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XML- FORMALIZATION OF THE TECHNIQUES FOR EXECUTION OF PARAMETERS MEASUREMENT

There had been suggested new method and software for automation of data processing according to existing techniques for execution of parameters measurement of water objects and solids applying unified XML-model.

***Key words**: XML, automation, techniques for measurement execution, water quality, soil quality, environment parameters.*

Specially elaborated and certified techniques for measurement execution (TME) are applied for carrying out measurements of environment parameters in laboratories. TME is a complex of procedures and rules, execution of which provides obtaining of measurement results with required accuracy. Certification of techniques of measurement execution – is a procedure for determination of technique correspondence with required metrological conditions. Processing of all soil and water parameters is labor consuming and requires automation [1].

Thus, elaboration of new method for the programme realization of automation process of measurement execution techniques of water objects and soil parameters, which provides automation and unification of calculations in order to avoid errors, made by enterprises and laboratories staff is actual.

To solve the set-up task it is necessary to elaborate new method for programme realization of the process of automation of measurement execution techniques, that would meet such requirements:

1) simplicity of usage;

2) minimum time of programme use training;

3) possibility to follow each step of calculation.

4) registration during calculation of all possible variants in accordance with normative documents.

Various typical techniques for measurement execution of soil and water parameters were considered , and it was revealed, that they not only specify the result of measurement calculation, but all necessary conditions, operations and means: list of measuring devices (MD), preparation process for measurement, measurement execution, conditions of its execution, intermediate processing of the results, errors, control of convergence, control of reproducibility, control of measurement error, control of calibration characteristic stability etc.

To solve the set-up problem unified format for TME description applying the XML technology and new algorithmic approach were elaborated.

The base of the suggested method is structural description of TME as integrated information package, including all necessary for automation of measurement procedure execution. Each file of TME description contains formalized description of corresponding parameters:

- water categories, TME type, measurement units;
- connections parameters with index and MD;
- error ranges;
- variants and formulas for result calculation;
- table sample for calibration characteristic.
- Each TME is shown as separate file in XML-format with set-up structure and elements.

At the expense of this the following functions are provided:

- transfer of TME data between different information systems;
- cross-platforming of TME description;scale of TME description, if it is necessary to expand its functionality;
- possibility of saving of all information, which is necessary for realization of TME, in one file;
- possibility of usage of hyperlinks to other information sources (reference books, instructions, normative documents etc);
- possibility of TME upgrading applying automatic or manual mode without interference in programme codes;
- independence of TME description from programme code and data structure modifications.

According to elaborated method all TME parameters, which are necessary for realization of automated computations, are suggested to arrange in one hierarchial structure, which is self-sufficient (Fig. 1). This structure is stored in XML format and executes functions of TME formalized description, suitable for programme processing.

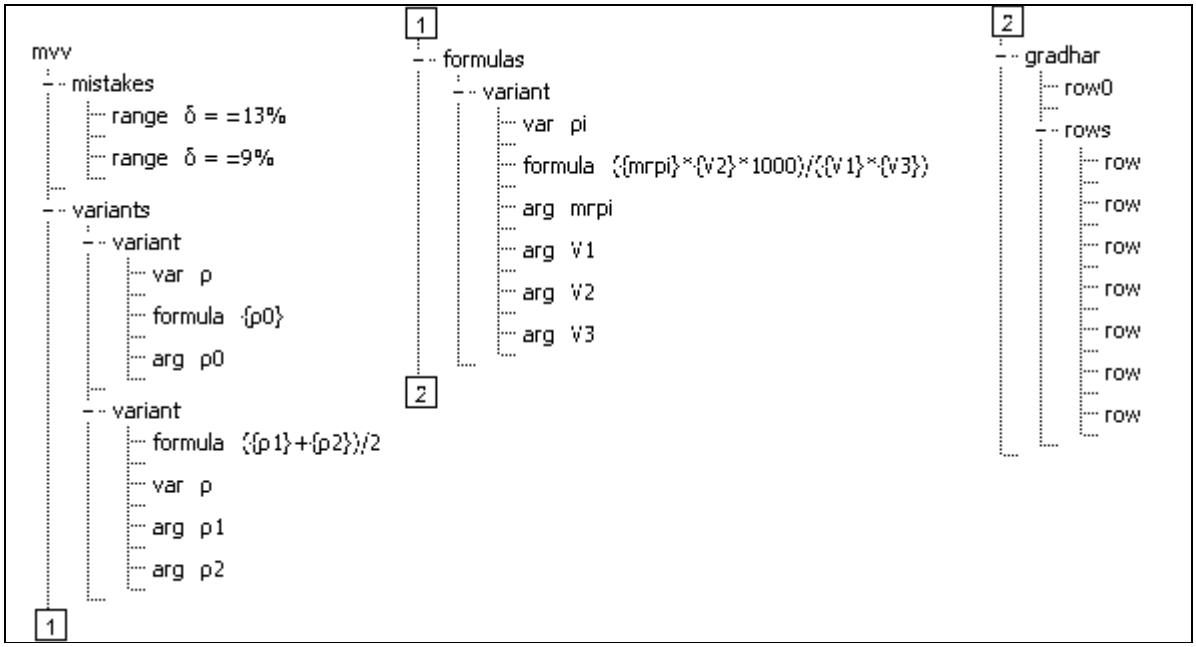

Fig. 1. Structure of XML- description of TME № 081/12-0108-03

Such basic elements of XML-description and their designations are suggested [2, 3]: <mvv></mvv> root element, attributes of the element have designation:

type="w" – type of technique application ("w" – water and discharges, "g" – soils and waste products);

id_mvv="372" – TME code in the register of automated control system (ACS);

alias="MBB № 081/12-0108-03" –technique code;

title=" Technique for measurement execution of mass concentration of carbon bisulphide applying extraction and photocolorimetric method " – full name of TME

" –id_factor="76" – index code to which the technique is applied;

factor=" Carbon bisulphide" – factor name;

id_main_zvt="1" – code of measuring engineering facilities (MEF) by ACS data, used for measurement;

main_zvt="BasicMEF for TME" – name of MEF;

id_tip="19" tip=" Photocolorimetric" – code and type of measurement method;

id_unit="6" unit="mg/aliq" – code and name of unit of measurement result;

cat_vod_bin="13" cat_vod=" surface, underground and reverse" – mask-code and name of waters categories;

doc="MBB 081-12-0108-03.doc" – title of normative TME document file;

default_variant="1" –default variant of computation;

result="(±δ), %; P = 0,95; n = 2" – parameters of result accuracy ;

tochn="3" – type of measurement result rounding-off ;

need_n_measuring="2" – necessary quantity of parallel measurements;

<mistakes></mistakes> – section of TME error description, contains description of measurement ranges and data for error computation;

<range></range> –error of measurement range as a text equivalent (δ = ±13%), element has parameters:

num="1" –range number;

min="0.2" max="2.0" alias="0,2-2,0" – range limits of measurement and their text representation;

id_tip="0" tip="relative (δ, %)" – code and type of error;

precision="3" –accuracy of result's rounding-off;

cat_vod_bin="13" cat_vod=" surface, underground and reverse" mask-code and name of water categories;

formula="" – formula of error computation (if necessary).

Each TME may have several variants of computation. To take into consideration this aspect all possible variants are described in the section <variants></variants>, that contains elements <variant></variant>, that describe the designations of the result (<var>), formulas of final computation (<formula>) and their arguments (<arg>).

Results of intermediate computations for their parameters are used in formulas of final computation. Formulas of intermediate computations are described in the section<formulas></formulas> by analogical principle.

Storage of TME formalized description in XML format enables by programming means to use this structure as separate programming object, its functions are realization of corresponding computations by TME, determination of corresponding errors , control of input data, description of the obtained results etc.

Software was elaborated for the suggested method for automation of measurement execution of water objects and soil parameters. Fig. 2 shows general view of program tool for setting by the user of prepared XML-formalized techniques to input data, required for automatic computation by corresponding TME. Such setting should be executed during the fist XML-formalization of TME, further the process of data processing automation by that TME will be significantly accelerated and simplified.

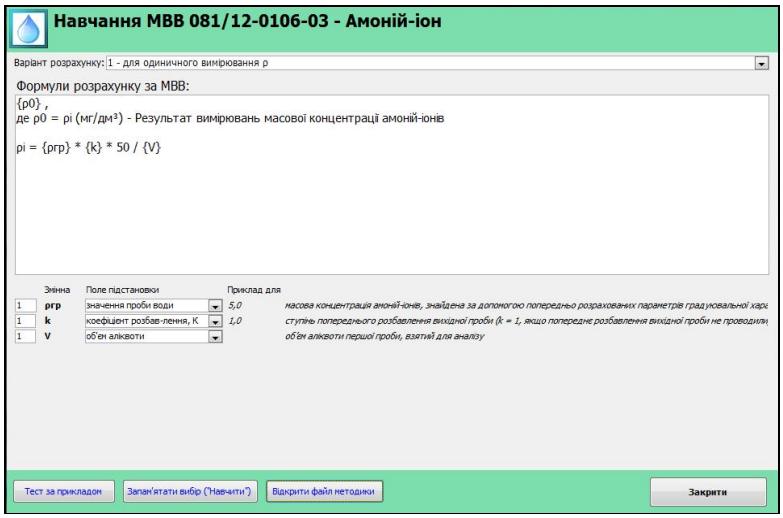

Fig. 2. General view of XML-formalization editor

During 2005 – 2009 with authors' participation unified automated system of State Ecological Inspection and subdivisions of analytical control of territorial organizations of Ministry of Environment was created in Vinnytsia National Technical University. It obtained measurement results of environment pollution, emissions, discharges and waste, its accumulation, processing and analysis (ACS «EcoInspector»; also called – «automated system of control» – ASC «EcoInspector»). ACS "EcoInspector"has three main subsystems: "Water and discharges", "Soils and waste" "Emissions". The suggested technology is used in it for description formalization and automation of TME data processing [1, 2].

Applying this method XML-formalization of more than 20 techniques was performed, now they are used in all regional branches of State Ecological Inspection of Ministry of Environment. In ACS «EcoInspector» TME is calculated in accordance with formulas, set in TME file directly in the form "Journal of Measurement Results" in background mode and does not require separate interface. In case, when it is necessary to establish dependence on data of "Journal of Measurement Results" form, then appropriate form (Fig. 2) will be opened, enabling to set correspondence between journal data and TME.

Computation in accordance with set-up dependences is performed after pressing the button" Test by example". Normative document, describing TME is opened after pressing the button "Open technique file". Techniques of measurements were realized using this principle.

Conclusions. New method of data proceeding automation according to current techniques of measurement execution (TME) of water objects and soils parameters,

which is distinguished from existing ones by new unified structure of TME parameters and means of their automated proceeding applying XML-format is suggested.

Special editor for XML-model identification for each TME and means for automation of computation realization on the base of that model are elaboratrd.

This method and software were successfully tested and implemented in State Ecological Inspections in most of regions of Ukraine and in State Ecological Inspections in cities of Kiev, Sevastopol, and Autonomous Republic of Crimea.

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