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INTELLIGENT TRANSPORTATION SYSTEMS (ITS) IN MODERN LOGISTICS

The article examines the importance of intelligent transport systems in modern logistics. The authors consider the methods that are used in ITS to optimize transport operations. The article describes key aspects, advantages and practical problems of the system. Examples of successful integration of ITS in different logistics sectors are discussed, as well as their future development. The importance of ITS in improving transport operations, safety and reducing environmental impact on logistics is also emphasized.
Keywords: *logistics, intelligent transportation system, efficiency, transportation, trafic*

Traffic is currently increasing worldwide. The significant increase in the number of vehicles and the limited capacity of the road network creates many conflict situations, and mobility is rapidly declining. Experience in major cities around the world shows that congestion cannot be solved by building highways alone. To coordinate transport flows effectively, ITS must be implemented.

Intelligent transport systems are a group of systems that use information, communication and management technologies built-in vehicles and road infrastructure to make the transport networks more efficient. Intelligent transport systems are based on information that needs to be collected, processed, integrated and disseminated; the ITS system can serve as a situation coordination and operational coordination function for all road users, special services and agencies [2].

Modern logistics faces many challenges, such as increasing transport volumes, reducing delivery times and the need to reduce costs. In this context, intelligent transport systems (ITS) are a powerful tool for improving transport efficiency. ITS includes a wide range of technologies and applications such as traffic management, monitoring and forecasting systems, and decision support systems. The possibilities are endless [1].

- Activities that were traditionally undertaken through human intervention can be automated.
- Road network performance can be monitored and adjusted, in real-time.
- Data that was previously collected by costly physical infrastructure can be provided through new, richer data sources.
- Analysis that was undertaken from historic data can now be undertaken by systems delivering intelligence through real-time data analytics.
- Road users' choices, previously influenced only through road signs, can be influenced through a wide array of publication channels such as mobile devices/in-car systems.

How does smart transport technology work? Building intelligent transport systems in a city requires the following: information collection; traffic analysis; traffic modelling; data exchange; road traffic management.

Intelligent urban transport requires technologies that allow data exchange between the system's core and all its components, as well as between individual communication elements. The most important component of modern transport solutions is the information subsystem, the main task is to make information accessible to public transport users. The city has one ITS control center, where data from traffic flow detectors and photo and video cameras on the road environment will be transmitted online. The system 1 also records traffic speed, number of cars and public transport, weather conditions and state of the highway. In case of accident, the system warns about narrow spaces on the road and offers avoid routes. The traffic lights should be changed according to the

traffic load of nearby intersections. The above systems allow to regulate traffic flow during traffic jam, cancel unpopular routes or select new ones [3].

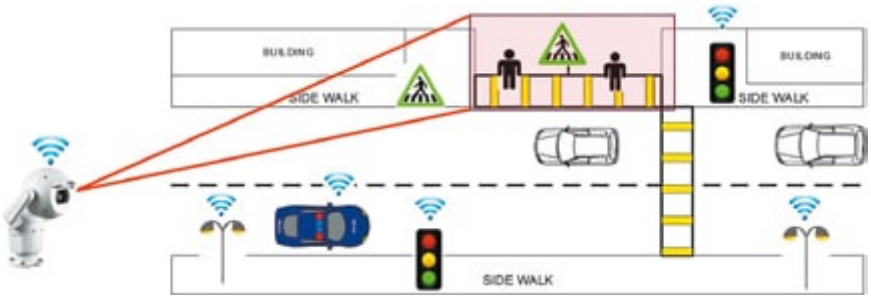

Fig.1. Intelligent transport technology work

The use of ITS in practice has provided evidence of the effectiveness of the system:

Japan was one of the pioneers in Intelligent Transport Systems (ITS) research, beginning in the 1960s and 1970s. The country has significantly advanced ITS to address traffic congestion, accidents, and environmental pollution (Tokuyama, 1996). The implementation of ITS occurred in four phases:

First Phase (1960–1984): Introduction of in-vehicle navigation systems for route guidance and electronic payments. As of March 1996, approximately 40 different models of in-vehicle navigation systems were being sold in Japan by 25 companies. Total sales exceeded one million units [4].

Fig.2. In-vehicle navigation system

Second Phase (2005): Improvements in information services and the development of an emergency management system for rapid rescue operations.

Third Phase (2005–2010): Enhancements to infrastructure and onboard vehicle equipment.

Fourth Phase (Post–2010): Integration of all information technologies used by travelers and vehicles into a fully functional ITS (Vanajakshi et al., 2010).

The Japanese government collaborated with the private sector on ITS applications, resulting in a significant reduction in congestion, from 60,3 % to 29,3 %, and improved traffic flow at tunnel entrances and tolls (Ministry of Land, Infrastructure, Transport and Tourism, 2004) [5].

After the success of Intelligent Transport Systems (ITS) in countries like Japan, the United Arab Emirates became the first Arab nation to implement ITS in Dubai in 2002. This initiative aimed to address the rapidly growing population and related traffic issues, while also attracting global investors.

The Dubai government began by constructing new roads and enhancing the road network before launching the "Travel and Traffic Management application". This included installing CCTV cameras, radar, and infrared sensors along roads, bridges, and tunnels, and establishing a traffic control center for data management [6].

Fig.3. Lane Control Signals

The implementation of ITS yielded numerous benefits, such as:

– Automatic notifications of alternative routes during congestion.

– Safe diversion of traffic from accident-blocked lanes.

– Speed limit warnings during incidents.

– Quick access to accident sites to assist injured individuals.

– Automated traffic management during special events.

In 2013, Dubai initiated the testing phase of the Public Transportation Operations application, enabling users to book tickets via mobile phones for various transport options, including metro, buses, and taxis (Vanajakshi et al., 2010) [7; 8].

Thus, intelligent transport systems offer significant benefits to the logistics industry, including improved efficiency, safety and environmental friendliness of transport. However, their full potential requires the integration of different technological and organizational solutions. Further research and development in the field of ITS will contribute to the creation of more sustainable and efficient logistics systems in the future.

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