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THE FORMALIZATION OF THE ELECTRONIC DOCUMENT RAILWAY AUTOMATICS AND TELEMECHANICS ON THE BASIS OF SIMULATION MODELING

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Abstract:

The article presents the synthesis of a formalized view of the combined algorithms performing the similar technological functions in one member document in the sector of railway automatics and telemechanics, taking into account features of their structure. The method of combining algorithms is the introduction of additional attributive logical conditions. The model provides a reduction in the number of occurrences of the same type of operators, and logic elements in the algorithmic description of the process of technical documentation management

Keywords: railway automatics and telemechanics, technical document management, formal methods and models, the joint algorithm, the synthesis of the combined algorithms, the introduction of additional attributive logical conditions.

To automate the design and maintenance of technical documentation in the design organizations of Uzbekistan, foreign software packages are most often used.

As an industry-specific format, a format accepted by numerous users at the international level and used for data transmission over networks should be used. Its structure should not be tied to a specific development company, it should be simple and flexible.

In the field of maintaining and designing technical documentation, the main data storage formats are used, the DWG format is used.

The DWG format is an internal format of AutoDesk, Inc and is intended for storing mainly graphical information. Due to the wide distribution of AutoDesk products in the world market, this format has also become widespread. Many global software developers have provided the conversion of graphic data to this format.

However, along with the indisputable advantages, this format also has a number of disadvantages in light of the requirements for a universal format for storing and exchanging data, which should become the basis for a unified electronic document management system in the industry:

- The impossibility of making the necessary changes to the format, if necessary, arises from the fact that all rights to it belong to AutoDesk, Inc.
- AutoDesk, Inc reserves the right to make changes to the format without the consent of anyone. When this format is changed, the workflow system built on it with the use of application software may be disrupted.
- Lack of means of document verification. Verification means checking a document for its compliance with the standard.
- The absence of a description of the format as an integral part of the document makes it impossible to create verification tools.
- Poor suitability for storing non-graphic information.

The latter drawback forces the developers who have adopted this format as the main one to additionally use other means and forms of storing non-graphic information, which are often not only not standardized, but poorly or not at all documented. Non-graphic data can make up a significant, sometimes most of the documentation. And in this case, we can talk about the DWG format only as an integral part of the industry format. But the DWG format cannot be part of the industry standard due to the copyright ownership of AutoDesk, Inc.

Nowadays there is a lot of talk about DWG, which "supposedly" is the international standard for tasks of this kind. However, the developers themselves, who took this format as a basis, are silent about its insufficiency and thus tacitly acknowledge its inconsistency as a contender for the role of a universal format.

And only the focus on the products of AutoDesk, Inc makes it convenient for them to use the proprietary formats of this company.

Modern applications require a more flexible data presentation protocol than DXF / DWG, and mechanisms to define the structure of the document and describe the elements it contains. This requirement is met by the extended markup language - XML ("Extensible Markup Language") the specification of which was approved by the international organization W3C in early February 1998.

Today, in the field of CAD of railway automation, it is necessary to create and process an impressive amount of various paper and electronic documentation. It includes electrical schematic diagrams, wiring diagrams, schematic station plans, custom specifications, etc. The idea behind using XML for an industry standard is to standardize documents and present them in a uniform and computer-friendly format. All participants in the design and operation process are interested in this.

Examples of using XML as an interdepartmental standard for storing and exchanging data are the developed OTP specification - the Online Trading Protocol, which is an XML-based business transaction specification. CheckFree, Intuil and Microsoft have developed the OFX language, which allows using XML to securely conduct financial transactions on the WEB - Open Financial eXchange.

Understanding XML

XML is an abbreviation for the eXtensible Markup Language. In XML, data is represented as strings of text that include alternating inclusions of so-called markup to describe the properties of the data. The use of markup allows you to supplement the text with information regarding its content or form.

Markup is most often in the form of descriptors, which differ from character data (unlabeled text) in that they are enclosed in angle brackets. Therefore, a text string document consists of descriptors and character data that constitute the content of an element.

An element starts with a start descriptor and ends with an end descriptor that has the same name as the start descriptor. The ending descriptor must have a forward slash after the opening angle bracket to be distinguished from the starting descriptor.

The region of text from the start to end descriptor, including these descriptors, is called an element, for example:

<Building> EC Post </Building>.

A collection of elements with the same properties forms an element type. Element types are characterized in that the descriptors for those elements have unique names (sometimes called descriptor names).

Markup provides the ability to supplement a document with meta information (i.e. information about information) that describes its content and structure. Descriptors allow you to explain the character data contained within an element, the main building block of XML. Elements can contain other nested elements, sometimes called sub-elements. A document consists of a single, outermost element (the highest-level element) that contains other elements and / or character data. Each element / sub-element in a document contains an ordered collection of sub-elements interleaved with character data.

The structure of an electronic document is shown in Fig. 1.

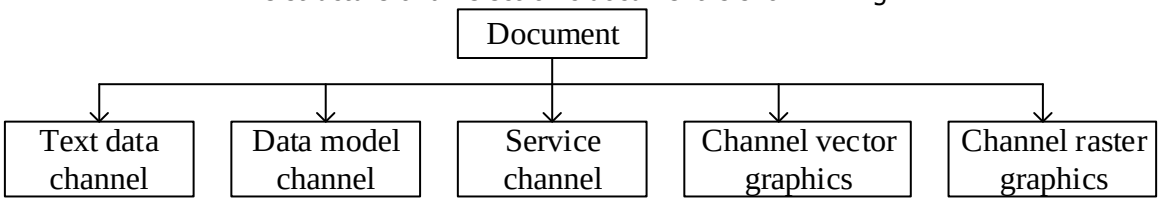

Fig. 1 Document structure

The data feed contains a tree structure of objects. Each object, in turn, can contain many parameters and subobjects (Fig. 2).

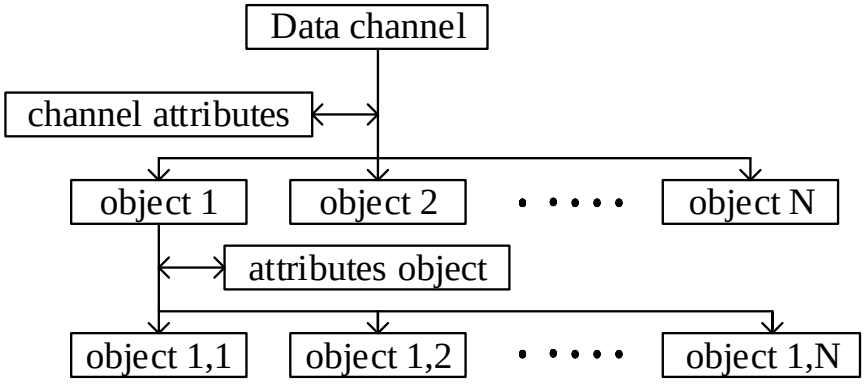

Fig.2. Data channel structure.

Elements can have so-called attributes. An attribute is a property of an element that provides additional information, for example:
<Ordinate Building = "40"> EC Post </Building>.
The following are some features of attributes and elements that allow us to make a conclusion about which of these ways of presenting information should be used in specific cases:

- Attributes provide the most essential data type checking.
- Attributes do not require a final descriptor and therefore take up less space.
- In a processing infrastructure, attributes may be easier to access and processing speed may be faster (because attribute processing, unlike inline elements, does not require iterative or recursive operations).
- By using the DTD document type definition, you can set default attribute values.
- Elements allow constraints on the structural content of data items.
- Elements can have multiple values, and attributes are limited to one value. Elements should be used when a collection of values is possible.
- Elements allow you to create nested structures. If it is necessary to describe the structure of any data position, then the only possibility is to use elements. Elements are also the best option if you need to describe the structure of a data element at a later stage.
- Items can be specified using a link. Therefore, if some content can be used simultaneously in several documents or in several fragments of a document, it should be presented as an element.
- Elements can include whitespace characters.
- It is easier to represent quotation marks in elements.
- Elements are more convenient for representing large values or binary components.
- Unique identifiers for data items are usually placed in attributes.

Attributes make the document easier to understand and can help make applications more efficient. An attribute is simpler than an inline element and can provide additional information such as data type and cardinality constraints. In addition, the attribute name provides another opportunity to show the purpose of this content in the context of an element.

A balanced approach is to use attributes for specific characteristics of the content, such as properties or important characteristics. Attributes can be used if the information they contain forms an integral part of the object represented by the element type, and inline elements are used if the object they represent has an independent existence. For example, attributes can be properties of an object, but cannot be parts or children of a modeled object. Attributes can also contain control information, such as names or unique identifiers, that you want to access without looking at inline elements.

The peculiarity of this language is that when using certain markup methods, the document remains accessible for understanding; in fact, introducing XML markup does not distort document information. The second feature of XML is that it can represent hierarchical (nested) information. Therefore, XML markup allows you to enter information about its content and structure into a document.

Key Features of XML

- structured;
- self-determining;
- expandable;
- adaptable to the viewer.

Let's consider each of these characteristics in more detail.

XML is a structured language specification. Good XML can be both well-structured and reliable at the same time.

As with SGML, a DTD (document type definition) is applied to XML documents to describe the syntax, grammar, and data structure of XML documents. The DTD also determines whether each of the elements you declare is required, optional, or conditional, and whether the parameter has a range of valid values, has a default value, or whether an empty tag is valid.

The DTD uses the XML parser to determine whether a document is well-structured, that is, it contains the well-defined start and end tags, and valid, that is, it fully conforms to the DTD. Disagreement is unacceptable, and even one single mistake will prevent the entire document from being processed. The lexical analyzer can automatically validate a document using an embedded DTD, using externally defined DTDs, using described business logic rules, or an externally defined set of processing commands.

One of the most significant advantages of such a structure is the ease with which you can determine the correspondence of document attributes to database structures or object hierarchies. This provides a reliable mechanism for transferring documents between a client renderer and a database, or various data exports between two databases, where the XML document acts as an intermediary. That is, we get the opportunity to use reliable means of extracting information from documents (lexical analysis). Without well-structured documents, one would have to lexically analyze the elements of a poorly structured document and check it against samples.

Another advantage of structuring is that XML is machine-readable documents. This allows different companies to automatically read information using a standard format. By using a DTD that describes the grammar of new elements in a document, you can even link different formats through a generic description. For example, design

documents such as a circuit diagram may contain data about connections and parameters of circuit elements, or other specialized data described as special DTD attributes.

Self-determination:

Another important inherent property of XML is the ability to use self-identifying information. Although XML documents do not require self-definition (they should only be well-structured). These descriptions, known as metadata (Metadata), can contain such information about the document as protection (who can read it), as well as - what the document is about, in what language it is composed, who is its author and other data.

Extensibility:

One of the main features of XML is indicated in its name - extensibility, i.e. the ability to develop and customize.

Adaptability to the viewer:

One of the new features of well-structured documents is that such data can adapt to different viewers. For example, since XML is a dialect of SGML, in theory, information could be transmitted directly in the format of a published book, assuming your publisher has a valid DTD. But beyond its various printing capabilities, XML provides the ability to adapt to differences in hardware and software and to the way the reader is perceived.

The software has the ability to view XML documents in discrete components. Customized XML applications further enhance the capabilities of the software. For example, CDF (Channel Definition Format) is a & QUOT; forced distribution & QUOT; content, and OSD (Open Software Description) allows software application upgrades, usually in conjunction with a DRP (Distribution and Replication Protocol) XML application, while defining the distribution hierarchy and unique byte identifiers using MD5 checksums.

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