MATHEMATICAL PARADIGM OF CONTROL PARAMETERS OSCILLATORY TANGENTIAL TRANSFORMATION PROCESSES IN KINESIOLOGY AND EDUCATION

Dobromir Bonacin[1], Danijela Bonacin[1] and Mislav Lozovina[2]

[1] *Faculty of education, University of Travnik, Bosni & Herzegovina*
[2] *Faculty of maritime studies, University of Split, Croatia*

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Abstract
The aim of this article was to present the preliminary setup of a new model and sub-models, mathematical definitions of control oscillation processes in kinesiology (education, economics, medicine,...). From these examples, it is clear that the transformation process can decompose into its component sub-processes. In advance, the article has offered a different decomposition, and it refers to a specific way of managing and controlling oscillation processes, i.e. a way to recognize cumulative sub-processes, and short-term effects, and finally a quick response. It is obvious that the presented model in this article, is potentially a very powerful tool for the identification processes of any kind, especially in kinesiology.

***Key words**: processes, oscillations, control, parameterization, mathematics*

Introduction

Training is a process that can be defined in many ways, but it is methodologically justified to describe it as a process which is aimed at minimizing the distance between the forecast and the final state of the state obtained with the help of operations that we have implemented. These operations or individual operators, have multiple power and range, and some local, some global and some example of an occasional nature. Seems to be of crucial importance to identify the parameters of such transformation processes in order to better understand the processes in general. This is especially true for oscillatory processes and transformation processes in kinesiology, education, including medicine, economics ii etc., that are regularly just like that. Their oscillatory character seemingly limited ability to monitor and control, but that is the case only until you turn mathematical tool and methodological paradigms that tool positioned in a place where the oscillatory motion can at least be controlled, and with adequate methodological knowledge it also can be controlled and ultimately managed (Bonacin, 2010).

Methodological conception

Here we can point to some important rules and objective behavior in any situation is possible only when there is a function whose extreme can be found, either minimum or maximum. Another problem is the relationship between the state achieved in the earlier sequences and conditions for which the operator was just created. Generally, the rule is that the situation in any measured point depends on the conditions in the previous paragraphs. Thus, the process of training is one stochastic process, and this situation can be called and described as Markov chains or similar operations (Lozovina et al., 2011, 2012). However, if the rule worth (and it worth!) that status of any measured point depends on the conditions in the previous points then issue stochastic is not the real issue, but the real question is precisely the question of accumulation and that they are not only Markov chains but certainly the process parameters accumulation. It can present in two ways. *The first way*: Concurrent monitoring process with at least proportional, derivative and integration response - Figure 1 (Bonacin, 2009). In this case there are two systems integration training process and are labeled base summarizing the entrance (after the setpoint) and output from the process. At the entrance you are trying to act on the error, and the output that examines the results achieved. Of course, training is always multidimensional system with a starting position that establishes criteria for achievement (setpoint). *Another way*: Universal cognitive continuum within with oscillating local sides (transitive) values "in the direction of back and forth" as achievement (Bonacin, 2005). The totality of this presentation requires the knowledge of some parts of mathematics without which it is impossible to solve these problems. The next problem to be solved is: Problem of kinesiological transformation volume. Another problem is the devices through which we can gather information about the changes that are in our profession extremely primitive. Reasons: 1) take a lot of time, 2) their reliability is low, 3) validity worse.

This is an area that solves kinesiometry (Measurement Theory). Under the volume of work in training, in modern physiology and psychology we involve the cumulative composite intensity and extensiveness, and the energy equivalent is mainly volume (Trninić et al., 2009; Lozovina et al., 2011). Under the names of the ″load″ or "intensity" or scope usually includes only energy terms talking about the amount of work, the amount of effort, work duration or the other energy components.

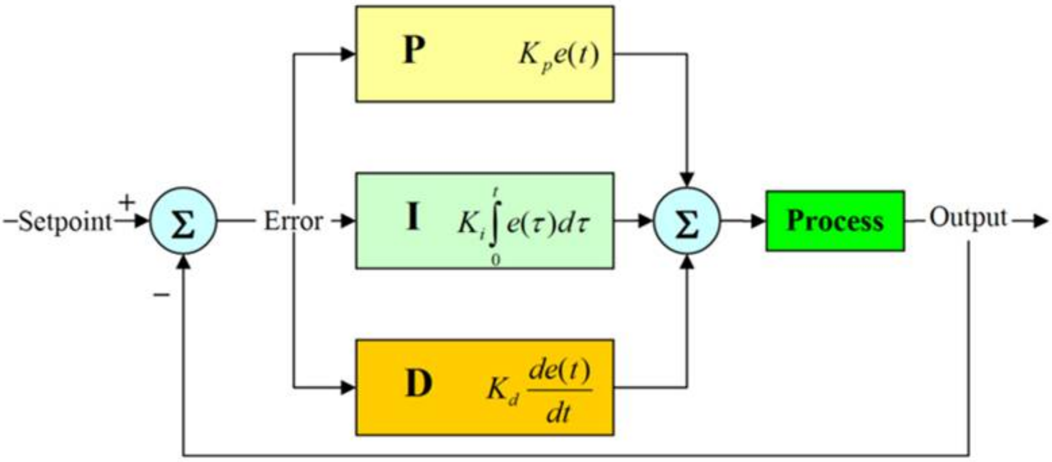

Figure 1. Universal process regulators (Bonacin, D., 2009)

However, volume is to be composed of three components: 1) energetic, 2) information, and 3) synergy. In mathematics, the derivative function with integrals main fundamentals of calculus, which is widely used in all scientific and many other areas where the required budget development function at a specified interval and kinesiology transformation processes are just that. Geometric interpretation of this problem is described as derivation slope of the tangent to the function at some point, which gives the response speed of training sub-processes, i.e., local stability of the process whereby the coefficient of m is direction

$$m = \frac{y2 - y1}{x2 - x1}$$

and since the

$$m = \frac{f(x+h) - f(x)}{(x_0 + h) - x_0} = \frac{f(x+h) - f(x)}{h}$$

because

$(x_0 + h) - x_0 = h$ i $\Delta x = h$.

the function derivation is

$$Df = \lim_{h \to 0} \frac{f(x_0 + h) - f(x)}{h}$$

The slope (direction) is closely associated with the derivation of the reason that when the interval x2 - x1 = h tends to zero, the line becomes a tangent function, and limes of its slope coefficient becomes directional derivative of f in point (x0, f(x)).

Derivation function therefore is nothing more than stability in the training process in part being analyzed, in this case the synergy integrative sub-processes in relation to the final state defined superimposed values of the current situation in relation to the limit which describes the actual or total final state. So figure 2 shows how these parameters reflect knowledge of process behavior.

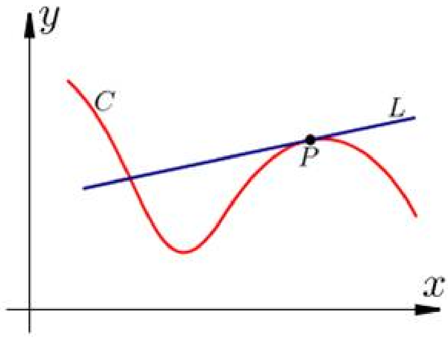

Figure 2. Derivatives of oscillatory processes (Bonacin et al., 2012)
(The line *L* tangent function *f* in point I whose derivation corresponds to the slope of *L* in point *P*)

If, in this regard, synergistic component designate as an interaction which includes some continuous intervention options with derivatives aspiring affine function, and assuming its knowledge then solves the problem still influenced by the energy and information component. In a similar way one can "turn of " any component that interests us, just as it is possible in the same way and discover the correctness of any of the sub-processes in the overall training.

Solution

It is realistic to assume that every serious global training process includes discontinuous progressive overload (Figure 3). This is because a continuous linear progress is impossible, and without rest, relaxation, compensation and super-compensation quickly leads to major drop functions, and in general to a violation. However, if even superficially examine the image in Figure 3, we can see oscillatory inevitable in any Kinesiology or pedagogical process (Bonacin, Da., 2010). From this it necessarily follows that the oscillations are actually programmed, deliberately controlled unstable phase of the process, in order, through the exercise of homeostasis and adaptation at a higher level functions.

It is obviously a key issue in the programmed instability needs to be addressed precisely the question of stability, how the process would not be out of control and turned into destruction. This problem can be solved in several ways, but all of these methods must include respect for the former states, because in these processes cumulative effects are always present and can never fully brought under control, just as it is often not an irreversible process in which return to a previous state is not possible due to realized irreversible effects. Pursuant to the foregoing, as well as taking into account the facts and circumstances described in Figure 2, on the one hand, it is necessary to define a mathematical framework for rescaling the oscillations more easily understandable model, and on the other, the operative acceptable form. That is why for the progressive discontinuous loads parameterization we use coefficient direction or derivative function of the partial segment in some training stages i.e. for explication appropriate state athletes and treated the subject in the process. Of course, there are two sub models, one that deals with only one segment are needed to identify the current state of athletes form and the other - cumulative, needed in order to identify future training operators which seek to achieve target states (Bonacin et al, 2008, 2012). As can be clearly seen in Figure 4, the position and direction of the partial tangent will depend on the general orientation, or curvature of acute training stages, or mathematically speaking on the degree of affinity or linear segments within the entire process. If the whole global process of growing (as in the picture) can be a suitable simple function (linear trend, ...) to calculate the tangent angle with respect to the abscissa, which is defined by the speed of the growth or training technology speed changes of selected parameters for evaluation. This essentially corresponds derivative controller with Figure 1. That is the essence of these regulators.

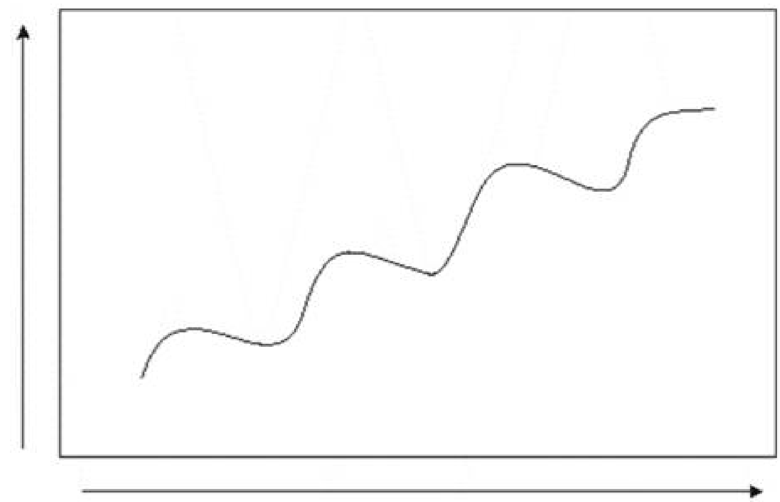

Figure 3. Global view of progressive discontinuous load (Bonacin, Da., 2010)
(Abscissa = time, Ordinate = intensity)

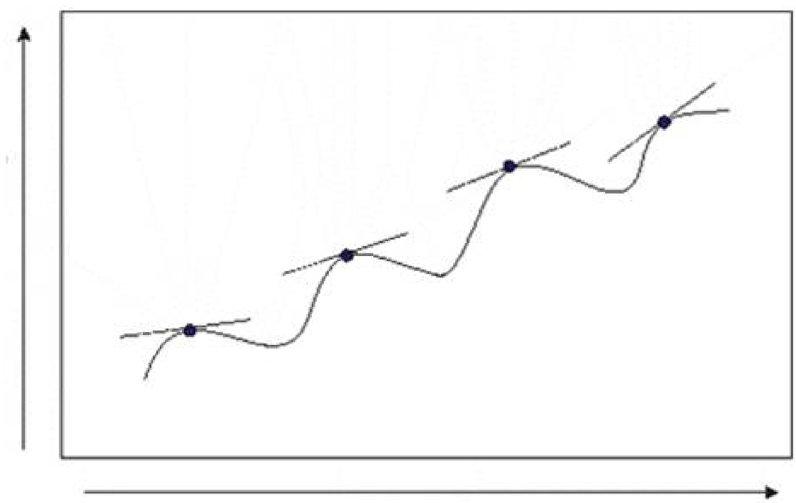

Figure 4. Partial tangential segmentation of transformation process
(Abscissa = time, Ordinate = intensity)

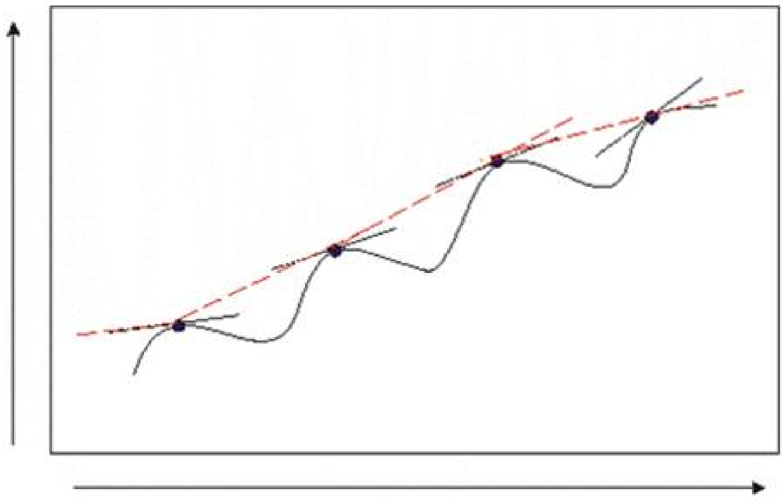

Figure 5. Cumulative tangential explication of transformation process
(Abscissa = time, Ordinate = intensity)

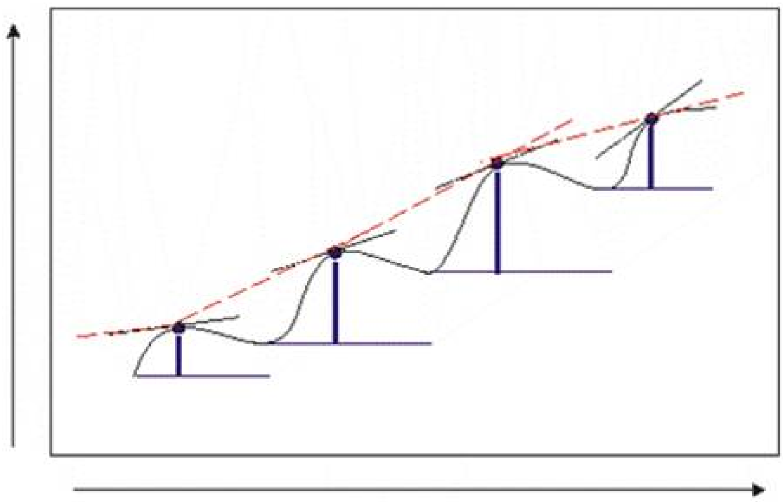

Figure 6. Speed of response to the stimulus within the segments of the transformation process
(Abscissa = time, Ordinate = intensity)

It can be most simply described as a way to derivative controller, in this case described tangential segmentation registers or "rehabilitate" the current error status differences, and thus shows the possibility of redistribution of content that need to be integrative tissue of the whole process, but not current ad hoc effects that can be produced.

Conclusion

It is designed and proposed mathematical model paradigm of control parameters tangential oscillatory processes in kinesiology and education. From these examples, it is clear that the transformation process can be decomposed into its component sub - processes at least in two ways. By one method it is to be performed in accordance with expectations from planning through transformation as energy, information and finally synergistic components i.e. proportional, integration and derivative identification and control (Figure 1). However, this article is offered a new, different decomposition, and it refers to a special management and control of oscillatory processes. According to Figure 6, we see the short-term effects and quick response, i.e. acute reaction of entity that is subject to treatment. In the example above it is obvious that the reaction is very turbulent in the central part of the treatment, while at least at the outset. According to Figure 5, however, we see the long-term effects of the process that shows a constant tendency to increase but in the fourth chord checkpoint least though tangential tilt it the most, which certainly suggests approaching the limits permitted stimuli. It is obvious that the overall curve has a logarithmic course and it is logical that the second inflection point occurs on lower slope because it is a stage of supra-liminal total workout. Finally, Figure 4 also shows that local processes are very active, but they are practically equal in "nature" because they are segmented effects very similar. It is obvious that the presented model in this article, is a very potentially powerful tool for the identification process of any kind, especially in kinesiology.

References

Bonacin, D. (2005). Comprehensive continuum. *Homo Sporticus, 8*(2), 16-20.

Bonacin, D. (2009). Univerzalna spoznajna načela egzistencije procesa. In Smajlović, N. (Ed.) *2nd international symposium New Technologies in Sport*. Sarajevo: proceedings, (pp 48-53).

Bonacin, D., Bilić, Ž., & Bonacin, Da. (2008). *Uvod u antropološku analizu* [Introduction to anthropological analysis. In Croatian.]. Travnik: Edukacijski fakultet.

Bonacin, D., Bilić, Ž., & Bonacin, Da. (2012). *Uvod u kineziološku analizu* [Introduction to kinesiological analysis. In Croatian.]. Travnik: Univerzitet u Travniku.

Bonacin, Da. (2010). Oscilatorni procesi u kineziologiji [Oscilatory processes in kinesiology. /Master workshop/. In Croatian.]. Travnik: Edukacijski fakultet.

Lozovina, M., Lozovina, V., & Bonacin, D. (2011). Paradigm of methodological theory and mathematical modulation of sports training. *Sport Science, 4*(1), 7-18.

Lozovina, M., & Lozovina, V. (2012). Equation of sport's activity specification. *Acta Kinesiologica, 6*(1), 24-34.

Trninić, S., Jelaska, I., & Papić, V. (2009). Kinesiological, anthropological, and methodological aspects of efficacy equation in team sports games. *Acta Kinesiologica, 3*(2), 7-18.

MATEMATIČKA PARADIGMA KONTROLE TANGENCIJALNIH PARAMETARA OSCILATORNIH TRANSFORMACIJSKIH PROCESA U KINEZIOLOGIJI I EDUKACIJI

Sažetak

Cilj ovog članka bilo je predstavljanje uvodnih postavki novog modela i submodela matematičke definicije kontrole oscilatornih procesa u kineziologiji (edukaciji, ekonomiji, medicini,…). Iz navedenih primjera, očito je da transformacijski proces možemo dekomponirati na njegove sastavne sub-procese. Članak je ponudio jednu drugačiju dekompoziciju, a ona se odnosi na poseban način upravljanja i kontrole oscilatornih procesa, tj. na način da se prepoznaju kumulativni subprocesi, ali i kratkoročni efekti i konačno brzi odziv. Očito je da je ponuđeni model u ovom članku potencijalno snažan alat za identifikaciju procesa bilo kojih vrsta, a posebno kinezioloških.

Ključne riječi*: procesi, oscilacije, nadzor, parametrizacija, matematika*

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Correspondence to:
Assoc.Prof. Dobromir Bonacin, PhD.
University of Travnik
Faculty of education
72270 Travnik, Aleja konzula 5, Bosnia & Herzegovina
Phone: 00387 62 907 430
E-mail: dobromir.bonacin@st.t-com.hr