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Modern Approach to Management of the Socio Economic Systems Development

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Abstract: The study highlights the factors that have the greatest influence on the development of socio-economic systems. It is proved that in these circumstances is not enough only to direct efforts to ensure the functioning of the socio-economic systems of any level it is necessary to ensure their sustainable development. This is especially true of businesses where registration, compilation and analysis of information is a time-consuming procedure, requiring tight control of subordinate structures from a single center. Such socio-economic systems are enterprise of tourist and recreational sector. The study presents a methodology of modeling and structuring of a control system of tourist and recreation areas on the basis of elements of neural network theory. This is done keeping environmental factors on mega, macro and meso levels the internal state of the managed system, accuracy of control action management system. The proposed methodology allows to increase the quality of business management of resort and recreational complex at the expense of a more flexible response to changes in the parameters of internal and external environment.

Key words: Resort and recreational sphere, neural networks, the quality of management, socio-economic, subordinate

INTRODUCTION

Under the socio-economic system is commonly understood as a complex probabilistic dynamic system covering the processes of production, exchange, distribution and consumption of material and other goods. For socio-economic systems are the enterprise, industry, municipalities, regions, etc.

Modern conditions of social and economic systems are characterized by instability purposes, volatility of commodity markets conditions, permanent changes in the cost of factors of production and prices of financial resources, lack of investment volumes, changes in the competitive environment and other macro and micro economic factors. One of the primary management tasks in such conditions is to ensure functioning and sustainable socio-economic system.

Considering the company tourism and recreation areas as the socio-economic system that responds to the impact of external factors we cannot be satisfied with the state of research in this area (Claveria and Torra, 2014). Registration, collation and analysis of information related to the provision of tourist and recreational services, turns into a fairly time-consuming procedure.

For tourist destinations, sustainable economic development requires, together with the attainment of economic efficiency, environmental protection and social cohesion. This latter aspect implies that the local community has to be actively involved in the planning and in the management of the tourism sector and that (the great part of) tourism earnings have to be fairly distributed among the residents. Desires and aspirations of local residents and their attitudes towards tourists should be carefully taken into consideration by tourism planners (Figini *et al*., 2009). This is especially true of enterprises belonging to a network when there is a problem of the hard work of subordinate control structures from the "center". Those, there is a problem of action of this "organism" as a whole.

In the last 15 years, the socio-economic impact of tourism and the factors affecting attitudes towards tourism in host communities have received significant attention. In particular, tourism impact is often disaggregated into three categories: economic, socio-cultural and environmental. Since, tourism generally disrupts social, cultural and environmental local systems, the non-economic impact often tends to be negative as a whole whilst economic effects are perceived

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as positive. Economic impacts are known and well measured because estimated for different purposes whereas social and environmental effects are of difficult evaluation. Therefore, the overall benefit of tourism development is often overestimated and might drive to sub-optimal policy decisions. The intensity and the direction of the overall impact depend on a variety of socio-cultural and economic factors associated to the local destination, including the nature of tourism activities, tourists personal characteristics and the pace of tourism development.

The analysis showed that the tourism product is a composite one with its production, distribution and marketing being configured along a value chain involving many activities which are vertically, horizontally and diagonally related and integrated in varying degrees. Both orthodox and non-orthodox economists agree that innovations will only be undertaken when there is a sufficiently high innovation dividend which pays for the added cost and risk of innovation. Thus, profitability appears to be the strongest explanatory variable both behind investment and innovation. Based on the notion that expected profitability from innovation can serve as the primary independent variable determining innovation behavior across different economic sectors and/or sub branches of tourism the paper sets out to establish the innovation potential for each of the tourism value creating economic activities from the provision of information to prospective customers (tourists) in the sending region to post-trip (after sale) services. In addition to the usual profit-generating forces of costs and revenues such dimensions as firm size and economics of scale, proximity to relevant science and technology (know-how for innovation) through human capital and forms of organization (e.g., network-organization and/or clusters) will equally be taken into consideration (Weiermair, 2006).

Speaking of the methodology of management of development of socio-economic systems there is a problem of the choice of indicators of quality-effectiveness, efficiency, optimality, synergy, stability, economic development, etc. In any socio-economic system possible violations and failures related to their exposure to the outside from other socio-economic systems as well as the bodies of the state and social system. This circumstance requires the socio-economic systems respond to changing conditions and as a result, changed the most in the direction by Timirgaleeva and Grishin (2013).

Among the most important global trends in the development of different levels of socio-economic systems a special place is occupied by the concept of sustainable development which allows us to solve the growing contradictions between the need to meet the growing needs of the consumers and limited resources. Ensuring sustainable development of socio-economic systems is put forward today in a number of priority issues in the world of management practice (Sadovin *et al*., 2015).

Socio-economic systems of different levels respond in different ways to the impact of external factors which have not been investigated sufficiently. Registration, collation and analysis of information related to the management of the development of socio-economic systems turns into a fairly time-consuming procedure. This is especially true of complex socio-economic systems, forming a network when there is a problem of strict control of the work of the constituent elements of a single "center". That is, there is a problem of action of this "organism" as a whole.

Management of development of socio-economic systems requires a high efficiency of decision-making in connection with the constant changes in the internal and external environment of their operation. Modern economic and mathematical methods make it possible to ensure the effectiveness of management. It should be some clarification of certain concepts on a new basis as proposing a neural structuring management system able to realize a system-process approach to the organization and development management as a separate element of the socio-economic system and the entire system within the region and the country in whole.

Applying this approach to the management of the development of social and economic systems requires information about the current state of affairs about the causes of problem situations (including those related to innovation) which suggest immediate intervention on the progress and results of the implementation of management decisions.

Analysis of the number of references has shown that today there are separate publications on enterprise development and sensory psychological systems. However, there are no studies in which the system combination of these problems can be seen. Some interest was aroused by the models by Abakumov *et al*. (2000), the provisions of the perception of the environment at the Adler, Zarochentsev, Khudyakov, research by Kromer (2003), a complex pattern recognition technique, management and decision-making in the Barsky.

Therefore, the aim of the work is to represent companies as sensor system that responds to changes in the available external environment, the so-called receptor field. It is expected that this approach will adequately simulate the behavior of the system based on a neural structuring.

EXPOSITION OF THE METHOD

The effective operation of the socio-economic system of any level is impossible without taking into account the rational and in most cases, the optimal management of material and related information and financial flows (Larina, 2004). An important issue is the choice of solutions which should be based on appropriate mathematical optimization techniques. Because in these tasks cannot use traditional methods, should apply the methods developed in the framework of modern control theory which allow to take into account not only the dynamics of the optimized process but also a number of restrictions adopted in the process of solving the problems of marketing and logistics.

Reliable quantitative results concerning the optimization of socio-economic systems, taking into account the relative value to the conservation of resources costs, public and private benefits of economic activities, can be obtained with the use of modern complex systems management, in particular, using neural networks methodology, genetic algorithms, fuzzy-neural control. Interpretation of the data management allows you to solve the problems of rational use of money supply growth to ensure the effective growth of the national economy. The use of modern approaches to solving the economic problems of management of development of socio-economic systems will make economically-sound and optimal solutions, the implementation of which will enhance the competitiveness of a particular socio-economic system.

As noted Claveria and Torra (2014), the increasing interest aroused by more advanced forecasting techniques together with the requirement for more accurate forecasts of tourism demand at the destination level due to the constant growth of world tourism has lead us to evaluate the forecasting performance of neural modelling relative to that of time series methods at a regional level. Seasonality and volatility are important features of tourism data which makes it a particularly favorable context in which to compare the forecasting performance of linear models to that of nonlinear alternative approaches. Pre-processed official statistical data of overnight stays and tourist arrivals from all the different countries of origin to Catalonia from 2001-2009 is used in the study. When comparing the forecasting accuracy of the different techniques for different time horizons, autoregressive integrated moving average models outperform self-exciting threshold autoregressions and artificial neural network models especially for shorter horizons. These results suggest that the there is a trade-off between the degree of pre-processing and the accuracy of the forecasts obtained with neural networks which are more suitable in the presence of non-linearity in the data.

The most widely used are gradient methods with a random change in the initial conditions of the known methods of training neural networks. The disadvantage of these methods is the difficulty of pattern recognition in the case of proximity to the norm of Euclid compared images. In this study, we propose a modification of teaching methods using as a scalar quantity criterion of sum rules of Euclid, Euclid generalized norms and standards by Chebyshev. Let's consider the effectiveness of the modified methods in solving problems with hardly recognized states of socio-economic systems of different levels.

One of the most important properties of any kind of system is stability. The system always responds to external perturbations and tends to return to equilibrium. However, if under the influence of external forces, the system is far away from equilibrium, it can become unstable and unable to return to equilibrium. At a certain point (bifurcation point), the behavior of the system becomes uncertain. Sometimes a slight effect on the system can lead to significant consequences and then the system moves into a new quality. Moreover, this transition occurs abruptly it is also essential to select the indicators of quality of the simulation of the system (Timirgaleeva and Grishin, 2013).

It is known that the source of management actions at any level of the system is to identify deviations from the desired state which complicate the achievement of management objectives. Deviations from the normal parameters of the system are due to the impact of external and internal environment. The management system is not necessary if there's no deviation. Based on these considerations, the impact of management in enterprises TRS may be represented by the following model (Fig. 1 and 2).

The diagram shows the influence of environmental factors on mega (G), macro (C) and meso-levels (Q) which corresponds to the international, national and regional environment. Administrative impact (St) at the moment of time (t) is formed on the basis of the analysis of deviations from the norm of the system settings which includes not only the functioning of the enterprise TPC standards but also indicators of strategic and tactical planning.

The internal state of the system (F) is a function of external influences and determines the Effectiveness (E), based on an analysis which produces administrative action:

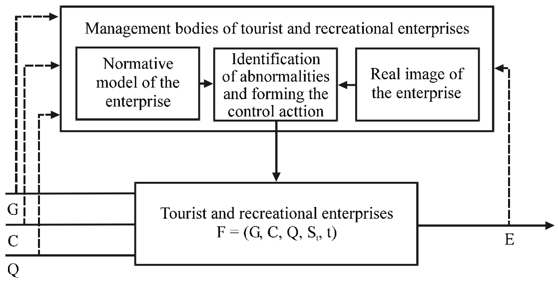

Fig. 1: The generalized model of enterprises resort and recreational sphere

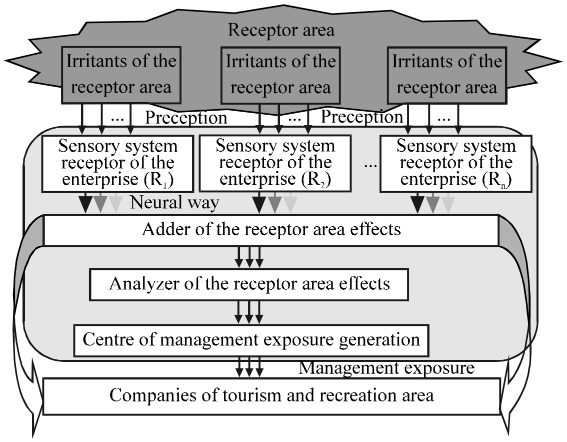

Fig. 2: The neural circuit formation of the impact of various factors on the management of the enterprises of tourist and recreational sphere

$$F = \phi(G, C, Q, S_t, t); E = \varepsilon(F) \Rightarrow opt; S_t = \upsilon(E, G, C, Q)$$

Environmental factors can be divided into those that affect the state of the enterprise TRS (significant factors) and those that do not affect (insignificant factors) or their impact can be ignored (weakly significant factors). From the perspective of companies TPC can be said that each company has its own sensory system perceiving stimuli of some part of the environment. By analogy with nature, this part is called the receptor field and appropriate structures which perceive external stimuli-receptors.

Influence of various factors on the management of enterprises present in the form of a neural circuit (Fig. 2). Irritants affecting the activity of the enterprises have the following properties: type and kinds of stimuli, the intensity of the effect of the stimulus, localization or place of influence, the influence of the duration. At the same types of stimuli will be classified into economic, political, financial, economic, social, geographical, environmental and others.

As for the types of stimuli, they are specifying (a kind of) this type stimulus. The intensity of the stimulus effect shows the force with which it acts on the receptor. Localization shows the functional part of an object or operation process influences the stimulus. Duration of exposure linked to the timing of action and influence perception of his touch TRS enterprise system. The duration of exposure should be considered not only in the narrow sense of the term as a kind of uniform discrete-time characteristic but also in the broader concept of the definition of trends in manifestations of the stimulus intensity.

To select the most influential types and kinds of stimuli on the sensory system of the company from the list of TPC possible in a particular situation, it is necessary to conduct intensive peer review manifestations:

$$V = \phi(g_n, c_k, q\ g_n \in G\ (n = 1, 2, \ldots, N), c_m \in C\ (m = 1, 2, \ldots, M)\ \text{and}\ q_l \in Q\ (l = 1, 2, \ldots, L)_l, t)$$

of the complex effects of stimuli receptor field at different times. Determination of the intensity trends impact the stimulus is advantageously carried out at discrete times. For this entire period of time $[0, t_{max}]$ split into several segments the boundaries $o[t(\delta_u); t(\delta_{u+1})]$, f which corresponds to the onset of the critical events in the set $kr = \{kr_1, kr_2, ..., kr_T\}$. As a manifestation of force gradation separate stimulus accept such estimates: very low 0; low 1; moderate 2; high 3; very high 4. After analyzing the trends of stimulus exposure intensity changes can determine the global trend to increase or decrease the intensity of their symptoms. Average trend analysis can show the trend of the overall effect of stimuli, ie change dependencies of an enterprise from the TPC impact of environmental factors at different levels of influence.

Localization irritation can show how the change affects the characteristics of the functioning of the individual components of the entire system as a whole. In the simplest form, this can be represented as a factor of influence k^h_p where $h = \{g, c, q\}$, $p = \{n, m, l\}$: $V = \phi(k^g_n \cdot g_n, k^c_m \cdot c_k, k^q_l \cdot q_l, t)$

The perception of stimuli receptors has the following characteristics: Selectivity, sensitivity of receptor systems, adaptability, completeness, reliability, stability, lability, categorical intensity.

Evaluation of the impact of management is based on expert evaluation of the sensitivity of receptors specific enterprise system TRS to the perception of external stimuli: $P = \xi(g_n, c_k, q_l, t)$.

Different parts of the system are tuned to different kinds of perception and their sensitivity and concentrated in different ways. The system must have a certain lower threshold. This threshold should not be too high for the system to adequately respond to changes and is not very low, because this leads to the excitation and spontaneous activity in the receptors which leads to an unstable system and of perception, as a consequence, the system goes into a state of self-excitation.

The selectivity of the receptor enterprise TPC means that stimuli are classified according to the effect of importance. This can be illustrated by weighting coefficients influences (v^h_p where e h = {g, c, q}, p = {n, m, l}) for the sensor system: $P = \xi(v^g_n \cdot g_n, v^c_k \cdot c_k, v^q_1 \cdot q_1, t)$.

Lower threshold in terms of selectivity imagine how such stimuli which if $v^h_p \le v_{kp}$, then v_{kp} where rated critical. That is irritant with the intensity level below critical level of importance for management decisions becomes zero and resets the impact of the stimulus.

Adaptability of individual enterprise system receptors to changes in the receptor field allows you to quickly adopt new types of stimuli needed for the formation of the administrative decision, i.e., it helps to create a flexible system of the region:

$$\forall\{v^{g'}_n \cdot g'_n, v^{c'}_k \cdot c'_k, v^{q'}_1 \cdot q'_1\} \in \Theta \big| v^{g'}_n, v^{c'}_k,$$
$$\exists P' = \xi(v^{g'}_n, g'_n, v^{c'}_k \cdot c'_k, v^{q'}_1 \cdot q'_1, t), v^{q'}_1, \ge v_{Hn}$$

where, Θ many new types of stimuli; $v^{g'}_n \cdot g'_n, v^{c'}_k \cdot c_k, v^{q'}_1 \cdot q'_1$ new types of stimuli with appropriate levels of selectivity coefficients adopted for them; P' sensitivity function to new types of stimuli.

Completeness of perception can be expressed not only in response to all stimuli, selectivity coefficients greater than the lower level of sensitivity but also a complete perception of all the necessary components of each stimulus:

$$\forall(g_n, c_k, q_1) \big| v^g_n, v^c_k, v^q_1, \ge V_{Hn} \; \exists P = \xi(v^g_n \cdot g_n,$$
$$v^c_k \cdot c_k, v^q_1 \cdot q_1, t) \,|P = \xi\, (v^g_n \cdot g_n, v^c_k \cdot c_k, v^q_1 \cdot q_1, t) \equiv$$
$$P^{max} = \xi(v^g_n \cdot g_n^{max}, v^c_k \cdot c_k^{max}, v^q_1 \cdot q_1^{max}, t)$$

where, P^{max} sensitivity to stimuli function at the highest possible perception of the stimulus structure. Reliability means that the selected receptor stimuli are perceived as they actually are not distorted by the process of perception, i.e.:

$$\forall(g_n, c_k, q_1)|v^g_n, v^c_k, v^q_1, \ge v_{Hn} \; \exists P = \xi(v^g_n \cdot g^\xi_n,$$
$$v^c_k \cdot c^\xi_k, v^q_i \cdot q^\xi_1, t)|(g^\xi_n \equiv g_n, c^\xi_k \equiv c_k, q^\xi_1 = q_1)$$

where, g^ξ_n, c^ξ_k, q^ξ_1 the image of the relevant stimuli in the perception of the receptors. Stability means that regardless of the perception and the presence of interference, the basic characteristics do not change the perception of time:

$$\forall(P = \xi(v^g_n \cdot g_n, v^c_k \cdot c_k, v^q_1 \cdot q_1, t),$$
$$P^{\Delta t} = \xi(v^g_n \cdot g^{\Delta t}_n, v^c_k \cdot c^{\Delta t}_k, v^q_1 \cdot q^{\Delta t}_1, t + \Delta t))|$$
$$|v^g_n \cdot g_n = v^g_n \cdot g^{\Delta t}_n, v^c_k \cdot c_k = v^c_k \cdot c^{\Delta t}_k, v^q_1 = v^q_1 \cdot q^{\Delta t}_1 \; P \equiv P^{\Delta t}$$

where, $g^{\Delta t}_n$, $c^{\Delta t}_k$, $q^{\Delta t}_1$ time perception of stimuli at Δt different from the basic t. Lability perception means that depending on the requirements of the sensor system with respect to changes in the control strategy to change the basic characteristics of the receptor field perception and response:

$$\forall(g_n, c_k, q_1)|v^g_n, v^c_k, v^q_1, \ge v_{Hn} \; \exists((P^s = \xi(v^g_n \cdot g^{\xi s}_n,$$
$$v^c_k \cdot c^{\xi s}_k, v^q_1 \cdot q^{\xi s}_1, t)) \ne (P = \xi(v^g_n \cdot g^\xi_n, v^c_k \cdot c^\xi_k,$$
$$v^q_1\; q_1, t)))|(g^{\xi s}_n \ne g^\xi_n, c^{\xi s}_k \ne c^\xi_k, q^{\xi s}_1 \ne q^\xi_1)$$

where, $g^{\xi s}_n$, $c^{\xi s}_k$, $q^{\xi s}$ the image of the corresponding receptors in the perception of stimuli by changes in s management strategy; P^s sensitivity to stimuli function when changing the management strategy.

The categorical means confidence in the correct perception of the stimulus characteristics and the inability to dual interpretation:

$$\forall(g_n, c_k, q_1)|v^g_n, v^c_k, v^q_1, \ge v_{Hn} \; \exists(g^\xi_n \equiv g_n,$$
$$c^\xi_k \equiv c_k, q^\xi_1 \equiv q_1) \cup \urcorner\exists(g^{\xi'}_n \equiv g_n, c^{\xi'}_k \equiv c_k, q^{\xi'}_1 \equiv q_1),$$

where, $g^{\xi'}_n$, $c^{\xi'}_k$, $q^{\xi'}_1$ the image of a double interpretation of the stimulus. The intensity of perception depends on the intensity of the stimulus and receptor sensitivity. To determine the intensity of the perception of the stimulus intensity Weber-Fechner law and Stevens can be applied.

Weber-Fechner law (Luriya, 1975) is an empirical psychophysiological law whose essence lies in the fact that the intensity of the sensations h_p proportional to the logarithm of the intensity of the stimulus (stimulus) h:

$$h_p = k \cdot (v^h_p)^n$$

where, k a constant determined by this sensor system. If $v^h_p < v^k_p$, the stimulus is not felt. This relationship was derived on the basis of law Buger-Weber and additional subjective assumptions about equality subtle differences in sensation. Empirical studies have confirmed this relationship only for the middle of the range of values perceived stimulus.

As is well known (Luriya, 1975) the law of Weber-Fechner law is often contrasted with law of Stevens, according to which the relationship is not logarithmic and exponential character:

$$h_p = k \cdot \left(v_p^h\right)^n$$

Where:

- h_p = Subjective value of sensations
- k = A constant depending on the units
- v^h_p = The intensity of the Pth stimulus h-type
- n = Index of the degree of function, this indicator is different for different modalities of sensations

The boundaries of its variations are established by experts. Because both laws provide approximately equal value, we will rely on the law of Weber-Fechner law which was more common in practice.

As the sensitivity of the gradation it will be taken the following estimates: very low 0; low 1; moderate hig 3; very high 4.

The perception of stimuli receptors receptor field is the basis of assessment of the impact of the environment on the state of the region's enterprises:

$$\Omega(V, P, t) = \frac{\sum_{n=1}^{N}\sum_{m=1}^{M}\sum_{l=1}^{L}\phi\left(k^g{}_n g_n, k^c_m c_m, k^q_l q_l, t\right).\ \xi\left(k_s \cdot \log\frac{v^g{}_n}{v_{kp}} g_n, k_s \cdot \log\frac{v^c{}_m}{v_{k?}} c_m, k_s \cdot \log\frac{v^q{}_1}{v_{kp}} q_l, t\right)}{\sum_{n=1}^{N}\sum_{m=1}^{M}\sum_{l=1}^{L}\phi\left(K^g{}_n g_n, K^c{}_m c_m, K^q{}_1 q_l, t\right).\ \left|\xi\left(k_s \cdot \log\frac{v^g{}_n}{v_{kp}} v^g{}_n g_n, k_s \cdot \log\frac{v^c_m}{v_{kp}} c_m, k_s \cdot \log\frac{v^q{}_1}{v_{kp}} q_l, t\right)\right|}$$

If all actions have a positive impact, then $\Omega = 1$, if all actions have a negative impact, then $\Omega = -1$. In all other cases Ω value lies in the range of (-1; 1).

For comparison also perform neural network forecasting work of another kind of socio-economic system-a small enterprise.

To solve the problem by using an artificial neural network is necessary: to form the training set; select the configuration of the neural network; to train a neural network; test the neural network.

To improve the small enterprise management the following indicators were identified, requiring the forecast: the level of internet use per month, changes in prices for internet service from your upstream provider, changes in prices for network services from competitors, equipment price increases, the level of payment for the use of the internet by consumers, the number of newly arrived visitors per month, the number of members who left the network in a month, price growth rates for loans of this sector of business.

Existing data are time-ordered sequence that is the time series. In order to determine the relationship between observations (separated by time intervals of 1 month), calculated autocorrelation coefficient which reflects in essence, the usual correlation computed between the generators of the time series of current and lagged values of the dependent variable. Using correlation analysis revealed that there is a dependence on the magnitude of the predicted value of the previous time (month) and from the same month a year earlier for all of the above indicators. Thus, the following values are chosen time series: $y(t_1)$ And $y(t_{13})$ as input factors.

As studies have shown the influence of the average value of the projected figures for the month and the previous one, this value is also included in the input data set. The normalization of the data makes it possible to bring disparate data to comparable ranges as well as to bring them closer to a uniform distribution which increases the information content of the training examples. Of the possible normalization of the options has been selected the next-a linear normalization which causes all values a to a single range of [0.1]. Thus, all values were normalized to time series and the input of the neural network serves only values in the range [0, 1].

To solve the problems of forecasting the following types are most suitable neural networks: Multilayer Perceptron (MLP-Network) and Radial-Base Network (RBF-Network). But in most cases when solving the same problem, RBF network size will exceed the size of the MLP. RBF network is composed of one hidden layer and the MLP network in the general case a few. However, any function can be approximated by a three layered MLP network with one hidden layer with any degree of accuracy. In this case the use of a larger number of levels is impractical, so kick while training time is increased and the accuracy of the prediction is reduced. Thus, the task of choosing the number of layers for both types of neural networks is formulated: how RBF network and MLP network should have one hidden layer.

RBF Network allows to use a Gaussian activation function or its modification. At the same time MLP has the ability to work with different functions which gives more opportunities for experimentation in the process of building a neural network model. Further, RBF network has no ability to extrapolate data by increasing the width

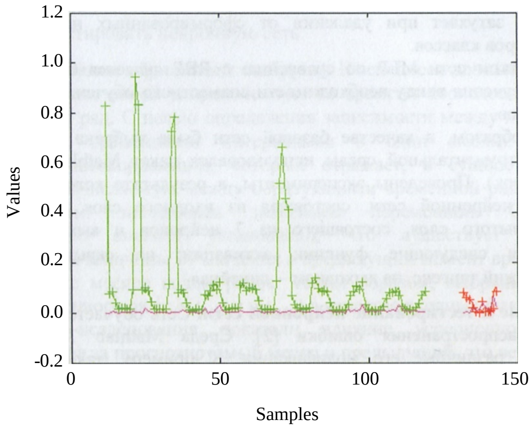

Fig. 3: Testing of samples

of the input value range as the network response decays rapidly with distance from the learning sample generated class centers.

MLP network disadvantage compared with the RBF is the higher complexity due to the need of joint learning several layers of neurons.

Thus, MLP network has been chosen as the core network. As an instrumental medium used package Mathlab 7.0 (neural network toolbox). Experiments were carried out which result was a neural network architecture, consisting of an input layer having neuron hidden layer 4 consisting of 7 neurons and output layer. Use the following activation function: on the hidden layer-hyperbolic tangent at the output-linear.

Granted for 12 years, information used as follows: for 11 years, figures are included in the training set and the last (12) years-in screening. Upon receipt of the neural network performed its tests, the results in Fig. 3.

On the left side of the figure shows the results of testing on the training set in the right the check. The mean square error on the test sample is 6.1579e-004.

Application of neural network forecasting provides a reliable forecast for the next month/year for the adoption of a program of sustainable development of the enterprise. The result of the prediction was a marked decrease in profit and increase in the cost of maintaining the network which allowed us to find an effective solution to overcome possible future difficulties using new forms of profit.

CONCLUSION

Results of the study show that the implementation of the models will optimize the management and the operations of the socio-economic systems of any level. This approach will reduce the overall cost due to more flexible (adaptive) response to changes in the internal and external market situation. Further, study will attempt developing of generalized recommendations on the selection of species used in the article of mathematical functions based on specific socio-economic systems, their status in the various sectors and regions.

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