ТЕЗИ СТЕНДОВИХ ДОПОВІДЕЙ ТА ВИСТУПІВ УЧАСНИКІВ КОНФЕРЕНЦІЇ

HIGHLIGHTS OF REPORTS AND PRESENTATIONS OF PARTICIPANTS TO THE CONFERENCE

Timely response to an emergency requires the presence of 5G.

Determining the level of intelligence of a particular traffic light and creating databases of patterns of normal and emergency situations are priority tasks for research.

The thesis proposes an approach to designing a smart traffic light based on the use of Fuzzy Cognitive Maps (FCM) [2]. The approach allows formalizing cause-and-effect relationships between key factors: traffic density, time of day, presence of pedestrians, category and extremeness of incidents, equipment reliability, and the level of satisfaction of pedestrians and drivers. The description of different views on the smart traffic light control system using UML diagrams (Use Case, Deployment, Activity, Sequence) made it possible in this work to determine the scenarios of the traffic light operation and the logic of interaction of its components. Scenario modeling was conducted in the Mental Modeler environment, which showed the effectiveness of the developed system. In the "pedestrian comfort" mode, a reduction in waiting time at the crossing was achieved; in the "driver comfort" mode, the average idle time of transport was reduced; the compromise mode provided a certain level of satisfaction for both categories of participants; in case of emergency situations, the system correctly prioritized the movement of emergency service cars.

Special attention was paid to modeling possible emergency situations that must be considered in adaptive traffic light control. The study allowed us to identify emergency situations in this work to which a certain traffic light can’t respond satisfactorily without the appropriate level of intelligence.

For example, among the situations that are considered emergency, we can consider situations caused by certain weather conditions (excessive precipitation, ice, fog, very high or very low air temperature together with certain humidity values, strong wind, powerful lightning). The presence of certain sensors (video surveillance systems, weather, visibility and road condition sensors) in a smart traffic light, as well as computing capabilities, allows the smart sensor to collect, analyze, detect changes in the traffic light environment and adjust signaling modes in almost real time, even considering the possible change in the emotional state of drivers and pedestrians. But the use of certain communication networks for Internet access by a smart traffic light expands the capabilities of a smart traffic light not only by adding information about weather conditions and emergencies outside the operating area of a single traffic light in a smart city, but also by software remote control of the traffic light or even manual intervention of the operator in changing the signaling mode from the transport center of a smart city. Considering emergency weather conditions, the traffic light requires more reliable equipment for both the traffic light itself and the reliability of all hardware and software components of a smart traffic light.

The obtained results of modeling the operation of a smart traffic light confirm the feasibility of using FCMs for adaptive traffic light control.

Further research should be directed to modeling the integration of hardware and software of the system, including the use of reinforcement learning algorithms for the smart traffic light control system.

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ON THE ISSUE OF IMPROVING THE TRANSPORT AND LOGISTICS INFRASTRUCTURE FOR FREIGHT TRANSPORTATION IN UKRAINE

The optimization of transport infrastructure has a positive impact on the environmental situation, while the utilization of transit potential contributes to an increase in government revenues. Global experience demonstrates the need for continuous improvement of transport systems at both national and international levels to ensure effective interaction among participants in the transport process.

One of the key ways to enhance the competitiveness of enterprises is the development of logistics centers. Ukraine benefits from a favorable geographical location, positioned at the crossroads of trade routes between the European Union and the countries of the Customs Union. As such, an important area of research is the adaptation of international logistics infrastructure development practices to the current Ukrainian context.

However, under current conditions, the operations of customs authorities face a range of challenges, among which delays in cargo handling, as well as the idling of railcars and vessels in seaports and adjacent railway stations, occupy a particularly significant place. These issues not only slow down logistics processes but also generate additional costs for businesses, adversely affecting the country's investment climate. The unjustifiably long duration of customs inspections and the preparation of the corresponding documentation is currently one of the main causes of substantial queues of vehicles at border crossing points. This situation negatively affects the dynamics of freight transportation, including multimodal shipments involving rail transport.

The operation of these facilities is organized on the basis of careful planning and the rational movement of goods from border-crossing points to end-users, achieved through the calculation and implementation of optimal logistics chains.

It is therefore proposed to create a network of customs-logistics complexes located at major railway stations to provide ancillary transport services for international rail shipments — such as customs clearance, consignment formation, and document handling.

In this context, the challenge arises of determining the optimal number of such complexes across different regions and their spatial distribution within the country. Developing and refining a methodology for identifying the optimal quantity and locations of customs-logistics complexes is thus both a pressing scientific task and a practical necessity.

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RAILWAY DEVELOPMENT IN COMPARATIVE PERSPECTIVE: THE CASE OF THE UNITED KINGDOM AND UKRAINE

АНАЛІЗ РОЗВИТКУ ЗАЛІЗНИЧНОГО ТРАНСПОРТУ: ДОСВІД ВЕЛИКОЇ БРИТАНІЇ ТА УКРАЇНИ

Railways have always played more than a purely functional role in nations' development; they are strategic assets, especially in times of crisis. For Ukraine, the railway network is not only a major economic artery, but also a key component of national security. During the war, railways facilitated evacuation, humanitarian aid, and supply lines. In peacetime and post-war recovery, they will form the backbone of rebuilding trade, restoring connectivity, and aligning with European standards.

Digitalization and Customer Orientation.

The UK has made significant advances in digital railway services: real-time information systems, mobile apps for journey planning, integrated ticketing, sophisticated freight tracking, and systems for accessibility. These contribute not just to convenience, but also to efficiency, reliability, and public trust.

Ukraine's Ukrzaliznytsia has taken steps in this direction: online ticketing, digital logistics, and app services. But the pace of adoption and integration can be improved. Digital customs clearance, e-CMR for freight, real-time cargo tracking, passenger feedback mechanisms, and accessibility standards can be expanded. Such tools often cost less (relative to track building or electrification) but yield high returns in user satisfaction and operational efficiency[3].

Opportunities and Challenges of Adaptation.

Using Ukraine's substantial electrified track (≈ 45%), expanding into non-electrified lines offers both environmental and cost savings.

Improved freight and passenger services can boost domestic trade and integration into EU corridors.

Highlighting infrastructure projects (e.g. strategic cross-border lines) can attract international finance (EU, EIB, etc.) [2].

Financial scale: HS2's Phase 1 being estimated at ~£66 billion shows how fast costs can escalate. Ukraine must avoid cost overruns, corruption, and overly optimistic assumptions.

Pace of electrification: in the UK, despite its wealth, current rates are far below what is needed to reach net-zero by 2050. Less than half the needed annual kilometres are being electrified [1]. Ukraine's recent speeds (70 km in a year) are commendable, but scaling that up will require major investment, workforce capacity, and stable supply chains.

From the UK's experience, the following strategic lessons emerge:

Prioritize electrification: build on the ≈45% already electrified network in Ukraine. Seek to increase the annual rate of track electrification substantially, with clear targets.

Rigorous cost estimation and risk management: using HS2 as cautionary tale, all phases must include contingency, realistic inflation adjustments, and strict oversight.

Selectively engage PPPs in freight, logistics, and maintenance, not necessarily service operation everywhere, to attract capital and innovation while maintaining control over strategic assets.

Accelerate digitalization and customer-centric reforms: small investments in digital tools, feedback