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Models of the classification system for the characteristics of light vehicles based on the goods nomenclature

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ABSTRACT: This article develops a model of increasing the reliability of primary data, ensuring its product description and brand code continuity in the creation of a system of classification of characteristics of light vehicles on the basis of the Commodity Nomenclature, its mathematical model based on variational approach, and automated model. The models of this developed classification system are described not only to prevent various errors in customs clearance processes in terms of brand names and CN FEA codes, but also to speed up the process of electronic customs clearance (ECC) at the level of accuracy.

KEY WORDS: classification of characteristics, the goods nomenclature,model of the system,dynamic object, identification.

I.INTRODUCTION

At present, most countries of the world are based on a unified system of description of goods, which significantly simplifies the passage of goods across the customs border and creates favorable conditions for international trade.

However, there are some inaccuracies in the issuance of the commodity code depending on the characteristics of the goods, or even if the trademark is correctly classified, the conformity of the same commodity code in other types of goods, which creates doubts in the correct calculation of customs duties. indicates that it is not. It is also important to create a system for classifying the characteristics of light vehicles on the basis of the nomenclature of goods.

The model of an information system is to reflect its properties through a formalized description of the components of the system and the relationships between them in some language (natural, algorithmic, mathematical, graphic). In creating such a model, an organizational and economic model of a particular management entity is formed, which describes in detail all the relationships between object-specific information sets and data modification algorithms [1].

The main task of modeling is to bring the properties and characteristics of the created model as close as possible to the object or event to which the behavior is to be studied. Modeling allows you to describe the object being modeled with mathematical formulas, according to which a computer program can also be created.

There are a number of principles for classifying models of different natures, the most important of which are:

- by the method of reflection of reality, ie by form;
- on the nature of the modeled objects, ie on the content.

Recently, methods, algorithms and procedures of intelligent information processing (IIP) for the study of various control systems are widely used. One of the most effective approaches in solving IIP problems is the methodology of complex organized data classification analysis [2-4].

Most modern systems are socio-technical. Quality indicators (staff qualification, work quality, workload) are taken into account in the management of their performance, their values are directly and indirectly characterized by quality indicators [5].

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II. MATERIAL AND METHODS

In the field of customs, in the electronic declaration of light vehicles, it is important to link their membership by forming a two-way, ie technical characteristics and a set of necessary and primary data for customs purposes.

In Figure 1 below, we present a model for ensuring the reliability of primary data in ensuring the continuity of the brand description and brand code.

There are special approaches to assessing the quality of primary data, information supply, management, for example, the use of mathematical methods is one of the most effective methods.

The increasing complexity of classification data has led to an increased focus on ensuring the quality of management of existing or developed systems. In this case, the solutions are mainly implemented in two directions [6]:

- Development and use of various types of computer systems: information systems (IS); fully automatic control systems (FACS); automated control systems (ACS), ensuring the participation of the human operator (HO) in management; information and management systems (IMS), information and measurement systems (IMS), etc.;

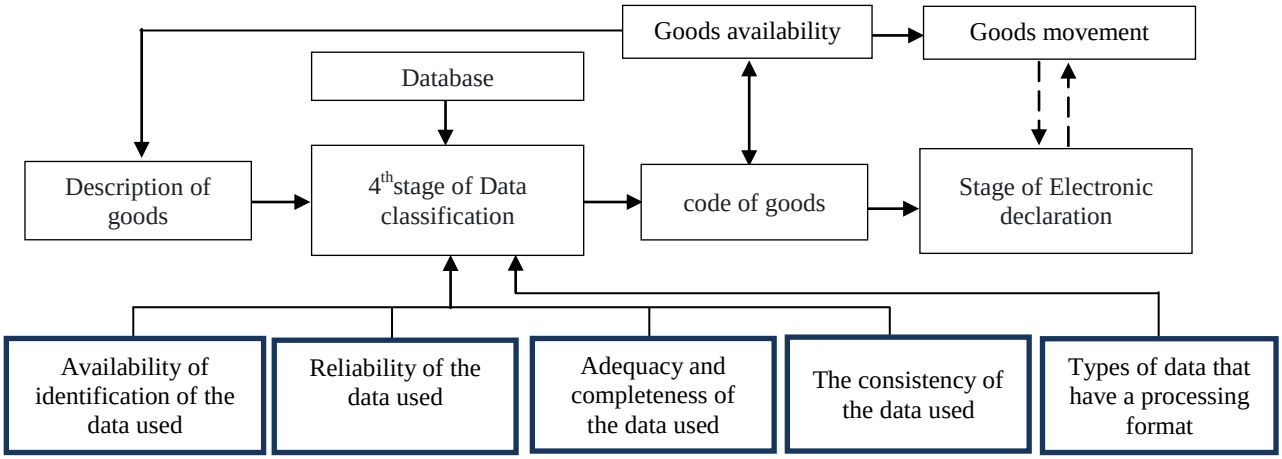

Figure-1. A model for ensuring the reliability of primary data in ensuring the continuity of the product description and brand code

- Improving the performance of HOs involved in the management of information systems and increasing the quality requirements for selection.

The completeness and accuracy of data perception in classification systems, the timeliness and accuracy of actions depend on the size and quality of the data of brand characteristics and other characteristics.

Models of control over the amount of information provided to the human operator [7].

Model 1 (mainly for high-level information loads). Suppose that the HO (human operator) needs to provide information in N forms. We accept the following.

1. The total amount of data that an HO can receive per unit time in a given period of a given shift is equal to S1. In the general case, S1 = S1 (t), i.e., time dependent. Causes: The HO may be tired, and the HO may have a "get to work" period at the beginning of the shift.

2. The minimum amount of data required for each type of decision-making by the HO is $\{g_n\}_{n=1...N}$.

3. We can calculate the "utility" coefficients for each type of information equal to the value of the reduced risks (in rubles) per $\{g_n\}_{n=1...N}$ units of origin of information that exceeds the minimum required volume for $(\{K_n\}_{n=1...N})$ accuracy.

4. The maximum amount of information that does not reduce the risk after that is $\{G_n\}_{n=1....N}$.

5. The cost of receiving, transmitting, processing, and displaying information units for individual types is $\{N_n\}_{n=1...N}$. Then the following solution, which maximizes the function, serves as the optimal solution for each volume of information of type $\{Y_n\}_{n=1...N}$

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$$\Omega_1\left(\sum_{n-1}^{N}(K_n(Y_n-g_n))-\sum_{n=1}^{N}C_nY_n\right),$$

where the amount of losses incurred by the reducer on the right corresponds to the cost of obtaining, processing and providing information to the reducer. Restrictions:

$$\left(\sum_{n-1}^{N}Y_n\right)\le S_1;\{g_n\le Y_n\le G_n\}_{n=1....N};\left(\sum_{n=1}^{N}C_nY_n\right)\le Z_1^{(\max)}.$$

In this case, the restrictions on the maximum amount of costs per $Z_1^{(\max)}$ unit of time may lead to the fact that $\sum_{n=1}^{N}C_nY_n$ will not be achieved.

Usually the combined use of these methods (or part of them) gives the greatest effect. In this regard, organizations are interested in optimizing the expenditure of funds (resources) in these areas, taking into account the following factors: the required and actual number of human operators, their characteristics, the expected duration of these persons in the future, various regulatory restrictions on human operators and others.

The analysis of the conditions of human-operators' activities allowed to identify the specific features of their decision-making and implementation, a set of factors that can lead to a deterioration in the quality of their operations. It is advisable to use decision-making models to eliminate customs violations, taking into account the differential consideration of the importance of short-term and long-term consequences of decisions by human operators, taking into account "time factors" and risks in the implementation of decisions.

In the research work, a statistical model of the operation of a complex object as a model of the dependence of the output indicators y on the input indicators vector x is considered.

$$y=F(x),x=(x^{(1)},.....,x^{(k)})\in X\subseteq R^k. \quad (1)$$

Such a model is constructed on the selection of N vectors with dimension $(k+1)$ and obtained in the normal operation mode of the identifiable object

$$(y_t,x_t)=(y_t,x_t^{(1)},.....,x_t^{(k)})\in\tilde{X}=R^{k+1},t=1,.....,N, \quad (2)$$

it can then be easily shown that the proposed approach can also be used to identify a dynamic model in a view that is sufficiently general.

$$y(t)=F[x(t),x(t-1),x(t-2),....,x(t-m)], \quad (3)$$

where m is the "memory depth" of the dynamic model. In other words, the difference between models (1) and (3) is only the size of X, which is the input space, which increases to km for (3).

The criterion for the quality of identification is usually the standard deviation of the output parameter y from the approximation model (approximation function):

$$J=\int\left[y-\tilde{F}(x)\right]^2p(x)\,dx, \quad (4)$$

where the function of the probability distribution density in the p (x) - X space is obtained.

Such presentation of the model is the basis of the method of fragmentation. In this case, the approximation model can be described as follows:

$$\tilde{F}(x)=\sum_{j=1}^{r}\varepsilon_j(x)\tilde{F}_j(x,a_j), \quad (5)$$

where $\tilde{F}_j(x,a_j)$ is the local approximation function in the Bj domains derived from the parametric class of the selected functions. In this case, the function (4) corresponding to the model being identified (5) is written as follows

$$J=\sum_{j=1}^{r}\int_{B_j}\left[y-\tilde{F}_j(x,a_j)\right]^2p(x)\,dx. \quad (6)$$

In this case, the problem of partial approximation of the identifiable model is brought to the solution of the problem of dividing the local models of all classes into classes where the sum of the squares of the evaluation neviazkas is minimal. In other words, it is necessary to find such vector parameters aj that the result (6) assumes a functional minimum value. In general, parameter r (number of Bj fields) should also be involved in minimizing criterion (6). However, for the criterion in Figure (6), such minimization gives a trivial, i.e., maximal possible result in terms of a valid estimation of the regression coefficients aj. Obviously, this situation does not correspond to the

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intuitive notion of the "optimal" number of fields. To solve the problem of identification (6) is to formally consider the functionality and apply some algorithm to minimize it. Image recognition and clustering methods are used to find division areas and local $\tilde{F}_j(x, a_j)$ approximation functions.

A variational approach is also used to solve the identification problem in data classification. For example, to develop a fractional approximation algorithm according to the functional approach (6), it is necessary to consider the first change of the functional δJ (6) and develop an algorithm that ensures that the necessary condition of the functional extremum J is satisfied: δJ = 0. predetermined (e.g., with expert advice).

The δ J variation is divided into two independent parts: δJ = δ1J + δ2J, where δ1J is the change in the aj characteristics of the local regressions; The variation of dividing δ2J – J into parts, i.e., along the boundaries of the Bj regions. Since the differences δ1J and δ2J are taken independently, the necessary condition for the functional extremum J can be rewritten as follows: δ1J = 0 $\cup$ δ2J = 0.

Without limiting the generality, we assume that r = 2, taking into account the conditions necessary to minimize the functional possibilities for a more concise formula presentation.

$$\int B_j \left[y - \tilde{F}_j(x, a_j)\right]^2 \nabla_{aj} \tilde{F}_j(x, a_j)\, p(x)dx = 0,\ j = 1,2, \tag{7}$$

$$\Phi(x, y) = \left[y - \tilde{F}_1(x, a_j)\right]^2 - \left[y - \tilde{F}_2(x, a_j)\right]^2 = 0,\ x \in \wedge, \tag{8}$$

where ∇ is the gradient operator, $\wedge$ is the fragment-smooth boundary of the surface separating regions B1 and B2, and F (x, u) is the discriminant function.

It is proposed to use an iterative procedure of the stochastic approximation type to solve the system of equations (7), (8) [8], [9], [10]:

$$\alpha_j(n+1) = \alpha_j(n) - sign\Phi\left[x(n+1), y(n+1)\right]^{\gamma} j(n+1) * \\ * \left\{ y(n+1) - F_j\left[x(n+1), \alpha_j(n) \right] \right\} \nabla \alpha_j \tilde{F}_j\left[x(n+1), \alpha_j(n) \right], \tag{9a}$$

$$\Phi\left[x(n+1), y(n+1)\right] = \left\{ y(n+1) - \tilde{F}_j\left[x(n+1), \alpha_j(n) \right] \right\}^2 - \\ - \left\{ y(n+1) - \tilde{F}_2\left[x(n+1), \alpha_2(n) \right] \right\}^2,\ j = 1, 2. \tag{9b}$$

For the discriminant function (8), expression $\Phi(x, y)$ cannot be used to predict this decision rule because it only contains a specific characteristic for a particular sample of observations. Therefore, the discriminant function should only be constructed as a function *f*(*x*) depending on the input characteristics.

To approximate the function *f*(*x*), teacher image identification algorithms can be used [7]. In this case, the observations (2) are used as a learning pattern, and the values of $sign\,\Phi(x, y)$ are taken as learning signals that contain information about where the point x is located: at B1 (if $sign\,\Phi(x, y)$ = 1) or at B2 (if $sign\,\Phi(x, y)$ = -1).

An iterative algorithm based on the potential function method can be used to approximate the function f (x) [7,11,12]. This algorithm and equation (9a) actually constitute a flexible piece approximation algorithm. Reforms aimed at ensuring the protection of human rights, improving the living standards of the population, ensuring freedom of economic activity, improving the material and procedural norms in the field of justice are leading to an increase in the country's international rankings and indices [13].

In particular, over the past 4 years, the country's Heritage Fund's Economic Freedom Index has risen by 52 points, the World Bank's Logistics Efficiency Index by 19 points and the Doing Business Index by 18 points.

Uzbekistan has risen from Group 6 to Group 5 in the Organization for Economic Cooperation and Development's "Country-specific Risk Classification" system.

The customs service of Uzbekistan has launched an interactive service "Integrated Tariff", the basis of which is the procedure for issuing permits, sanitary-epidemiological, phytosanitary and veterinary control documents required

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for foreign economic activity, import and export of goods across the customs border. restrictions and prohibitions, the rate of customs duties for each commodity, as well as information on tariffs and other measures of notarial regulation established by the legislation. The main feature of this interactive service is linked to the product code, in which the position of the product determines in the CN FEA. This system is not automatically integrated with the logical connection of "Marking and description of goods" with column 31 of the CCD and "Brand code" with column 33 of the CCD. This leads to misunderstandings and ambiguities in the procedures of customs authorities, foreign trade participants and declarants, as well as misinterpretation of laws and other regulations governing these issues.

Currently, the transparency of CN FEA codes, positions and names of goods is reflected in the international information and legal portal www.norma.uz. (https://static.norma.uz/raznoe/2017.pdf).

In the register of electronic interactive services for business entities, created on the official website of the State Customs Committee of the Republic of Uzbekistan www.customs.uz, there is a section "Preliminary decisions on the classification of goods by customs authorities." Article 374 of the Customs Code of the Republic of Uzbekistan (Transparency of Preliminary Decisions. Maintaining a Register of Preliminary Decisions on Classification of Goods) states that initial decisions on classification of goods are open information and must be provided to all legal entities and individuals without any restrictions upon their written request the State Customs Committee of the Republic of Uzbekistan shall maintain a register of initial decisions on the classification of goods and ensure its periodic publication.

This website contains only the CN FEA code and the full description of the goods in the register of initial decisions made by the customs authorities on the classification of goods.

III. RESULTS AND DISCUSSION

In classifying the brand characteristics of light vehicles of commodity position 8703, first, the primary data for customs purposes were built in Figure 2 and the technical characteristics associated with CN FEAin Figure 3 in their Matlab program based on automated model simulation modeling.

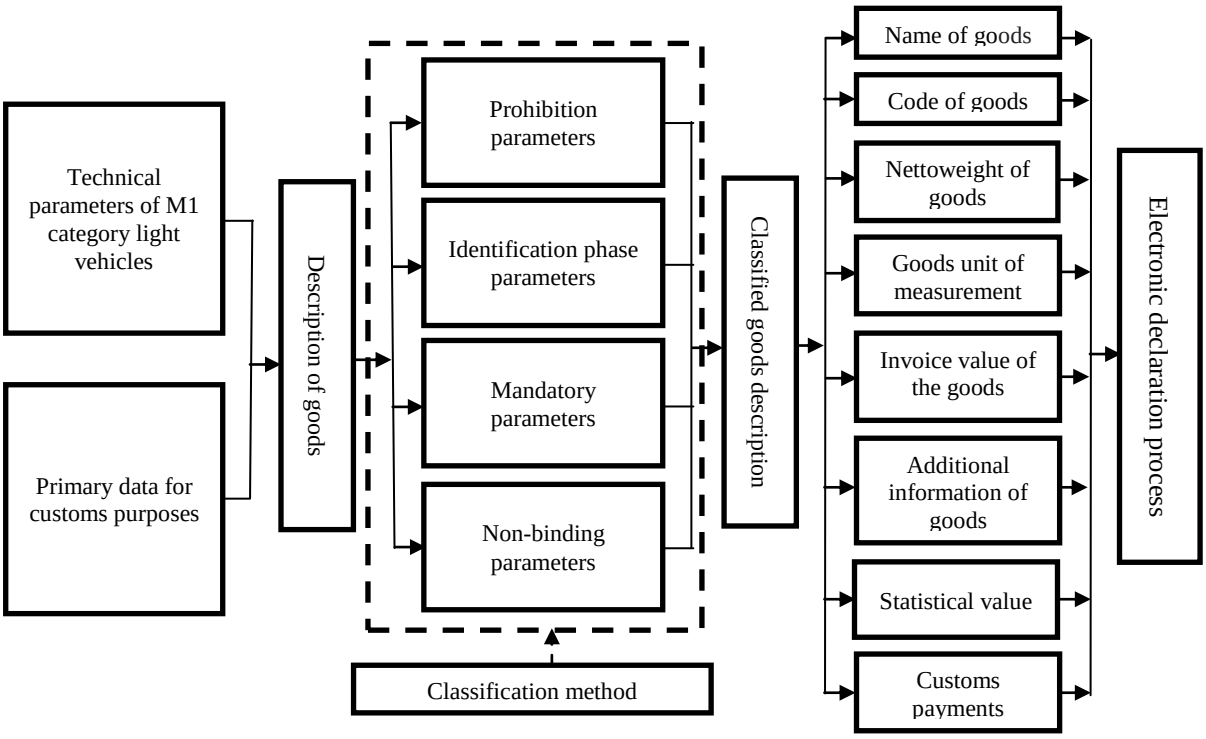

Figure-2.Commodity description of light vehicles for customs purposes

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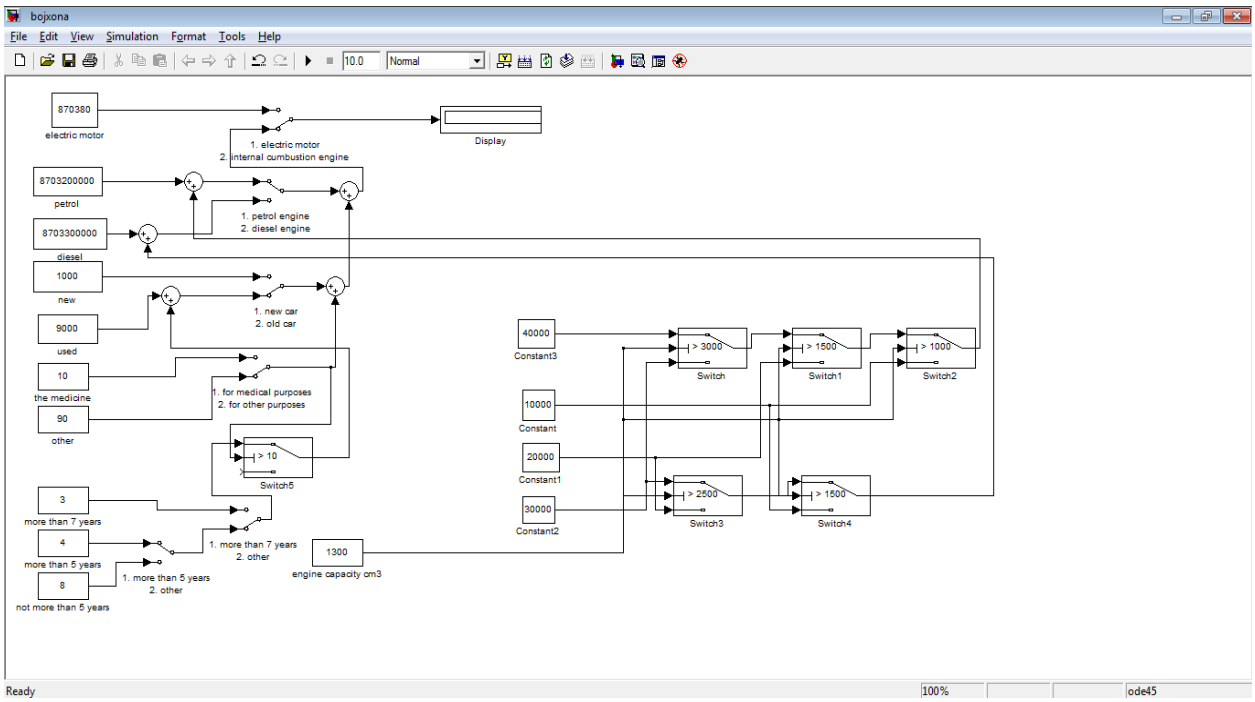

Figure-3. CN FEA 8703 Commodity position Automated model of light characteristics, mainly technical characteristics of light vehicles

In this case, the primary data in the section of product description in CCD, ie the category of passenger car, type of vehicle, manufacturer's name, car model. The above information of the vehicle is important in the automatic identification of the brand code according to the product description. Because the model database takes this information as primary data, it forms the database. This automatically displays the goods code and goods description on the CN FEA in a convenient way when we search for the brand, its name, the model manufacturer in the database. In addition, at the same time in the database, we will be able to quickly get information on the brand name, type, model, engine type, engine capacity through the manufacturer. This will lead to the formation of a brand name service in the future. In international practice, it takes some time to determine the brand code, depending on the nature of the product, its function, the field of application, as well as requires special knowledge for individuals and legal entities. It follows that the "Brand Name" service automatically enters the customs system.

IV. CONCLUSION

This model will provide practical assistance in improving the "Integrated Tariff" and "Preliminary package of decisions on the classification of goods by customs authorities" interactive services.
Therefore, various errors in the names of goods and CN FEA codes in the customs clearance process provide practical assistance to prevent not only the customs authorities but also FEA participants.

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