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ISSUES OF APPLICATION OF ARTIFICIAL INTELLIGENCE IN CLASSIFICATION OF ELECTRIC CARS ACCORDING TO COMMODITY NOMENCLATURE OF FOREIGN ECONOMIC ACTIVITY BASED ON COMPLEX INSPECTION SYSTEM

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Annotation: *In the article, the methods of automatic analysis and classification of goods and vehicles by means of Complex Inspection System (CIS) images are currently implemented on the basis of artificial intelligence (AI) systems, using the experience of Russia, China, Australia, the USA, Finland, Estonia, Turkey and Japan. Based on this, the issue of systematic classification according to the Commodity Nomenclature of Foreign Economic Activity (CN FEA) by means of intelligent recognition based on physical, external, electronic data, in the automatic analysis of its image data, in the identification of CIS electric vehicles (EV) for customs purposes, is highlighted.*

Key words: *Vehicle, artificial intelligence, goods, inspection complexes, physical signs of an electric vehicle, intelligent analysis of images, identification, classification, CN FEA, technical description.*

ВОПРОСЫ ПРИМЕНЕНИЯ ИСКУССТВЕННОГО ИНТЕЛЛЕКТА ПРИ КЛАССИФИКАЦИИ ЭЛЕКТРОМОБИЛЕЙ НА ОСНОВЕ ИНСПЕКЦИОННО — ДОСМОТРОВЫХ КОМПЛЕКСОВ ПО ТОВАРНОЙ НОМЕНКЛАТУРЕ ВНЕШНЕЭКОНОМИЧЕСКОЙ ДЕЯТЕЛЬНОСТИ

Аннотация: *В статье методы автоматического анализа и классификации товаров и транспортных средств посредством изображений инспекционно — досмотровых комплексов (ИДК) в настоящее время*

реализуются на основе систем искусственного интеллекта (ИИ) с использованием опыта России, Китая, Австралии, США, Финляндии, Эстонии, Турция и Япония. На основании этого решается вопрос систематической классификации по Товарной номенклатуре внешнеэкономической деятельности (ТН ВЭД) средствами интеллектуального распознавания на основе физических, внешних, электронных данных, при автоматическом анализе данных ее изображений, при идентификации Электромобили транспортное средство (ТС) ИДК для таможенных целей.

***Ключевые слова**: Транспортное средство, искусственный интеллект, товары, досмотровые комплексы, физические признаки электромобиля, интеллектуальный анализ изображений, идентификация, классификация, ТН ВЭД, техническое описание.*

INSPEKSION KO‘RIK MAJMUALARI ASOSIDA ELEKTROMOBILLARNI TASHQI IQTISODIY FAOLIYAT TOVARLAR NOMENKLATURASI BO‘YICHA TASNIFLASHDA SUN’IY INTELLEKTNI QO‘LLASH MASALALARI

***Annotatsiya:** Maqolada hozirgi kunda inspeksion ko‘rik majmualari (IKM) tovar va transport vositalarini IKM tasvirlari yordamida avtomatik tahlil qilish, tasniflash usullari sun’iy intellekt (SI) tizimlari asosida amalga oshirilayotganligi Rossiya, Xitoy, Avstraliya, AQSH, Finlyandiya, Estoniya, Turkiya va Yaponiya davlatlari tajribasi misolida keltirilgan. Shundan kelib chiqib, bojxona maqsadlari uchun IKM elektromobil transport vositalari(TV)ni identifikatsiya qilishda uning tasvirli ma’lumotlarini avtomatik tahlil qilishda jismoniy, tashqi, elektron ma’lumotlari asosida aqlli tanish orqali Tashqi iqtisodiy faoliyat tovarlar nomenklaturasi (TIF TN) bo‘yicha tizimli tasniflash masalasi yoritilgan.*

***Kalit so‘zlar:** Transport vositasi, sun’iy intellekt, tovar, inspeksiom ko‘rik majmualari, elektromobil transport vositasining jismoniy belgilari, tasvirlarni aqlli tahlil qilish, identifikatsiya, tasniflash, TIF TN, texnik tavsif.*

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Enter: One of the important tasks facing the customs practice is the expansion of the scope of electric car EV in the world car market and their reading and classification based on their separate physical, external signs and electronic data with the help of CIS.

According to experts, in 2024, the global supply of electric mobile EV will increase to 18.4 million units, and in 2025, it will reach 20.6 million units, according to Gartner, an American consulting company [1].

Research section: In accordance with the strategy for the development of the customs service of the Russian Federation until 2030, it is established that the Russian Federal Customs Service consists of the formation of intelligent customs services by introducing artificial intelligence into the processes of customs clearance and customs control [2]. In this regard, an "intellectual" control point is being developed, which provides recognition of separate groups of goods and classification by CN FEA during the automatic analysis of images by the SI system of EV images obtained with the help of CIS.

Currently, with the help of this service, recognition of goods classified into 6 product groups of CN FEA, 23 product positions and 21 product sub-positions of the foreign trade network, as well as prohibited and restricted objects (drugs, firearms) [3] has been performed.

The average confidence of product recognition by the neural network architecture was 77%. From March 2023, the testing of this technology, which involves the steps of scanning, analyzing images and storing the results in file form, was used in real-time customs inspections of CIS [4].

"In the unified automated information system of the customs authorities, using AI and machine learning mechanisms, 74 product groups (positions) from the uniform commodity nomenclature of foreign economic activity of the Eurasian Economic Union (30 units of "fixed value") were identified through CIS images;

- goods subject to bans and restrictions on import into the territory of the Russian Federation based on mechanisms of automatic analysis of unstructured data using the unified automated information system of customs authorities, as well as

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identification of intellectual property objects and controlled goods (lists) quantity 10 pieces ("specified value" 6 pieces); [5]

"Cascad" KPS CIS images analysis using a neural network to recognize product categories and their non-uniform structures, which showed the presence of extraneous additional goods.

The accuracy of correct product recognition (neural network confidence) increased from 60% to a maximum value of 98% depending on the product category.

In the experience of the People's Republic of China (PRC), 3S - "Smart Customs, Smart Borders, Smart Connectivity" (Uzb: "smart customs, smart borders, smart connectivity" initiative), which includes the intellectualization of cross-border infrastructure and the automation of state control at border points.

Automatic image recognition system is widely used in China to improve the efficiency of customs control [6]. The customs authorities of the PRC are effectively managing customs clearance based on AI elements using the "centralized customs image inspection system". CIS intelligently analyzes the image, and the system immediately sends a message to the official at the checkpoint in case of irregularities in the truck or container. In addition, the system can recognize the density and volume of some goods in containers.

In addition to the recognition of categories of goods transported in cargo containers and cargo of individuals, China introduces technologies for automatic detection of product codes, as well as animal and plant species [7].

Images captured by the PRC CIS are transmitted in real-time to the Centralized Customs Image Inspection System, where the scanned images are automatically analyzed for intelligent recognition. At the same time, AI technologies are also used in China, according to which the results of intelligent analysis of CIS images are automatically compared with the information shown in the customs declaration.

In Russia, attention is focused on the recognition of consumer goods, while in China and Australia, the task of combating the smuggling of rare species of flora and fauna is considered important, in the USA and Australia, the importance of

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identifying invasive species that harm agriculture and the environment is recognized in the CIS images [8], [9].

In accordance with the Non-Intrusive Inspection Systems Program in the US, non-intrusive equipment with low X-ray energy is used, which allows for TV-flow scanning technology without disembarking passengers. HXC-320 CIS is operating in the USA to implement this technology. This CIS is equipped with a 320 kV x-ray generator, which allows the car scanner to work as a transit portal without disembarking drivers and passengers. This technology allows to increase the capabilities of checkpoints.

In Latvia's experience, the State Revenue Service of the Republic of Latvia introduced a system of automatic identification of EV and containers at customs checkpoints at Terehovo checkpoint.

Within the framework of the above-mentioned system, identification, reading and recognition of license plates of EV crossing the state border is carried out. The specified system has additional functions such as identifying the container number, EV brand, color and other identifying features.

The Australian experience. Australia has a rich diversity of flora and fauna. This contributes to illegal wildlife trade. Australian reptiles and birds are highly prized overseas. Exotic species, including snakes and turtles, are also imported into the country, carrying pests and diseases that can threaten agriculture and fragile natural ecosystems [10].

Australian customs officials are training an artificial intelligence system by creating a library of animal X-ray images. The system recognizes animal species in both passenger luggage and international mail.

The Japanese experience. Since Japan has no land borders with other countries, it does not have rail and road checkpoints. Goods enter the country through sea and air checkpoints. Accordingly, customs inspections of bulky goods using portal-type CIS are carried out mainly in relation to containers.

Currently, by applying AI in CIS, we can observe that certain groups of goods are recognized and classified by their characteristics that define them as

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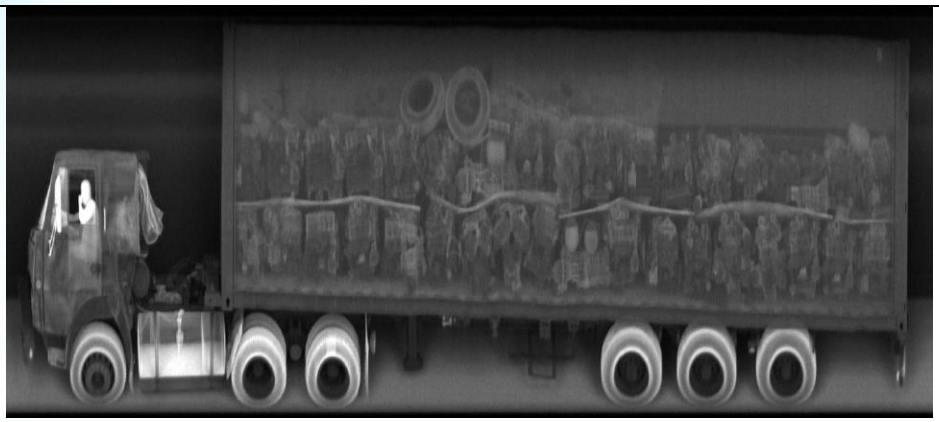
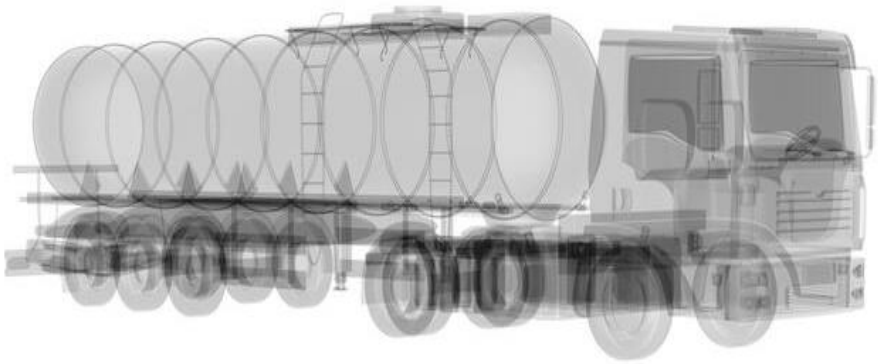
goods. In the practice of customs, we can observe the 2D and 3D dimensional images of cargo carriers and special EV obtained using CIS.

Table1

№	Used logies	Image recognition spaces
1	"Z Portal" CIS in 2D space	
2	Dimension in pace in X-ray [11]	
3	EV recognition on the AI system	It uses advanced computer technology for recognition and cation of EV image or video

Electric mobile EV is a EV that is driven by one or more electric motors with independent electricity.

Classification of electric EV [12,13]:

1. By purpose: passenger; freight carrier; family; sports deaf; other types (tricycles, micro-electric EV, etc.).

2. Depending on the type of engine : Gasoline, HEV - hybrid electric vehicle, PHEV - Plug-in hybrid vehicle, REEV - Range Extended Electric Vehicle,

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BEV - battery electric vehicle, FCEV - Fuel cell electric vehicle, FHEV — full hybrid electric vehicle, MHEV - Mild Hybrid Electric Vehicle.

In recent years, many countries around the world have introduced various incentives and tariffs to encourage the production and use of electric vehicles due to their environmental friendliness and economy.

If we pay attention to the experience of developed countries, we can observe that new technologies introduced in customs practice can recognize, analyze and make decisions by identification or authentication of several types of goods, their characteristics, without the human factor.

Summary. Due to the increase of new generations of EV species, the emergence of several methods of identification and their systematic classification will make a practical contribution.

Table 3

№	Identification methods	Autentification methods
1	Chemical	-
2	Physical	-
3	Physical signs (structural structure)	-
4	Documents related to goods and TV	Biometrical autentification
5	Electronic system data identification	Biometrical autentification
6	Normative legal documents	-

We will be able to determine the CN FEA code based on the identification of the CIS images of the physical, external signs and characteristics of the product.

In conclusion, based on the library of human face image, the library of flora and fauna world, the library of recognition of goods in photographs, FEA shows the availability of a classified commodity code according to EV. However, the classification of the new generation of electric car EV using CIS image shows that the practice of assigning a product code is not intended and considered.

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