

JOURNAL OF TRANSPORT



ISSUE 4, 2025 vol. 2

E-ISSN: 2181-2438

ISSN: 3060-5164



RESEARCH, INNOVATION, RESULTS



**TOSHKENT DAVLAT
TRANSPORT UNIVERSITETI**

Tashkent state
transport university



JOURNAL OF TRANSPORT

RESEARCH, INNOVATION, RESULTS

E-ISSN: 2181-2438

ISSN: 3060-5164

VOLUME 2, ISSUE 4

DECEMBER, 2025



jot.tstu.uz

TASHKENT STATE TRANSPORT UNIVERSITY

JOURNAL OF TRANSPORT

SCIENTIFIC-TECHNICAL AND SCIENTIFIC INNOVATION JOURNAL

VOLUME 2, ISSUE 4 DECEMBER, 2025

EDITOR-IN-CHIEF

SAID S. SHAUMAROV

Professor, Doctor of Sciences in Technics, Tashkent State Transport University

Deputy Chief Editor

Miraziz M. Talipov

Doctor of Philosophy in Technical Sciences, Tashkent State Transport University

The “**Journal of Transport**” established by Tashkent State Transport University (TSTU), is a prestigious scientific-technical and innovation-focused publication aimed at disseminating cutting-edge research and applied studies in the field of transport and related disciplines. Located at Temiryo‘lchilar Street, 1, office 465, Tashkent, Uzbekistan (100167), the journal operates as a dynamic platform for both national and international academic and professional communities. Submissions and inquiries can be directed to the editorial office via email at jot@tstu.uz.

The Journal of Transport showcases groundbreaking scientific and applied research conducted by transport-oriented universities, higher educational institutions, research centers, and institutes both within the Republic of Uzbekistan and globally. Recognized for its academic rigor, the journal is included in the prestigious list of scientific publications endorsed by the decree of the Presidium of the Higher Attestation Commission No. 353/3 dated April 6, 2024. This inclusion signifies its role as a vital repository for publishing primary scientific findings from doctoral dissertations, including Doctor of Philosophy (PhD) and Doctor of Science (DSc) candidates in the technical and economic sciences.

Published quarterly, the journal provides a broad spectrum of high-quality research articles across diverse areas, including but not limited to:

- Economics of Transport
- Transport Process Organization and Logistics
- Rolling Stock and Train Traction
- Research, Design, and Construction of Railways, Highways, and Airfields, including Technology
- Technosphere Safety
- Power Supply, Electric Rolling Stock, Automation and Telemechanics, Radio Engineering and Communications
- Technological Machinery and Equipment
- Geodesy and Geoinformatics
- Automotive Service
- Air Traffic Control and Aircraft Maintenance
- Traffic Organization
- Railway and Road Operations

The journal benefits from its official recognition under Certificate No. 1150 issued by the Information and Mass Communications Agency, functioning under the Administration of the President of the Republic of Uzbekistan. With its E-ISSN 2181-2438, ISSN 3060-5164 the publication upholds international standards of quality and accessibility.

Articles are published in Uzbek, Russian, and English, ensuring a wide-reaching audience and fostering cross-cultural academic exchange. As a beacon of academic excellence, the "Journal of Transport" continues to serve as a vital conduit for knowledge dissemination, collaboration, and innovation in the transport sector and related fields.

Emergency notification system for road traffic accidents

M.K. Valiev¹^a, B.A. Sobirov¹

¹Andijan State Technical Institute, Tashkent, Uzbekistan

Abstract: This paper analyzes the development and mathematical algorithms of an automated device that enables rapid emergency notification in the event of road traffic accidents. The device detects incidents based on accelerometer, GPS, and GSM/GPRS modules and sends signals to ambulance or emergency services in real time. The block diagram of the device, mathematical models, and experimental results are presented, and its effectiveness in improving road traffic safety is evaluated.

Keywords: emergency notification, road traffic accident, accelerometer, GPS, GSM/GPRS, mathematical algorithm, safety system, simulation

Yo'l-transport hodisalari sodir bo'lganda favqulotda xabar berish tizimi

Valiyev.M.K.¹^a, Sobirov B.A.¹

¹Andijon davlat texnika instituti, Tashkent, O'zbekiston

Annotatsiya: Mazkur maqolada yo'l-transport hodisalari yuz berganda tezkor favqulodda xabar berish imkonini beruvchi avtomatlashtirilgan qurilma ishlab chiqilishi va matematik algoritmlari tahlil qilinadi. Qurilmada akselerometr, GPS va GSM/GPRS modullari asosida hodisa aniqlanadi hamda real vaqt rejimida tez yordam yoki maxsus xizmatlarga signal yuboriladi. Qurilmaning blok-sxemasini, matematik modellar hamda tajriba natijalari keltirilib, yo'l harakati xavfsizligini oshirishdagi samaradorligi baholangan.

Kalit so'zlar: favqulodda xabar berish, yo'l-transport hodisasi, akselerometr, GPS, GSM/GPRS, matematik algoritim, xavfsizlik tizimi, simulyatsiya

1. Kirish

Yo'l-transport hodisalari (YTH) inson hayoti va sog'lig'i uchun eng katta xavf tug'diradigan omillardan biridir. Global miqyosda yo'l harakati hodisalari natijasida har yili yuz minglab insonlar halok bo'ladi yoki jiddiy jarohatlar oladi. Jahon sog'liqni saqlash tashkiloti (WHO) ma'lumotlariga ko'ra, har yili dunyo bo'yicha 1,3 milliondan ortiq odam yo'l-transport hodisalarida halok bo'ladi, 20–50 milliondan ortiq odam esa turli darajadagi jarohatlarni oladi [1]. Bu raqamlar yo'l harakati xavfsizligining jiddiy muammo ekanligini va harakat xavfsizligini oshirishga qaratilgan ilmiy va texnologik tadqiqotlarning dolzarbligini ko'rsatadi.

YTH oqibatlarini kamaytirishning eng muhim omillaridan biri — hodisani sodir bo'lgan zahotiyoq aniqlash va favqulodda yordam xizmatlariga xabar berishdir. Statistik tadqiqotlar shuni ko'rsatadiki, hodisa sodir bo'lganidan keyingi dastlabki 10 daqiqa ichida tibbiy yordam ko'rsatilsa, jabrlangan shaxsning hayotini saqlash ehtimoli sezilarli darajada oshadi [4]. Shu bois, tezkor xabar berish tizimlarining avtomatlashtirilgan va real vaqtda ishlash mexanizmi inson hayotini saqlashda hal qiluvchi rol o'ynaydi.

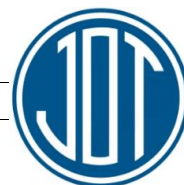
An'anaviy ravishda yo'l-transport hodisalarini xabar qilish jarayoni inson omiliga bog'liq bo'lib, ko'pincha hodisani guvohlar yoki jabrlangan shaxslarning o'zi yetkazadi. Bunda xabar berishdagi kechikishlar, joyini

aniqlashdagi noaniqliklar va boshqa xatoliklar hodisa oqibatlarini og'irlashtirishi mumkin. Shu sababli, transport vositalariga integratsiyalashgan avtomatik favqulodda xabar berish tizimlari dolzarb va zaruriy masala hisoblanadi [11].

Bunday tizimlar hodisani aniqlash, hodisa joyini aniqlash, jabrlangan shaxslar va transport vositasi haqida ma'lumotlarni to'plash va favqulodda xizmatlarga uzatish kabi funksiyalarni bajaradi. Zamonaviy tizimlarda akselerometrlar, giroskoplar, GPS modullari va GSM tarmoqlari qo'llaniladi. Masalan, akselerometrlar va giroskoplar transport vositasining harakatidagi keskin o'zgarishlarni, to'qnashuvlarni va avariyaning aniqlash imkonini beradi, GPS modullari hodisa joyini aniq belgilash imkonini beradi, GSM yoki boshqa simsiz aloqa modullari esa real vaqtda ma'lumotlarni uzatishni ta'minlaydi.

Mazkur tadqiqotning maqsadi — yo'l-transport hodisalarini avtomatik tarzda aniqlaydigan va favqulodda xabar yuboradigan tizim algoritmini ishlab chiqish, uning matematik modeli va blok-sxemasini taklif etishdir [3], [8]. Taklif etilayotgan tizim inson omilini minimallashtirish, xabar berishdagi kechikishlarni bartaraf etish va favqulodda xizmatlarning voqea joyiga tez yetib borishini ta'minlashga qaratilgan. Shu bilan birga, tizimning ishonchligi, noto'g'ri signal berish ehtimoli va ma'lumotlarni uzatishdagi kechikishlar kabi muammolar ham ko'rib chiqiladi va bartaraf etish bo'yicha ilmiy asoslangan yechimlar taklif etiladi.

^a <https://orcid.org/0009-0002-4877-3208>



Shuningdek, avtomatik favqulodda xabar berish tizimlari zamonaviy intellektual transport tizimlarining bir qismi sifatida qaraladi. Bunday tizimlar yo'l harakati xavfsizligini oshirish bilan bir qatorda, transport vositalarining passiv va aktiv xavfsizlik tizimlarini yanada samarali qiladi. Masalan, to'qnashuv aniqlangach, tizim avtomobilning xavfsizlik kamarlarini mahkamlashi, havo yostiqlarini faollashtirishi yoki boshqa xavfsizlik mexanizmlarini ishga tushirishi mumkin. Shu bilan birga, tizim yig'ilgan ma'lumotlar asosida yo'l harakati xavfsizligini oshirishga qaratilgan statistik tahlillar va transport siyosatini shakllantirishda foydali bo'lishi mumkin.

Mazkur tadqiqotda tizimning matematik modeli ishlab chiqiladi, blok-sxemasini tuziladi va uning ishlash printsiplari batafsil tavsiflanadi. Tizim algoritmi hodisani aniqlashdan tortib, xabar yuborishgacha bo'lgan jarayonni qamrab oladi. Bu jarayonda to'qnashuv kuchi, tezlik, harakat yo'nalishi, hodisa joyi koordinatalari va boshqa muhim parametrlar hisobga olinadi. Shu tarzda, tizim faqat hodisani aniqlash bilan cheklanmay, hodisa oqibatlarini minimallashtirishga ham xizmat qiladi.[11]

Shu bilan birga, avtomatik favqulodda xabar berish tizimi nafaqat shahar ichidagi transport vositalarida, balki shaharlararo yo'llarda ham qo'llanilishi mumkin. Bu tizimning universalligi va samaradorligi uning keng qamrovli tadqiqot va amaliy qo'llanish imkoniyatlarini ta'minlaydi. Shunday qilib, tadqiqot nafaqat ilmiy, balki amaliy ahamiyatga ham ega bo'lib, inson hayotini saqlash, jarohatlarni kamaytirish va yo'l-transport hodisalarini kamaytirishga qaratilgan strategik yechimlarni ishlab chiqishga xizmat qiladi.[10]

2. Tadqiqot metodologiyasi

2.1. Qurilmaning ishlash prinsipi

Qurilma uch asosiy moduldan iborat:[3]

1. Sensor moduli — akselerometr, GPS, gyroskop.
2. Hodisa aniqlash algoritmi — tezlanish va zarba chegaralarini hisoblaydi.[7]
3. Xabar uzatish moduli — GSM/GPRS orqali SMS yoki serverga xabar yuboradi.[4]

2.2. Matematik algoritim

Signalni filtrlash (silliqlashtirish):

$$\hat{x}_i(t) = \alpha x_i(t) + (1 - \alpha)\hat{x}_i(t - 1)$$

bu yerda:

- $x_i(t)$ — i-sensor o'lchami,
- α — filtr parametri ($0 < \alpha < 1$).

Aniqlash mezonini (chi-kvadrat test):

$$z = \sum_{i=1}^n \frac{(\hat{x}_i - \mu_i)^2}{\sigma_i^2}$$

Agar $z > T_z > T_z > T$ bo'lsa, hodisa qayd qilinadi.

Akselerometrning tezlanish qiymati:

Agar:

$$A = \sqrt{a_x^2 + a_y^2 + a_z^2}$$

$$A \geq A_{kritik}$$

bo'lsa, hodisa mavjud deb qabul qilinadi.

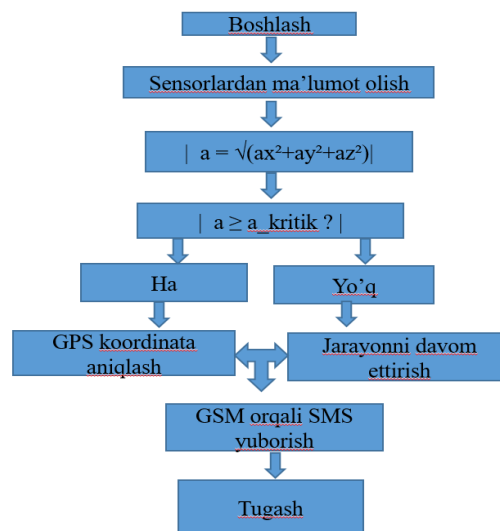
Bu yerda:

$$A_{kritik} \approx 3.5g.$$

GPS modulidan hodisa joylashuvi koordinatalari olinadi va GSM/GPRS moduli orqali SMS xabar yuboriladi.

SMS yuborish sharti:

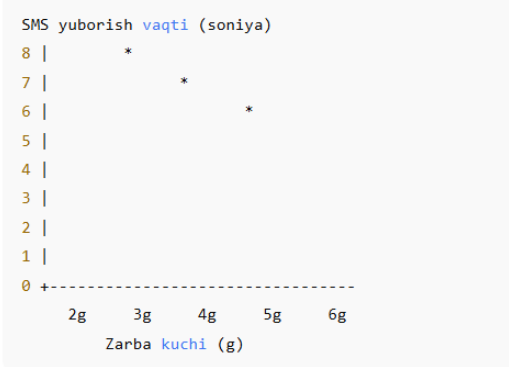
$$H(t) = \begin{cases} 0, & \text{hodisa aniqlanmagan (monitoring)} \\ 1, & \text{hodisa aniqlangan va SMS yuborildi} \end{cases}$$



1-rasm. Algoritm oqim sxemasi (blok-sxema)

3. Natija va muhokamalar

Tajriba sinovlari davomida qurilma quyidagi natijalarni ko'rsatdi:



2-rasm. Izoh: grafikdan ko'rinib turibdiki, zarba kuchi ortgan sari SMS yuborish vaqti qisqaradi

1-jadval

Zarba kuchi va SMS yuborish vaqti bog'liqligi

Test №	Tezlik (km/soat)	Zarba kuchi (g)	Aniqlanish holati	SMS yuborish vaqti (soniya)
1	30	2.8	Yo'q	SMS yuborilmadi
2	50	3.7	Ha	7
3	80	5.2	Ha	6



Natijalar shuni ko'rsatdiki, hodisa chegaraviy qiymatdan oshganda (≥ 3.7 g) qurilma SMS xabarni 6–7 soniya ichida yubora oladi. Bu vaqt tibbiy yordamga tezkor chaqiriq yuborish uchun yetarli hisoblanadi[12].

Tadqiqot natijalari shuni ko'rsatadiki, qurilma YTH sodir bo'lgan vaqtni yuqori aniqlik bilan qayd etadi va SMS yuborish tezligi ham qoniqarli. Shu bilan birga:

- Kuchli jihatlar: tezkor aniqlash, avtomatlashtirilgan xabar uzatish, GSM tarmoqlarida ishlash.

- Zaif jihatlar: tarmoq uzilishi vaqtida SMS yuborilmasligi, noto'g'ri signal ehtimoli.

Takomillashtirish yo'llari: IoT serverlaridan foydalanish, V2V (vehicle-to-vehicle) aloqasi orqali mahalliy xabar uzatish, sun'iy intellekt asosida yanada aniqlash algoritmlarini qo'shish.

4. Xulosa

Ushbu tadqiqotda YTH sodir bo'lganda avtomatik tarzda xabar yuboruvchi qurilmaning matematik algoritmi va blok-sxemasini taklif qilindi. Simulyatsiya natijalari qurilmaning samarali ishlashini ko'rsatdi. Kelajakda tizimni kengaytirish va bulutli platformalar bilan integratsiya qilish imkoniyatlari mavjud.

Foydalangan adabiyotlar / References

- [1] Gu, Y., Jiang, L., Liu, H., Zhang, X., Wei, S. (2025). Advancing Road Traffic Safety Through Stochastic Modeling. Journal of Advanced Transportation, Wiley.
- [2] Valiev M.K. Transport vositalarining passiv xavfsizlik tizimlarini modellashtirish texnologiyalari. Toshkent: O'zbekiston Milliy Universiteti, 2024.
- [3] Valiyev.M.K vehicle accident alert system built using arduino, an adxl335 accelerometer,gps, and a gsm module 2023 <http://jurnal.jizpi.uz/index.php/JOURNAL/article/view/135>
- [4] Ullah, S. et al. (2021). EEMDS: An Effective Emergency Message Dissemination Scheme for Urban VANETs. Sensors, MDPI.

- [5] Zhu, W. et al. (2017). Reliable emergency message dissemination protocol for urban Internet of Vehicles. IET Research.

- [6] UNECE / UNICEF. Road Safety Performance Review: Uzbekistan (RSPR). Geneva, 2024.

- [7] Li, J., et al. Real-time vehicle crash detection using accelerometer and GPS data. IEEE Transactions on Intelligent Transportation Systems, 2022.

- [8] M. K. U. Valiev, "Active and Passive Car Safety Systems," Oriental Renaissance: Innovative, Educational, Natural and Social Sciences 3 (2023): 500–507

- [9] VM Komiljon o'g'li, BL Yuldoshalyevich - avtomobilning passiv xavfsizligi darajasini oshirish 2024

- [10] VM Komiljon o'g'li, BL Yuldoshalyevich avtotransport xavfsizligining mavjud turlarini tahlil qilish - 2024

- [11] M. K. U. Valiev, B.A Sobirov Human factors, technical malfunctions, and technological approaches in road traffic accidents in Uzbekistan Journal of Applied Science and Social Science eISSN: 2229-3213 pISSN: 2229-3205

- [12] Singh, A. & Kumar, R. IoT based accident detection and alert system. International Journal of Intelligent Transportation Systems, 2023.

Mualliflar to'g'risida ma'lumot/ Information about the authors

Valiev Muhammadali Komiljon o'g'li / Muhammadali Valiev	Andijon davlat texnika instituti doktranti valiyevalimuhammad1995@gmail.com http://www.valiev.com Tel.:+998932975566 https://orcid.org/0009-0002-4877-3208
---	---

Sobirov Bekzodbek Ahmadjonovich / Bekzodbek Sobirov	Andijon davlat texnika instituti Qurilish muhandisligi fakultet dekani bekzod.xush@gmail.com Tel.:+9989979907666
---	---



R. Mavlonov, S. Numanova

Strength and crack resistance of steel and bfrp hybrid reinforced concrete beams.....176

I. Yuldashev, Sh. Yuldashev

On another method for assessing effectiveness indicators of emergency response.....182

Sh. Yuldashev, Kh. Makhmudov

Analysis of the material composition and structural properties of road milling machine teeth.....185

B. Khasanov

Analysis of the development and structural structure of the electric vehicle market.....189

Z. Alimova, G. Niyazova

Oil quality studies of hydraulic systems of agricultural machinery in conditions of dusty air.....194

R. Dadaboev

Developing a mathematical model of the fuel supply system for injection engines.....198

O. Chulponov, B. Mamadov

Method of abrasive grinding and reduction of centrifugal two-way "D" type pumps.....202

Z. Kholboev

Study of the stress-strain state of the Varzyk dam, taking into account its own weight, hydrostatic pressure and soil moisture content.....205

M. Valiev, B. Sobirov

Emergency notification system for road traffic accidents.....209