3rd International Scientific Conference
Opatija, Croatia, September 25-29, 2002

KINESIOLOGY NEW PERSPECTIVES

Proceedings Book

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Organiser:
Faculty of Kinesiology, University of Zagreb

Under the patronage of:
Croatian Academy of Sciences and Arts

Faculty of Kinesiology, University of Zagreb
Zagreb, 2002

PROCESS IDENTIFICATION

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Introduction

In the broadest sense, processes imply the events, regardless of the ways in which they are defined, connected with some objects or entities within a time interval set in a particular way. This implicitly means that there will be no process if there are no visible changes on objects monitored throughout a particular transformation. This is the reason why some previously set parameters – the variables by means of which these objects are measured – are used to describe and to monitor the transformation of objects[3,5]. In the broadest sense, a measurement implies any operation that, in congruence with a complete and accurate set of rules, makes it possible to allot a sign or a number that relates to a particular characteristic to an object which is a member of a homogeneous set of objects, so that any two objects that differ in this characteristic may be differentiated from one another according to this characteristic, and that any two objects that are identical as regards this characteristic may be considered to be identical. Thus the set of values of some variables designating a set of objects is defined. If these variables are applied in two or more consecutive time points, then it is possible to compare the data between such two points. If the results in these two points display the differences that are not the result of measurement errors, it may be unfailingly said that a process in the interval between the two time points affected the objects and induced the changes registered by a measurement. By reasonably assuming that generally at least one permanent system of events may affect the objects, and consequently the results displayed as differences, the issue of defining a process is but a decomposition of a composite process in its parts that can be described in particular phases. Likewise, by assuming that generally these systems of events, that is, the elements of the composite need not contain the phases that overlap in time, the issue of process identification apparently comes down to determining the existence, intensity, onset, duration and completion of a particular part of the process, that is, of the subsegmented process. Assuming that it is possible to collect the multivariate data in the space that extends over some variables and that it is possible to monitor the objects whose transformations we are interested in numerous consecutive time points, then the identification of kinesiological processes comes down to detecting those subprocesses that commence their dominant agency in one of these n points. Likewise, in some particular point the agency of a subprocess decreases and ceases to be dominant for the entire process, thus making way for another subprocess to commence. Process identification is simply the detection of the position of a time point within the total number of points when a subprocess becomes dominant. Kinesiological processes are too complex, and seemingly rarely allow too large a number of time points through which the performance of a set of objects is followed. However, all processes characterised by a set of acquired parameter values allow such an approach. Lately, the number of such processes in kinesiology is increasingly high, for example, in diagnostics when entities are continuously engaged in the analyses of processes on specialised devices such as treadmills implying the analysis of ventilation-related issues, in real-time heartbeat monitoring, in telecontrolled myographic analysis, in data analysis on the basis of different video and stimulation devices, etc. It is, therefore, possible to define such algorithms and such models of data synthesis that provide a reliable process identification in kinesiology, but also elsewhere.

Materials and Methods

To illustrate the process identification for the purpose of this paper, the data about the development model of pseudo-objects in a finite two-dimensional space ranging from a completely empty space to the complex phenomena occurring in it were simulated on a computer. Acquisitional collection of data in 700 time points was simulated and monitored with a larger number of variables that was eventually reduced to 14 acquisitional variables and 4 arbitrary variables. This reduction was made by clasical factor model with rotations, so only variables with significant saturations of any factor were included in further model. To achieve an accurate identification these data were taxonomized according to the model of polar taxons[6], until the general and ultimate taxon was derived. Consequently, six easily interpretable taxons were obtained: 1. communicativeness (+passivity, -activity), 2. expansion (+material, -spatial), 3. level of organisation (+complexity, -simplicity), 4. coherence (+dispersion, -compactness), 5. stableness (+stability, -variability) and 6. harmony (+order, -chaos). In that moment, the time continuum was defined by sorted taxonomic data in order with general taxon. Through the time continuum comprised of 700 points these 6 taxons were monitored for the purpose of an easier identification of subprocesses, that is, of a set of time points dominated by a particular subprocess.The results achieved by the objects in taxons obtained in this way were put into a system of cumulative data ranging from the initial (1) to the final point (700). The Indifg[6] algorithm was subsequently applied to analyse the data that were organised in this way. This algorithm decomposes the matrix of data into the left and right eigenvectors in order to identify related time points. The data for each such taxon, as well as for all taxons together were graphically presented. Smoothed representation line was generated by 5^{th} order polynomial trendline. All methods were generated from algorithms and methods for multivariate data analysis and data signal proceeing [1,2,4,6].

Results and Discussion

The data analysed in the way described previously were translated into trajectories for each of the six subprocesses. The presented Figures display the indicators of increment in each individual subprocess, that is, in the effects that comprise the total analysed process. Apparently, these six impacts (agencies) show the shapes of time distribution precisely in the way that suggests the domination of one out of the six agencies in a particular period.

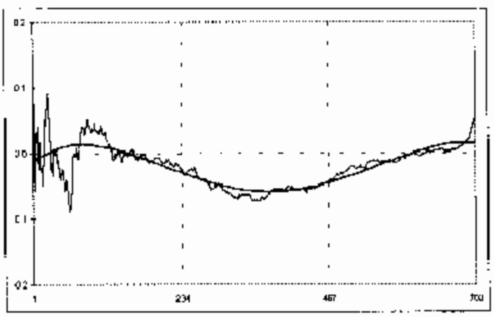

Figure 1. Communicativeness

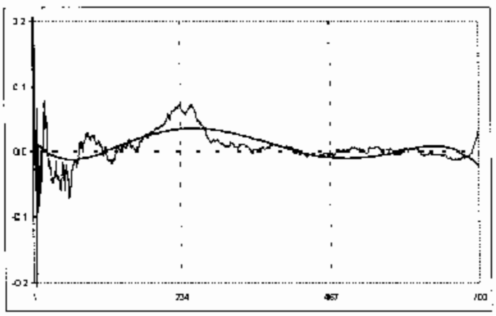

Figure 2. Expansion

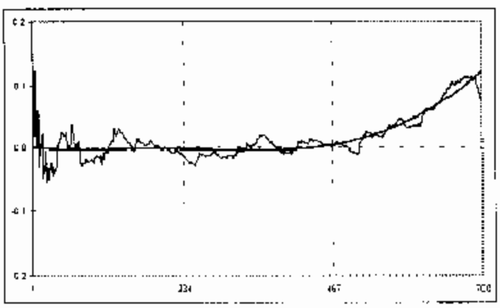

Figure 3. Level of organisation

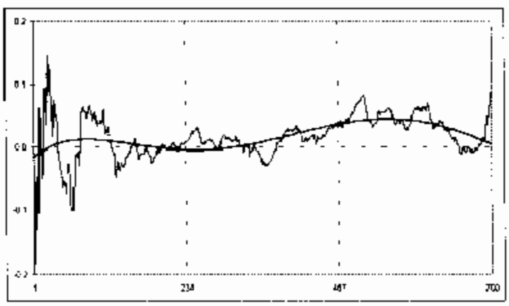

Figure 4. Coherence

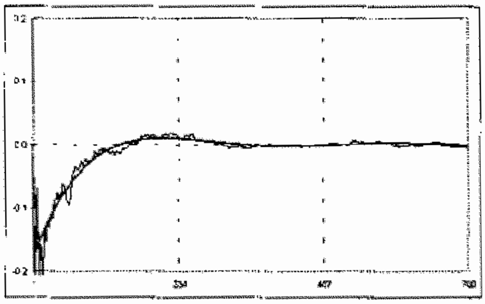

Figure 5. Stableness

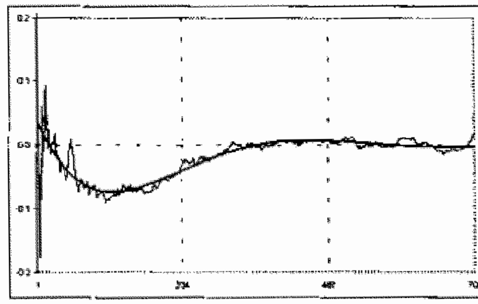

Figure 6. Harmony

At the beginning, it is instability that is dominant, which is understandable because at the beginning of each process there are numerous reasons that lead to this instability. In the end, when the total process is stilled significant passivity is expressed, because the process itself went through all previous phases. These are definitely the two basic subprocesses that indirectly describe the commencement and the completion of a process. It is obvious that stabilisation occurs after approximately 1/3 of the process (approximately at the point 234). Expansion may also be recognised within ultimate limits of the process, namely, in the first and in the second part of the process. Simultaneously, the increase in the level of organisation is mostly negative, which means that the structure of the whole process is mostly simple. Simplicity turns into complexity at the end of the process. Stableness virtually acts according to the logarithmic function, but also according to the function that describes the object that was thrown off balance and that redresses this balance slowly. Harmony behaves in the same way. Namely, immediately after the beginning of the process it takes the form of the chaos, but it stabilises already from the middle of the process onwards. Finally, coherence (dispersion) is directly in congruence with the second (longer) phase of the total process.

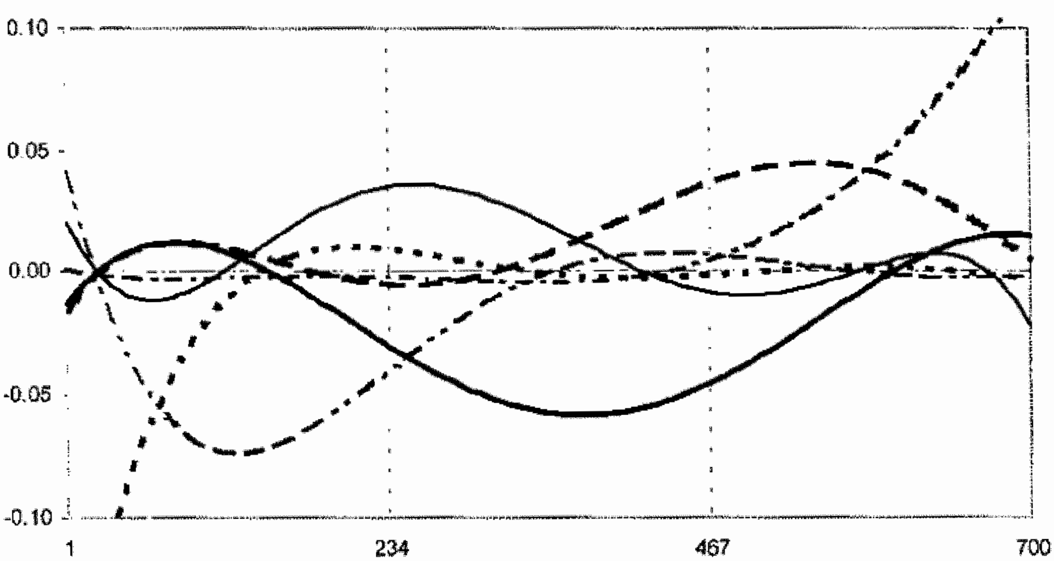

Figure 7. Trajectories of all subprocesses.
Points 1-700 with intensity ranging from -.10 to +.10

-.-- Communicativeness ---- Expansion ▬▬ Level of organisation
—— Coherence . . . Stableness ..----.. Harmony

It is easy to recognise the initial phases of the process in which the *initial uncontrolled release of energy* of the process itself is reflected, approximately up to the point 10 (approx. 1.5% of the total), which is particularly noticeable in Figures 1-6. This describes the regularities of the initial impetus of the process. Somewhere around the point No. 110 (approx. 15.0% of the total) the chaos of the process is somewhat more expressed due to the *variations* that occur between the points No. 10 and 110. Simultaneously, instability disappears and after about one third of the process the *amassing of materials (or perceptions)* is dominant and it is reflected as dispersion of the available material. This is the reason why the level of organisation decreases significantly and will continue to decrease up to approximately 50% of the total duration of the process when the expressed increase of sources amassment is completed, so that further arrangement in terms of complexity may proceed. On the whole, the listed issues describe the cognition or *learning* that is particularly accelerated towards the end of the process. Approximately at the half of the total process expansion develops, that is, the *external expansion* of additional resources. Finally, the model becomes passive because it has integrated everything that could be integrated so that it reaches the limits of the space and actually executes the *preparations for opening a new space*. These phases are very similar to the general phases of any process, also to the kinesiological procesess.

Conclusion

By means of the model of simulating the development of pseudo-objects in a finite space the subsegments of the totally defined process were successfully recognised and described. These subsegments show the domination in comparison to other subprocesses in particular periods. On the basis of the positions of certain subsegments, but also on the basis of their interactions, the bearers of the pieces of information that designate the process were identified and in terms of parameters determined as: Communicativeness, Expansion, Level of Organisation, Coherence, Stableness and Harmony. By means of the algorithm that places the polar taxons cumulatively into the Indifg position, the completely consistent and uninterrupted series of related points were obtained that described important phases of each process: 1) release of initial energy, 2) variations induced by energy, 3) collection and amassment of materials, 4) cognition or learning, 5) external integration of resources and 6) preparation for the transfer into a new process or to a new level. It may be concluded that what we are talking about here are the regularities, that is, the universal parameters and phases of a process that are transparent and easily applicable in any other field, therefore, also in kinesiology and that more attention should be paid to these issues as regards their essentials but also their utilisation for the purpose of research in kinesiology.

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