SECINĀJUMI

1. Veikti govju asins plazmas brīvo un piena aminoskābju dinamikas pētījumi Latvijas Brūnās šķirnes govīm laktācijas gaitā, kuri var tikt izmantoti kā orientējošs tests zinātniskajos izmēģinājumos.
2. Brīvo aminoskābju līmenim slaucamo govju asins plazmā laktācijas periodā bija tendence palielināties, bet piena aminoskābju daudzumam tajā pat laikā tendence samazināties.
3. Dati par piena aminoskābju sastāvu var tikt izmantoti, lai veiktu Latvijas brūnās šķirnes govju piena tehnoloģisko novērtēšanu un tā piemērotību pārstrādei dažādos piena pārstrādes produktos.

LITERATŪRA

1. Jemeļjanovs A., Miculis J., Ramane I., Konosonoka I.H., Kaugers R. and Vitina I.I. (2004) Development of organic livestock production and certification in Latvia // Organic livestock farming: potential and limitations of husbandry practice to secure animal health and welfare and food quality: Proceedings of the 2nd SAFO Workshop 25-27 March 2004, Witzenhausen, Germany.-p.183-191.
2. Joņins V., Mičulis J. (1999) Dažādi piena kvalitāti ietekmējoši faktori // Latvijas lauksaimniecības zinātniskie pamati:zinātniskā monogrāfija.-[Jelgava]:LLU, 7.143.-7.150.lpp.
3. Harper A.E. (1983) Some recent developments in the study of amino acids metabolism // Proc. Nutr. Soc.- Vol.42, N3-p.437-447
4. Mičulis J., Neilands J. (1997) Comparative evaluation of blood free amino acids level for Latvian Brown and Holsteins Breed cows // Proceedings of the 3rd Baltic Animal Breeding Conference, Riga, Latvia, 3-4 April.-p.114-115
5. Stein W.H., Moore S. (1954) The free amino acids of human blood plasma // J.Biol.chem.-, Vol.211.-p.915-926
6. Verbeke R., Peeters G. (1965) Uptake of free plasma amino acids by the lactating cow's udder and amino acid composition of udder lymph// Biochem.j.-Vol.94, N1.-p.183-189

DEVELOPMENT OF INTELLIGENT TECHNOLOGIES FOR CONSUMERS' PROTECTION IN THE FOOD MARKET

INTELEKTUĀLO TEHNOLOĢIJU ATTĪSTĪBA PATĒRĒTĀJU AIZSARDZĪBAI PĀRTIKAS PREČU APRITĒ

Moskvin Gennady, Spakovica Evelina, Moskvin Artyom
Tehniskā fakultāte, LLU, Latvija
Faculty of Engineering, LUA, Latvia
logicor@aldems.lv

ABSTRACT

Industry analysts expect that as regulations pertaining to testing of food and agricultural products continue to be adopted, the shift toward rapid-screening methods will continue. The overall product testing industry is growing steadily. The biosensor industry too is growing. Identification, assessment and conformity control of agricultural products, intellectual compatibility of measuring processes and functions of the "compensating stage" can be taken over by the cognition subject with its intellectual apparatus, which adds to the possibilities of applied investigation methods. The research contains the fundamental scientific problem of elaboration of expert and Artificial Intelligence (AI) system in the field of agriculture. On the basis of results of experimental researches and modeling of "intellect of consumer" was developed new conformity assessment

methods, based on principle of geometrical similarity of metrical images, also compact, low- cost electronic device “artificial tongue”.
KEY WORDS: food safety, consumers’ protection, quality assessment.

INTRODUCTION

For years, engineers worldwide have been working to develop mechanical systems that can mimic the human senses of smell, sight, and taste. The quest began 30 years ago with the creation of mathematical algorithms that emulated the brain’s method of processing information. Since then, intelligent systems that can sense, make decisions, "learn" and adapt have been successfully developed. Now, recent advances in technology have allowed these devices to become smaller, "smarter" and less expensive. The global scientific community has acknowledged research on an artificial tongue sensor for consumers’ protection. E-tongue, E-nose is expert systems for automatic analysis and recognition (classification) of liquids or gases, including arrays of non-specific sensors, data collectors and data analysis tools. Electronic tongues are used for liquid samples analysis, whereas electronic noses- for gases. The result of artificial tongue and artificial nose can be the identification of the sample, an estimation of its concentration or its characteristic properties. This new technology has many advantages. Problems associated with human senses, like individual variability, impossibility of on-line monitoring, subjectivity, adaptation, infections, harmful exposure to hazardous compounds, mental state, are no concern of it. Synonyms of an electronic tongue: artificial tongue, taste sensor. Synonyms of an electronic nose: artificial nose, olfactory system (for example, Odor scanner Headspace HS100). The principle of e-nose or e-tongue systems can easily be compared to the human perception as strong similarities are observed. The electronic e-tongue or nose gives either a simple answer like recognized, “good”, or “bad” or a more sophisticated response such as odor intensity or a molecule concentration. The main difference e-tongue is that the system analyses a liquid matrix. So the sensors are immerged directly into the liquid or into others mediums. In the most generic sense, quality refers to the combination of characteristics that are critical in establishing a product’s consumer acceptability. In the food industry, this is usually an integrated measure of taste, purity, flavor, texture, color, appearance and workmanship. In a highly competitive market, other criteria of quality can be “value” or a consumer’s perception of the worth of the product based upon the funds available for consumers on all traceability stages of quality.

The measurement and evaluation of quality is a complicated affair. Most organizations employ professional technicians to carry out his task, but this has not always been the case. In the past, many companies assumed that the quality of their raw materials could be guaranteed simply by paying the highest prices. However, this did not prove to be very reliable and almost all firms now use various analytical methods for quality determinations. Recently in agriculture for quality control of agricultural products are even more often applied biosensors. The biosensors industry is new but growing. The market is comprised of four segments-medical, environmental, food, and military. Ninety percent of sales come from glucose-detecting biosensors for medical applications. The market is generating a need for pathogen detecting biosensors across all segments [1].

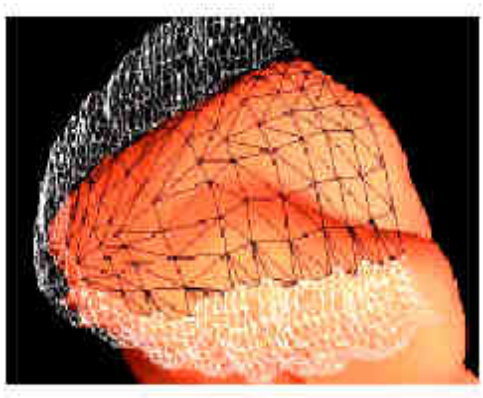
Quality control ensures that raw materials meet set standards, processing methods perform as designed, finished products meet company standards, and consumer confidence in the company remains high. Problems arise when there is disagreement on what is actually required to ensure safety. Another important area of standardization relates to the information presented to the consumer [2,6]. There may be some disputes arising out of a culturally based philosophy regarding the role of food in the diet. In this case it is not the product itself, but rather its description that must conform to a particular standard.

Much effort has been devoted to harmonizing labeling information and very large market segments do have common requirements. Some societies traditionally confer great

health benefits to certain foods while others may not. This may lead to health claims that are allowed in one country and not another. An organized industry association in order to establish a reliable identity for a particular product sometimes establishes industry standards. The overall food product testing industry is growing steadily [2]. Sales of artificial tongues, electronic noses and vision chip in 1998-2003 can see on the table 1, main principles of applied sensing methods - on the table 2.

millions-$	1998	2003	AAGR %
Electronic nose	14	20	7.4
Vision chip	8	21	21.3
Artificial tongue	0	2	NA
Total	22	43	26.7

a



b

Figure 1. **Sales of artificial tongues, electronic noses and vision chips in 1998-2003 (a) and sensing model of artificial tongue (b)**

1. attēls. **Elektroniskas "mēles", "deguna" un vizualizācijas sensoru pārdošanas apjomi 1998.-2003. gados pasaules tirgū (a) un "mākslīgā mēles" modelēšana (b).**

a

E-tongue	**E-nose**
•Potentiometric sensors •Measurements of conductivity •Voltamperom-metry •Optical sensors •Biosensors •**AFM-Resonance (LUA)**	•**Conductivity sensors** •MOSFET (Metal-oxide-silicon field-effect-transistor) •CP (Conducting Polymer) •**Piezoelectric sensors** •QMB (Quartz Crystal Microbalance) •SAW (Surface Acoustic Wave) •**Optical sensors**

b

Figure 2. **Intelligent instruments (a) „artificial tongue" (LUA) and applied sensing methods (b)**

2.attēls. **Inteliģenti LLU instrumenti „mākslīgā mēle" (a) un pielietojamas sensoru metodes (b)**

There is growing recognition of toxins as health risks, especially in grains and fish - seafood, which are two fast-growing food categories because consumers perceive them as healthful. Sales in the US for pathogen, pesticide and GMO products combined used by food processors are projected to increase from $149.5 million in 2000 to $239.4 million in 2005 at an AAGR (average annual growth rate) of 9.9%. The pathogen specific testing market is

expected to grow for all segments at a compounded annual growth rate (CAGR) of 4.5% with a total market value of $563 million by 2003 [2].

Development of intelligent technologies for consumers' protection in the food market

Intelligent techniques for measuring human sensory response to food texture have been undertaken since 1980s by Boyar and Kilcast, Moskvin [3], Shmulevich et al., Sakamoto et al., Kohyama et al., to study relations between physiological and sensory testing of perception. Since the half of the eighties the technological mimic of the main functions of human olfaction became possible. Since that, an increasing number of researchers have dedicated their efforts to improve the original idea pursuing the fabrication of electronic tongue. Practical applications, in a wide number of cases, appeared in the literature, and in the nineties some companies have introduced the electronic tongue technology to the market. Recently in food industry and in agriculture for quality control of agricultural products are even more often applied sensors. Much research was done in order to find new and more diverse sensors, and to date there are several companies offering ready-to-use electronic tongue [4-6]. Historically first instrument with artificial intellect was built in Latvia Agricultural University 18 years ago under supervision of Prof. G. Moskvin [3]. It was artificial tongue - device based on couple of electrodes and signal generating - signal recognition parts. For ages, the human tongue has been an important tool in assessing the quality of many products, food and agricultural products being good examples. While all others parts of production processes, including these of the food industry, were getting more and more automated, there was still no "objective" means for using the "subjective" information confined in the taste of products. This changed in 1988, when Prof. G. Moskvin introduced the new concept of an electronic tongue [3, 9, 12]. The "artificial tongue" (AT) ES and AI device is an electronic intelligent instrument, which consists of data acquisition and data analysis systems.

Analysts expect that as regulations pertaining to food and agricultural products testing continue to be adopted, the shift toward rapid nonconformity assessment methods will continue. Normally such standards become effective because the majority of producers agree to them. They are seldom related to safety, but more to a characteristic quality, which the industry feels is useful to establish credibility for the market. These standards are commonly referred to as commodity standards or standards of identity. Many measuring devices usually consist of two functional knots: primary sensing element (measuring transducer) and registering device. Sensing element usually has electric exit signal and further processing measuring information is completed by using different electrical schemes, mainly, of an analogous type. As to functional opportunities, preciseness and signal stability, the processing of digital data has significant preferences [3].

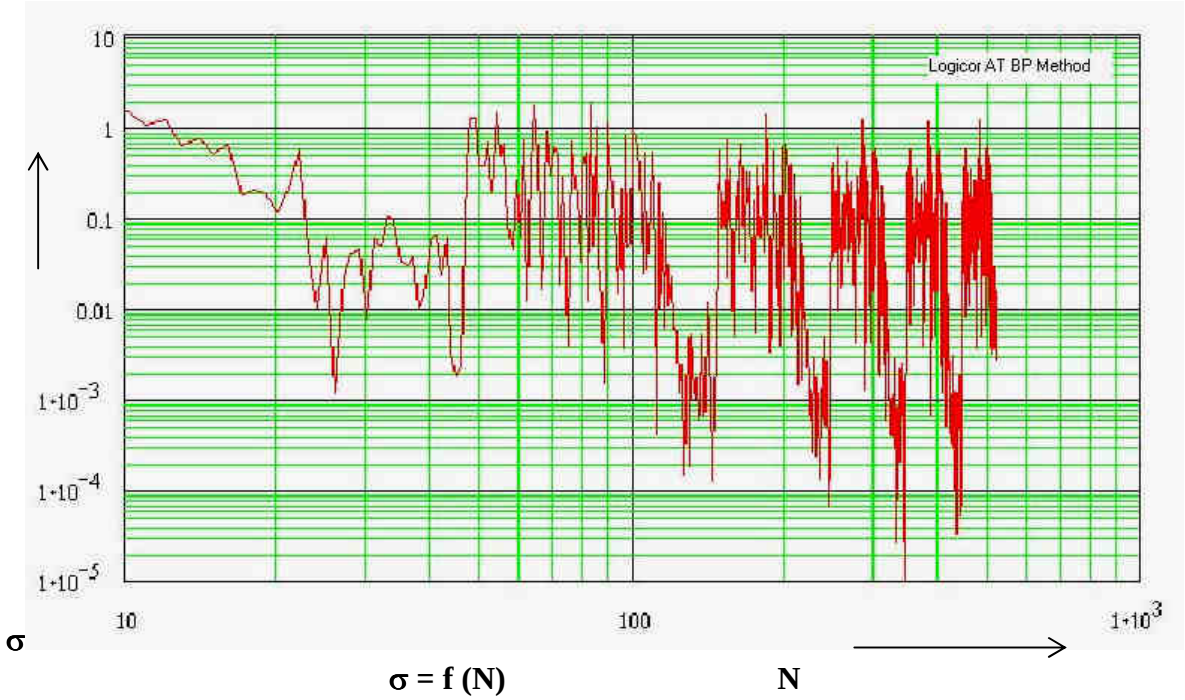
The presence of microcomputer in the measuring channel allows by use of special testing programs and errors back propagation algorithms to carry out identification experiment of measurable medium with help of intelligent complex making use of definite physical effects [3, 8, 9]. Automatic identification of the critical control points should be determined in all the stages of food production starting with the obtaining of raw materials or the production of component parts up to their marketing. Therefore, firstly, during the technological process a precise, safe, operative and objective information flow has to be established throughout all the production stages.

The solution of this problem is hindered by the lack of such measuring devices and suppliers which during testing, regulation and control of technological process parameters systematically, energetically, constructively, informatively, exploitatively and, what is most important, metrologically could be joined not only to the control systems but also to technical and measuring devices in real conditions. Just in such way can be explained the world tendency towards the "intellectualization" of measuring devices and sensors. In industrial

production there are no analogous for such agricultural and food products properties as stochastic and not uniform flow of materials and informative resources, significant changes of their properties and quality in time, presence of inertia in the communications with a bionic system. The above said does not allow applying the traditional methods and means in the control of technological processes and in the food production processes. The situation is worsened by the low technical level of the existing suppliers and devices used in agriculture and, in the first place, their preciseness and credibility. Theoretic investigations prove that sensors lag behind the development of food and other technologies therefore all over the world intensive financing is observed just in the field of technical progress.

METHODS, MATERIALS AND THE MAIN RESULTS

The electronic tongue or nose system performance is dependent on the quality of functioning of its pattern recognition block. Various techniques and methods can be used separately or together to perform the recognition of the samples. After measurement procedure a preprocessing block transforms the signals. The results obtained are inputs for Principal Components Analysis (PCA), Cluster Analysis (CA) or Artificial Neural Network (ANN), also Amplitude- Frequency Resonance (AFM) and "Chernoff faces" pattern recognition methods and algorithms [7, 8, 10, 11]. Research was focused on the development of classification algorithms. The multi - sensor system utilizes an imaging system, an impact sensor, a sensor of electroconductivity (constant and alternating current), an electronic chronometer for determination of relaxation time **(T_{rel}),** an ultrasonic sensor, a gauge for measuring electrical resistance **(R_a),** a force gauge (using as an electronic penetrator) and an measurement device - artificial tongue. Various ANN's were trained using back-propagation (BPA) and back-transformation (BTA) algorithms.



σ = f (N)

Figure 3. **Testing the back propagation algorithm (BPA) by means of LUA artificial tongue "Logicor AT" , σ = f (N)**

3.attēls. **BPA algoritma izpēte izmantojot LLU "Logicor AT" elektronisko "mēli".**

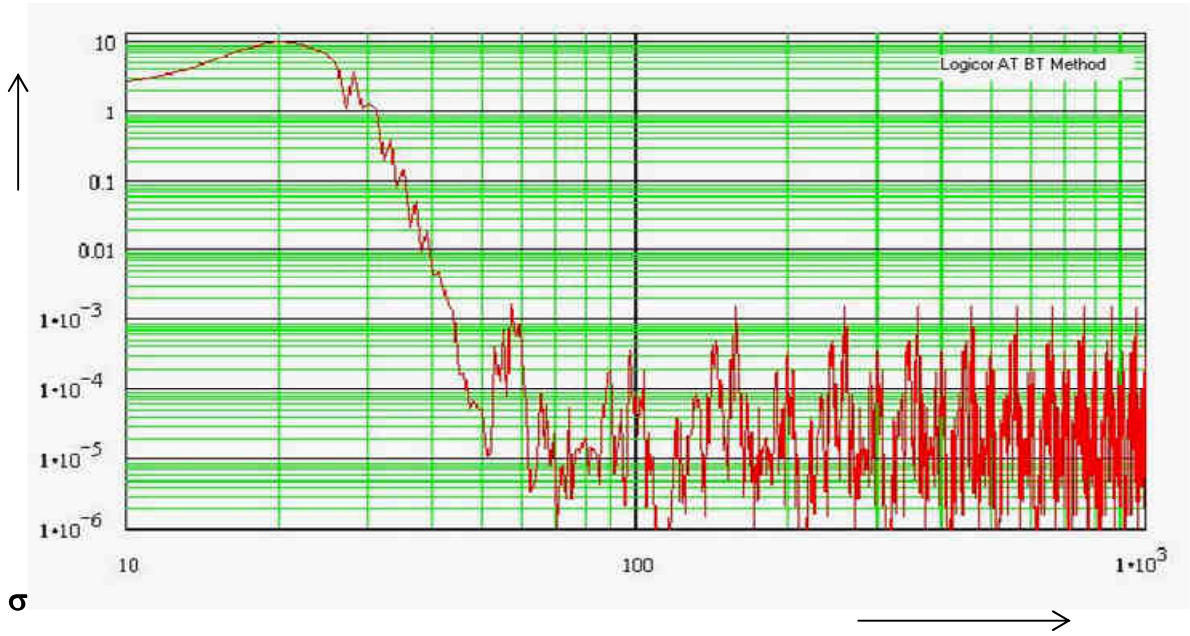


Figure.4. **Testing of back transformation algorithm (BTA) by means of LUA artificial tongue "Logicor - AT", σ = f (N).**

4. attēls. **Atgriezeniskās transformācijas algoritma (BTA) izpēte izmantojot LLU elektronisko "mēli" "Logicor - AT", σ = f (N)**

Further on "reference" functions of the influence factors are determined and feedback algorithm is synthesized in the form of ANN "self-learning" programs. For the estimation of error of tested algorithms was used standard deviation function **σ = f (N).** A result of compared testing of back propagation (BPA) and our back transformation (BTA) self - learning algorithms for artificial tongue "Logicor AT" on Figure 3 and on Figure 4 is reflected. The number of hidden neurons in three layers models with sigmoid, hyperbolic tangent and secant transfer varied functions. After training the ANNs, the performance of ANNs was discussed. Optimal configuration model was selected from 12 ANN configurations based on the standard deviation of mean absolute error. "Behavior" factor analysis of the object of interest has to be considered at the basis of the second type of bionic models.

The overall quality of food is not a linear combination of all measurable quality parameters. This presents major problems as to how these measurements should be combined to quality indices and grading decisions. The quality of food is a combination of numerous parameters such as: firmness, acidity, bacteria, aroma, color, color uniformity, taste, odor and other quality conformity parameters. In the most generic sense, quality refers to the combination of characteristics that are critical in establishing a product's consumer acceptability. In food industry, this is usually an integrated measure of taste, purity, flavor, texture, color, appearance and workmanship. In a highly competitive market, another criteria of quality can be "value "or a consumer's perception of the worth of the product based upon the funds available for the consumer. This is true for all stages of quality's traceability - from environment to home.

The main parameters are specific to the individual product. Thus, the concept of this work is to develop a system that can classify product based upon several parameters (for example - vision, taste, firmness, smell and weight) by using multi-sensor data acquisition. The use of E-tongue involves 3 phases. The learning phase - after establishing number of neurons, layers, type of architecture, transfer function and algorithm, network is forced to

provide desired outputs corresponding to a determined input. It is made by adjusting the "synapses" weights in order to minimize the difference between desired and current output [7]. The validation phase - verification by means of different data with similar characteristics from data, used in the learning phase. The production phase - in which the network is capable of providing outputs corresponding to input. Despite the numerous techniques developed for destructive and non-destructive evaluation of quality, for example of fruits and vegetables, quality sorting is still primarily based on manual decisions and manual work. Preliminary experimental determination optimal $\mathbf{K_{ind}}$ for the standard apple is shown on Figure 5.

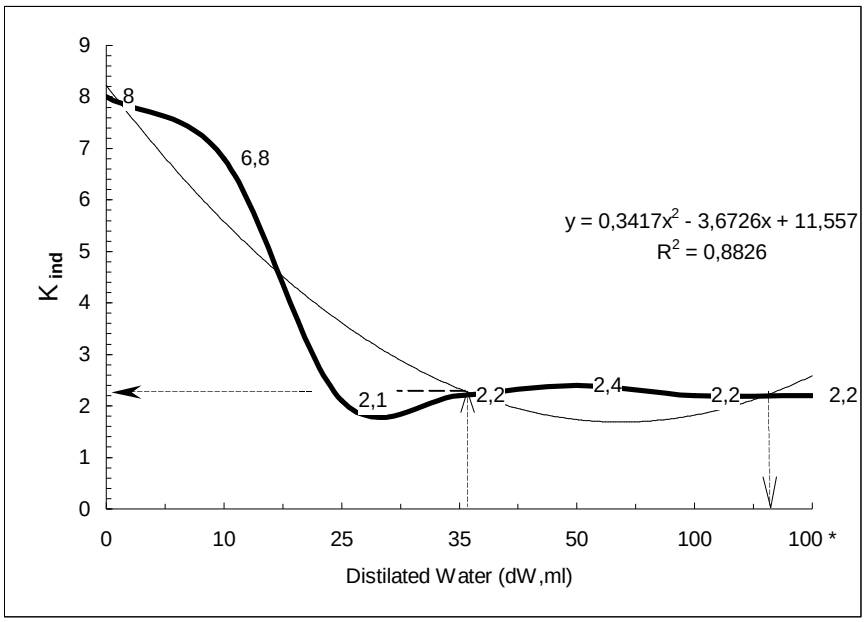


Figure 5. **Determination optimal K_{ind} for the standard product (here the apple) with add to sample 35 ml distillated water, K_{ind} = f (dW); A_s = 1,0…5,0 dB; F_{ind} = 7,0 kHz; dW =100* after waiting 40 min.**

5.attēls. **Testējama produkta optimālā identifikācijas koeficienta noteikšanas piemērs pie "Logicor AT" testera iestatītiem signāla parametriem K_{ind} = f (dW); K_{ind} = f (dW); A_s = 1,0…5,0 dB; F_{ind} = 7,0 kHz; dW =100* fiksēts pēc 40 min. Produkta proves optimālais koeficients K_{ind}=2,2 noteikts pie dW= 35 ml.**

The main results of preliminary experimental research prove that quality and conformity control of agricultural products and raw materials can be determined by fractal geometry methods by using the intelligent artificial tongue "Logicor-AT" [4, 8]. The peculiarities, conditions and specifics of food production require elaborate simple, safe, inexpensive and precise electronic conformity control devices. The elaboration of such devices is control systems for the quality of food and other products - is the decisive factor in operation of the conformity. Too the quality conformity assessment and respectively the risks in the rapid alert system in the chain of agricultural production can be easy detected by method of fractal geometry, Figure 6 [4-5, 8]. Techniques and criteria for training sets for the classifier were developed in such a way that only about 150 dates was needed to achieve good conformity classification resulting in 88 % of correct classifications for objects that were tested at different dates. A classifier that was trained can achieve 88% accuracy in the same classification. The presence of a microcomputer in the measuring channel allows the use of special testing programs carrying out identification experiments of a measurable medium using definite complex of physical effects (AFM, ultrasonic, electroconductivity, relaxation time of resistance and other parameters, which good correlated with mediums' properties)

[8,9]. The multi - sensor system that utilizes an imaging system, an impact sensor, sensor of electroconductivity constant and alternating current, electronic chronometer for determination of relaxation time $\mathbf{T}_{rel}$, an ultrasonic sensor, gauge for measuring an electrical resistance $\mathbf{R}_a$, force gauge, and an “artificial tongue” measurement device. In general, it allows improving scientific knowledge’s on the basis of informative service and quality control programs and guaranteeing legal protection of interests and rights of each consumer. The research on “consumer intellect” models is carried out through the synthesis of the non-traditional “watch – fractals” conformity method by using low- cost, risk assessing intelligent instruments.

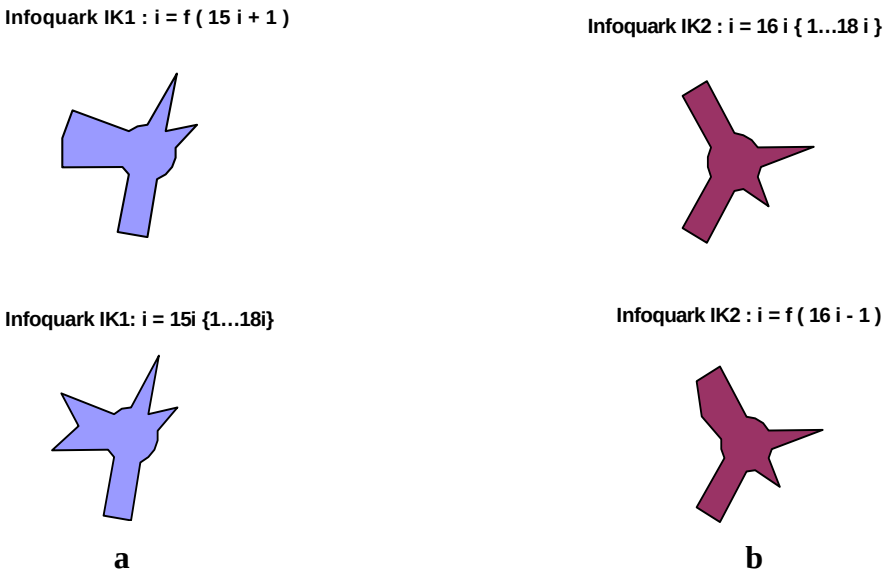


Figure 6. **Two examples of conformity control of tested producēts(a and b) by use of fractal geometry images (infoquarks IK1, IK2)**

6.attēls. **Divu testējamo produktu (a un b) atbilstības kontroles piemēri ,pielietojot fraktāļu ģeometrijas tēlu metodi (infokvarku izlases IK1, IK2)**

Preliminary interrogations of consumers show positive relation of consumers to new possibilities for the protection of their health, rights and interests. The main results of experimental research prove that quality and conformity assessment of agricultural products and raw materials can be easy determined by new conformity assessment method by use of intelligent sensor “artificial tongue”, based on use principle of geometrical similarity of metrical images [4, 12].

DISCUSION

Subsequently, the real "organisms" of AI systems can be expressed by means of the accepted conditioned standard of the perceptual model (experts’ knowledge). Besides, the most significant AI "biological" features remain. It can be said also in other way: real AI organisms are "the projections of the initial AI organism" designed by experts-theoreticians, models on in reality existing organic reason forms. Internal motivation of biological systems to self-organizing, reasonable by anti -chaos theory, can be used for the control of their quality that is for definition of conformity of biological system or physical mediums to parameters of an optimality, which is determined to quality of agricultural products. Internal intention of bionics systems to motivation and to structure it is important internal engine of process of search of an optimality of biological system. Such biological system itself continuously forms individual metric co-ordinates "space - time., selected space - measure and required "speed" of time for the conformity control, obtaining of needed useful information, for the modification and its processing by means of application of "artificial" or

"natural" intellectual tools [10-11]. Such motivation makes the identification process all embracing, core-aimed. This process never is local, but is global. Harmony degree of a external test influence on the researched biological medium can be estimated by methods of functional systems according to preservation of afferent principle. In bionic systems such harmonious approach in strategy of measurement and assessment of useful medium's properties allows to allocate such set of key test signals, which does not contradict to preservation of afferent principle [6, 8, 9].

Agricultural production peculiarities, conditions and specifics require elaborating simple, safe, inexpensive and precise conformity control electronic devices. Elaboration of such suppliers is the decisive factor in the quality of food and other products conformity control system operation. Intelligent sensors can essentially perfect the whole control system due to the increase of preciseness and a rational processing of signals received from the sensory element. Such existence problem of a measuring device and a sensor is the problem of a precise control of production processes, the problem of consumer's provision with qualitative food products, efficiency problem of any production. Therefore it is topical to design new generation conformity control measuring devices with the application of new fractal methods, which can effectively work under changing operation regime of equipment's, as well as adopt themselves to definite agricultural and food technology processes with not systemized parameters and not formalized requirements in real exploitation conditions [9]. One of the development directions can be the elaboration of rapid control law-cost conformity control electronic devices with "Artificial Intelligence" (AI) elements, which continue the development of microprocessor technique technology. Such intellectual suppliers have "artificial tongue" sensible sensory elements in form of measurement transducer with digital or analogous electrical or other exit signal. AI "tongue" intelligent technology was designed as the synthesis of sensory elements with computing micro-devices. Intelligent compatibility of measuring processes and functions of the "compensating stage" can be taken over by the cognition subject with its intellectual apparatus, which adds to the possibilities of applied investigation methods. In the elaboration of bionic intellectual measuring systems it has to be understood that such a system has to be open to man's (expert's, specialist's) intellect, knowledge, practical experience (also not formalized and not systemized) and even to intuition [8, 9, 12]. These devices are already used in laboratories and in business. Preliminary interrogations of consumers show positive relation of consumers and businessmen's to application an intelligent devices "artificial tongue" and 'artificial nose" for conformity control in area of agricultural production and business (Figure 7). In general, it considerably allows, on one hand, to improve scientific knowledge's basis of informative service and quality conformity control programs and on other hand, to implement practically Latvian laws "Conformity Control" and "Consumers Protection", which guaranteed protection of interests and rights of each consumer. The research of "consumer intellect" models are carried out by means of synthesis of the non-traditional conformity assessment imagining method based on principle of geometrical similarity of metrical images in different areas of identification, classification and conformity assessment of agricultural products by using of rapid control intelligent instruments.

Applications areas of artificial tongues in the nearest future

The concept "consumers' protection" concerns the roles of marketing ethics in transactions between producers, marketers and poor consumers. Therefore we describe our research results looking from point of view some problems and obstacles faced by poor consumers. Bionic approach in the modeling of intelligent AT measuring systems allows examining two types of intelligent control models. For the elaboration of the first type models it is sufficient to study in isolation only "inner" parameters and processes of the object under exploration without taking into consideration the impact of outer medium factors and, in

relation with it, "behaviour" changes of the structure intended for synthesis. The modeling of this type can be useful for a preliminary metric image identification and conformation of the object under exploration. The further use of the model depends only on the success of the acquired model's theoretic and technical continuation [3-5].

Figure 7. **Intelligent expert system for conformity assessment of wine, (Australia, 2006).**
7. attēls. **Ekspertu sistēma vīnu kvalitātes un izcelsmes atbilstības pārbaudei (Austrālija, 2006).**

"Behaviour" factor analysis of the object of interest has to be considered at the basis of the second type of bionic models. Further on "reference" functions of the influence factors are determined and feedback algorithm is synthesized in the form of ANN "self-learning" programs. The basic contours of models technical realization are formed in complete agreement of the existing notions, data, levels of knowledge about the investigation process or object with the exploration task and aim [3]. Technological and informative revolution in all production spheres, especially in computing- and research-comprising technology branches determined application of local (divided intellect) systems in functioning structures and further development of local microcomputers. Subsequently, in the automation leading part belongs to intellectualization of measuring devices.

Artificial tongue uses electrical currents to produce recognizable patterns on a graph that are different for different compounds. The human tongue functions in a similar way because the sense of taste is no more than the recognition of electrical signal patterns for foodstuffs and other substances that have previously been encountered and remembered, Figure 1. Possible applications areas of artificial tongues in area of environmental pollution monitoring can be monitoring of agricultural and industrial pollution of air and water, identification of toxic substances, leak detection. In area of consumers' protection - for total traceability in the chain of food an agricultural production. In chemical industry - products purity, in the future - detection of functional groups, distinction, legal protection of inventions - digital "fingerprints" of taste; In foodstuffs industry - food quality control during processing and storage (water, wine, figure 5, coffee, milk, juice),optimization of bioreactors,control of ageing process of cheese, whiskey, automatic control of taste. In medicine - non-invasive diagnostics (patient's breath, analysis of urine, sweat),clinical monitoring,identification of unpleasant odor of pharmaceuticals. In safety -searching for chemical or biological weapon, searching for drugs, explosives, friend-or-foe identification.

CONCLUSIONS

1. Technological and informative revolution in computing technology branches determined the application of divided intellect systems and a further development of local microcomputers for conformity assessment of food and agricultural products.
2. Quality refers to the combination of product characteristics that are critical for consumer acceptance. But risk can never be totally eliminated. However, by setting high standards, by constantly evaluating risk and by drawing on the best available independent scientific advice, the EU can boast a state-of-the-art food safety policy.
3. In agriculture are even more often applied biosensors for risk assessing and quality control of agricultural products. The biosensors industry is growing.
4. The sensometric aims is: increase the awareness of the fact that the field of sensory and consumer science needs it own special methodology and statistical methods; improve the communication and co-operation between persons interested in the scientific principles, methods and applications of sensometrics; act as the interdisciplinary institution, worldwide, to disseminate scientific knowledge on the field of sensometrics.
5. The comparative researches of self-training algorithms for a rapid conformity assessing of agricultural products with the help of the intellectual device artificial tongue “Logicor – AT” have shown advantages for back transformation algorithms (BTA), which was elaborated and developed in LUA for the first time in the area of intelligent technologies about 30 years ago.
6. Main preferences of watch-fractal metrical images methods is very easy possibility to detection of all deviations from standard images and easy possibility operatively to find namely those quality parameters, which have influences on quality deviations of product.
7. On the basis of results of experimental researches and modeling method "of intellect of the consumer " we has developed a new method based on principle of geometrical similarity of metrical images and compact, low - cost electronic AI devices ”artificial tongue” for conformity assessment of agricultural products, goods and raw materials. Preliminary interrogations of consumers show positive relation of consumers and businessmen’s to new possibility for protection their rights and interests.

ACKNOWLEDGEMENT

This project was funded by two grants of Latvian Council of Science LZP 05-1594 and LZP 05-1595.

REFERENCES

1. Stephen M. Radke, Evangelyn C. Alocilja, (2002), Market Analysis of Biosensors for Food Safety, ASAE Paper 027025;
2. Charles R. Hurburgh (2003), Food quality and international trade, Resource, Engineering & Technology for a Sustainable World, Vol. 10 No. 4 ,April 2003, (ISSN 1076-3333);
3. Moskvin G.A. Intellectualized automatic measuring, dosing and accounting systems. Latvia University of Agriculture, Jelgava, 91p.
4. Moskvin G.A. Artificial Intelligence Measuring, Automatic Control and Expert Systems in Agriculture: in 3-rd IFAC/CIGR Workshop on Artificial Intelligence in Agriculture, Makuhari, Japan, April 24-26,1998, Preprints, p.176-181.
5. Moskvin G.A. Fractal and Perceptual Images in Info-Ergonomics: in 1-st IFAC Workshop on Control Applications and Ergonomics in Agriculture, Athens, Greece, June 15-17,1998, p.255-261.
6. Spakovica E. Dr.oec. Promotion. Interests of the Consumers and their Protection. Jelgava, Latvia University of Agriculture, 2004, 238 p.

7. Moskvin G., Back Propagation and Transformation Methods in Artificial Intelligence Systems. Proceedings of the 4-th International Scientific and Practical Conference, June 26-28, 2003, Rezekne, p.367-376.
8. Moskvin G., Development of Intelligent Systems and Technologies in Agriculture. Proceedings of International Scientific Conference .Motor Vehicle, Logistics, Alternative Fuels.. Jelgava, April 24, 2003, p. 165-172.
9. Moskvin G., Spakovica E. Intelligent sensometrical tool for the conformity assessment of agricultural products. Proceedings of 2004 CIGR International Conference, sponsored by CIGR, CSAM and CSAE, Beijing, China 11- 14 October 2004, CD- Paper, 11 p.
10. Москвин Г.А. Искусственный разум. Думающие машины. ISSN 1611- 4159, DAAD - LfL TUM-München, 150 с.
11. Москвин Г.А.Основы теории систем искусственного интеллекта-ISSN 1611- 4159, DAAD - LfL TUM-München, 108 с.
12. Moskvin G., Spakovica E. Intelligent Technologies for the Conformity Assessment in the Chain of Agricultural Production. CD -Proceedings of International Conference on Industrial Electronics, Technology & Automation (IETA 05), , Institute of Electrical & Electronics Engineers (IEEE), University of Bridgeport (USA), December 10-20, 2005, 8.p.