffic accidents, digital technologies, information security, management efficiency.

Аннотация: В данной статье научно обоснованы меры, осуществляемые в Республике Узбекистан в масштабах всей страны по регулированию автомобильного движения и снижению дорожно-транспортных происшествий. Отмечено, что среди этих мер наиболее эффективным и проверенным методом является качественная организация службы видеонаблюдения. Проанализированы вопросы применения систем видеонаблюдения, внедрённых в развитых странах, в условиях Узбекистана.

Ключевые слова: системы видеонаблюдения, безопасность дорожного движения, интеллектуальные транспортные системы, цифровое управление, автомобильные дороги, транспортная инфраструктура, нормативно-правовая база, технические стандарты, профилактический контроль, дорожно-транспортные происшествия, цифровые технологии, информационная безопасность, эффективность управления.

Annotatsiya: ushbu maqolada O'zbekistonda avtomobil harakatini tartibga solish va yo'l-transport hodisalarini kamaytirish bo'yicha amalga oshirilayotgan umummilliy chora-tadbirlarning ilmiy asoslari keltirilgan bo'lib, yuqori sifatli videokuzatuv xizmatlarini tashkil etish eng samarali va tasdiqlangan usullardan biri ekanligi ta'kidlangan. Hujjatda O'zbekistonning o'ziga xos sharoitlarida rivojlangan mamlakatlarda muvaffaqiyatli joriy etilgan videokuzatuv xizmatlarini joriy etish bilan bog'liq masalalar ham tahlil qilingan.

Kalit so'zlar: videokuzatuv tizimlari, yo'l harakati xavfsizligi, aqlli transport tizimlari, raqamli boshqaruv, avtomobil yo'llari, transport infratuzilmasi, me'yoriy-

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huquqiy baza, texnik standartlar, profilaktik nazorat, yo'l-transport hodisalari, raqamli texnologiyalar, axborot xavfsizligi, boshqaruv samaradorligi.

Introduction:

In recent years, the level of utilization of automobile roads in the Republic of Uzbekistan has been increasing significantly. The development of the digital economy, population growth, the expansion of urbanization processes, and the yearly rise in the share of automobile transport have led to a growing demand for road infrastructure. According to data from the State Committee on Statistics, between 2018 and 2024 the number of vehicles in the country increased by nearly 40%, which in turn resulted in higher traffic intensity and greater complexity in ensuring road traffic safety.

This process, in turn, requires new approaches to road infrastructure management. Traditional control systems, being heavily dependent on the human factor, are unable to fully monitor all situations in real time. Therefore, the introduction of digital technologies, particularly video surveillance systems, is regarded as an integral component of the modern transport management concept.

Today, video surveillance systems serve not only as monitoring tools but also as crucial sources of information for analytical purposes and decision-making in management. The data obtained through such systems make it possible to evaluate, in real time, the behavior of road users, traffic density, the technical condition of roads, accident-prone zones, and environmental load. On this basis, scientifically grounded mechanisms for planning and optimizing traffic flow can be developed.

One of the most important aspects of introducing digital technologies is the reduction of the human factor. Video surveillance systems automatically detect and record traffic violations such as speeding, running red lights, and ignoring road signs. As a result, the workload of road patrol services decreases, subjective approaches in monitoring are eliminated, and the level of transparency and the rule of law increases. Moreover, automated fine systems improve driver discipline, foster road culture, and have a preventive effect.

Another significant advantage of expanding video surveillance services is the creation of analytical databases. Based on the collected video data and their processed analytical indicators, it becomes possible to model traffic flow, identify problematic areas, and develop plans for infrastructure modernization. For instance, in high-density traffic zones, traffic light cycles can be automatically adjusted, or alternative routes can be identified to prevent congestion. Such analytical mechanisms are a key element of the “smart city” concept.

Main Part:

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The necessity of establishing video surveillance systems on highways is justified by a number of scientific, technical, and social factors. Today, the annual increase in the number of vehicles makes the issue of road traffic safety even more pressing. According to the data from the Traffic Safety Service of the Ministry of Internal Affairs of the Republic of Uzbekistan, about 35 percent of road traffic accidents that occurred in the country in 2023 were caused by human factors — such as driver negligence, speeding, failure to obey traffic signals, or other violations. From this perspective, video surveillance systems are among the most effective technological tools that help prevent such incidents, detect them, and ensure a prompt response to violations.

Video surveillance systems primarily serve to establish automated control mechanisms in ensuring road traffic safety. For example, through automatic number plate recognition technology, it is possible to determine in real time information such as vehicle speed, technical inspection status, insurance validity, or unpaid fines. This approach minimizes the impact of the human factor, prevents corruption, and makes the process more transparent and fair. Moreover, such systems transmit data to a centralized database, enabling appropriate measures to be taken automatically based on analytical processing.

Video surveillance systems also play an important role in analyzing traffic density, road infrastructure load, and congestion levels. Modern cameras equipped with artificial intelligence not only record images but also analyze parameters such as speed, traffic flow, and the efficiency of traffic light signals. This provides real-time analytical data to traffic management centers, allowing them to optimize traffic light cycles, suggest alternative routes, and predict congestion in advance. Such systems are also environmentally beneficial, as balancing traffic flow helps reduce the amount of harmful emissions released into the atmosphere.

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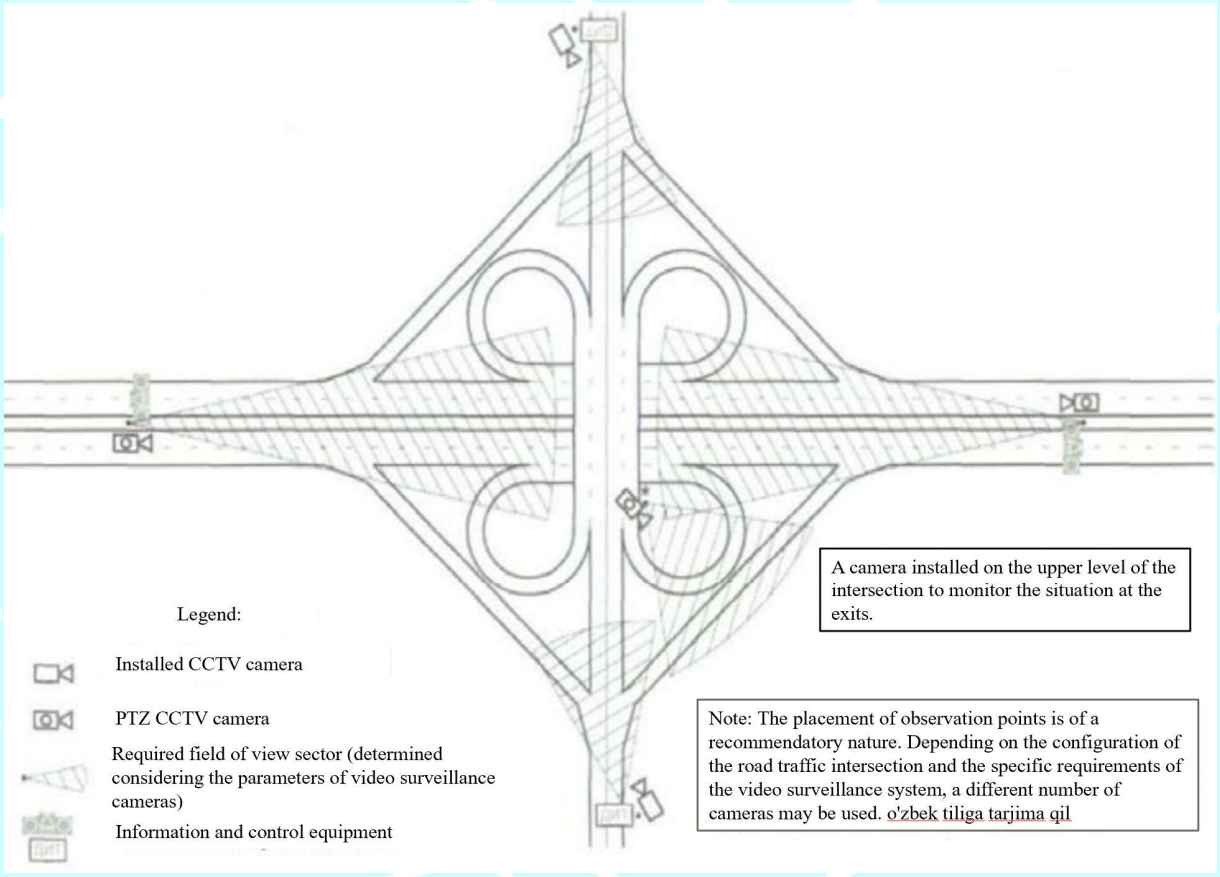


Figure 1. Layout of video surveillance service elements at intersections

Video surveillance systems play an important role not only in ensuring safety but also in maintaining public order. Cameras installed along roads and at traffic intersections serve as vital sources of information in detecting criminal activities, vehicle thefts, illegal cargo transportation, and the movements of individuals under criminal investigation. In this way, video surveillance systems integrated into the road infrastructure enable law enforcement agencies to take prompt actions, solve crimes, and prevent potential offenses.

It should be particularly emphasized that the implementation of video surveillance systems is not merely a technical task, but a process that requires the creation of a comprehensive management framework. For these systems to operate effectively, mechanisms for data collection, processing, and analysis must be closely interconnected. Moreover, strengthening privacy and personal data protection measures, developing technical maintenance infrastructure, and training qualified specialists are also essential components for sustainable functioning.

The large-scale implementation of video surveillance systems on Uzbekistan's highways is not only a means of enhancing road safety but also a significant step toward developing digital governance systems, improving the efficiency of public services, and ensuring citizens' security. Therefore, the establishment of video surveillance services should be supported at the state policy level and carried out on a sound scientific and technical basis.

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Scientific Basis and International Experience:

Global experience demonstrates that video surveillance systems are among the most effective digital management tools for ensuring road traffic safety. Developed countries have been implementing large-scale projects under the concept of "intelligent transport systems." For example, in the United Kingdom, the *Smart Motorways* program integrates high-definition cameras, speed sensors, and digital road signs installed along major highways. The collected data are transmitted to a central control system, which monitors traffic flow in real time, adjusts lane usage during congestion, and coordinates vehicle movement. As a result, the number of road traffic accidents in the country has decreased by approximately 18–20 percent in recent years.

The experience of South Korea is also noteworthy. Within the framework of the *Smart City Traffic Management System* project, every major city in the country is managed through a unified network of video surveillance cameras. Using artificial intelligence algorithms, the system analyzes traffic density, optimizes vehicle speed, and automatically adjusts the operation of traffic lights. According to the Korean Ministry of Transport, in areas where such systems have been implemented, the number of road traffic accidents has decreased by an average of 25 percent, while traffic efficiency has increased by 30 percent.

Singapore's *Intelligent Road Network* project has also been implemented successfully. Cameras installed at every intersection not only monitor traffic conditions but also analyze the level of vehicle emissions. This approach ensures both road safety and environmental sustainability. Based on the collected data, the government automatically determines the amount of the *congestion charge*, which encourages drivers to adopt more responsible behavior on the road.

The United Nations' *Global Road Safety Strategy to 2030* identifies the implementation of digital monitoring technologies as one of the key priorities for improving road safety. According to the document, the introduction of video surveillance and automated monitoring systems could reduce road traffic fatalities by up to 50 percent. Guided by this strategy, many countries are actively integrating advanced digital technologies into their transport infrastructure.

In Uzbekistan, significant reforms have also been undertaken in recent years in this direction. Under the *Safe City* and *Smart Road* projects, the number of video surveillance points in the capital and regional centers is steadily increasing. These systems automatically detect violations such as speeding, disobedience to traffic signals, and disregard for road signs. As a result, not only has traffic discipline improved, but the overall road safety culture has also been gradually enhanced.

International practice confirms that the implementation of video surveillance systems plays a vital role in ensuring road traffic safety, reducing human error,

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optimizing traffic flow, and decreasing environmental impact. For Uzbekistan, adapting these experiences to local conditions represents one of the most important directions for modernizing road infrastructure, enhancing safety, and advancing digital management systems.

Conclusion:

The expansion and modernization of video surveillance services on Uzbekistan's highways, based on modern technologies, is becoming a matter of strategic importance today. This initiative is not only related to ensuring road traffic safety, but also serves as a crucial tool for the digitalization of the transport system, improving management efficiency, strengthening environmental sustainability, and combating criminal activities. In modern conditions, the efficiency of transport infrastructure is determined not only by road quality or the number of vehicles, but also by the level of digital mechanisms used in its management. From this point of view, the large-scale implementation of video surveillance systems represents a comprehensive approach aimed at ensuring national security, economic stability, and social well-being.

Furthermore, to ensure the stable technical performance of video surveillance systems, it is necessary to implement technical requirements that comply with international standards. For instance, the ISO/IEC 62676 standard (*Video surveillance systems for use in security applications*) defines criteria such as camera quality, image resolution, transmission protocols, and the level of data protection. Integrating such standards into national regulatory documents will enhance the quality of cameras and server systems installed in Uzbekistan and allow them to be connected to a unified information platform.

Thus, the expansion and modernization of video surveillance services on Uzbekistan's highways is not merely a technological project but a strategically significant systemic reform. Its successful implementation requires the improvement of the regulatory and legal framework, adaptation of technical standards to international norms, training of qualified specialists, and seamless integration with artificial intelligence technologies. Such an approach will not only enhance road safety but also ensure the transition to an intelligent and sustainable model of transport system management.

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