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# UNIFIED ASPECT SEARCH ALGORITHM

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## ABSTRACT

Man does the studying of systems by modelling it. Examining parameters which are describing the operation of the system is important when creating the model. The parameters required for the test are retained and the irrelevant parameters are discarded. The remainder of the model determines the aspect system of the examination. The system can be tested according to many of the disciplines. These aspect systems are not uniform. For this reason, the product of the examinations by different disciplines is difficult to compare. Placing examination on uniform basis could provide common foundation for a single modelling process. In this article an aspect search algorithm is created which is based on the philosophical topics. All disciplines can be derived from philosophy. Because of these examinations based on philosophy can be uniform. The results of the tests are comparable. The requirements for the examination can be standardized. In addition, this method makes easier to adapt the operation. For example, the operating principles of energetic, mechanical, IT and social organizations can be adapted to each other.

## KEYWORDS

system, examination, aspect, search, algorithm

## CLASSIFICATION

ACM: H.1.1
JEL: D83
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## INTRODUCTION

Man tries to understand the operation of nature, and then tries to change it according to the needs. The purpose of intervention in nature is to ensure the sustainability of human civilization. In order to understand the operation of nature and to solve problems, one observes surroundings, forms a model, specifies operational rules and then uses the results in real life [1]. A critical part of the process is creating the model. Reality is a very complicated system with many connections. Thus, modeling can only partially be solved [2]. The system components required to identify the problem are taken into account when designing the model. The unnecessary elements are omitted from the examination. The model is a virtual copy of the system. In this model one can carry out studies that should interfere with the operation of the original real system or should cause its transformation [3-6]. The validity of the model used for the examination requires minimization of subjectivity. To this end the criteria system of the competent disciplines is applied. However, the aspect system of the disciplines is not uniform. For this reason the results of the examinations are difficult to compare. By using a unified criteria set these problems can be alleviated. Since all disciplines can be derived from philosophy the examinations are based on philosophy can be uniform [7]. A unified method can be useful to investigations for technical and human systems, too.

This article contains a new algorithm based on philosophical foundations. The purpose of this algorithm is to produce a unified aspect system for analysis. Then this aspect system can be used as the starting point for modeling. Thus the basis of the examination becomes homogeneous. The results of the examinations carried out on this basis are comparable with each other. Finally in the study there is an example for use.

## PRINCIPLE OF OPERATION

The algorithm can be used in two steps. First the general logical aspect system of the given examination can be produced. Subsequently the relevant aspects of the specific system can be determined. If the general aspect system of an examination type has already existed then only the second step is to be performed. The first step of the algorithm has three procedures: dimensioning, scaling, evaluating. In the second step – when applying the algorithm to a specific system – the relevant aspects of the aspect groups should be applied.

Philosophical topics are the source poles in the procedure. Every dimension of the algorithm must be derived from the poles according to the orientation of the examination. The scaling of the created n-dimensional space should be granulated according to the details of the test. The resulting n-dimensional finite space can be interpreted as a discrete function whose value set is the Cartesian product of the scale values. Each function value defines a general aspect group. This is how the general logical aspect system of the test produces.

## PHILOSOPHICAL POLES

To use this algorithm, the topics of philosophical basic questions are considered as source points. This ensures a unified foundation. The main philosophical themes [8], their equivalent elements in the algorithm and the methods of determining aspects are:

- examination of existence: What is the purpose of being? How can continuity of existence of individuals or groups be ensured? What are the conditions for this? In the algorithm the equivalent element of this question group is the pole of existence. The relevant aspects should be determined by examining components affecting existence. The recommended methods are the study of effect time and the study of impact size [9],
- examination of knowledge: Is the structure of the system known to the extent required for modeling? How much subjectivity can be allowed for the examination of the system? In

the algorithm the equivalent element of this question group is the pole of structure. To determine the aspects the human abstraction layers and the natural layers can be tested [8],
- examination of acting: What determines the actions, operations, and functionality of the systems? How can this be modeled? What features can be identified in the functioning of individuals and groups? In the algorithm the equivalent element of this question group is the pole of function. Relevant aspects can be found by studying the features of the system. The recommended method is to find equivalency with the abstract categories of human thinking [8],
- examination of truth: Which allegation is true? What are the subjective and objective elements of truth? Is there objective truth? What kind of truth determines the validation of the system operation? How to model the first level change of systems (statogenesis)? In the algorithm the equivalent element of this question group is the pole of control [8]. In order to determine the aspects measurement, validation and control topics should be studied [3-6],
- examination of changeability: What is organic change (morphogenesis)? What system components determine the possibility and course of change? How can it be modeled or influenced? In the algorithm the equivalent element of this question group is the pole of change. This includes all the aspects that affect system change and flexibility of the system [1, 7].

The general poles (Fig. 1.) are: *existence*, *structure*, *function*, *control*, *change*.

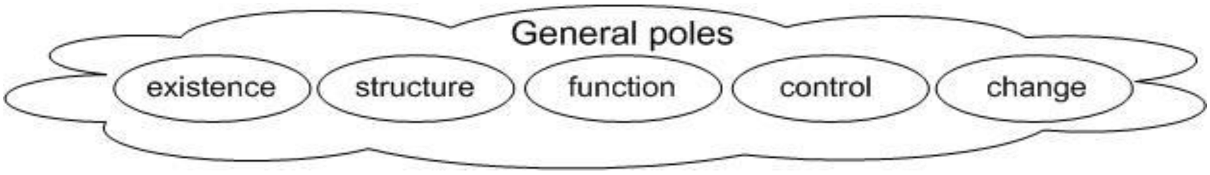


**Figure 1.** General poles based on philosophy.

## DIMENSIONING AND SCALING

Prior to conducting the test, its spectrum and orientation shall be indicated. It is necessary to analyze which elements are relevant and how detailed they will be in the modeling. Dimensions and scaling of the algorithm must be established based on these. The following should be considered:

- if the system needs to be examined from a number of independent aspects in more detail within a given pole, then a separate dimension per every aspect should be extended from the pole. This can be called branched extension,
- if there is only one aspect by a given pole then that particular pole should be extended to a dimension. This can be called a normal extension,
- if a given pole can be characterized by a single scale value, then this pole will not have an independent dimension. At the end of this process such scale values can be merged into a dimension. This can be called merged extension,
- poles that are not relevant to the whole test should not be included in the modeling. From such poles there will be neither dimension nor scale value. This can be called pole irrelevance.

Dimensioning is shown in Figure 2. Scaling and granulation follows dimensioning. It is necessary to determine the scale values of every dimension. Details of modeling can help to do this. The poles extended to single scale value should be merged in a common dimension. This common dimension can be an extended dimension of an independent pole.

## EVALUATION

The finite discrete space created after the above operation should be interpreted as a function. The output value of the function for a given spatial point is the list of appropriate scale

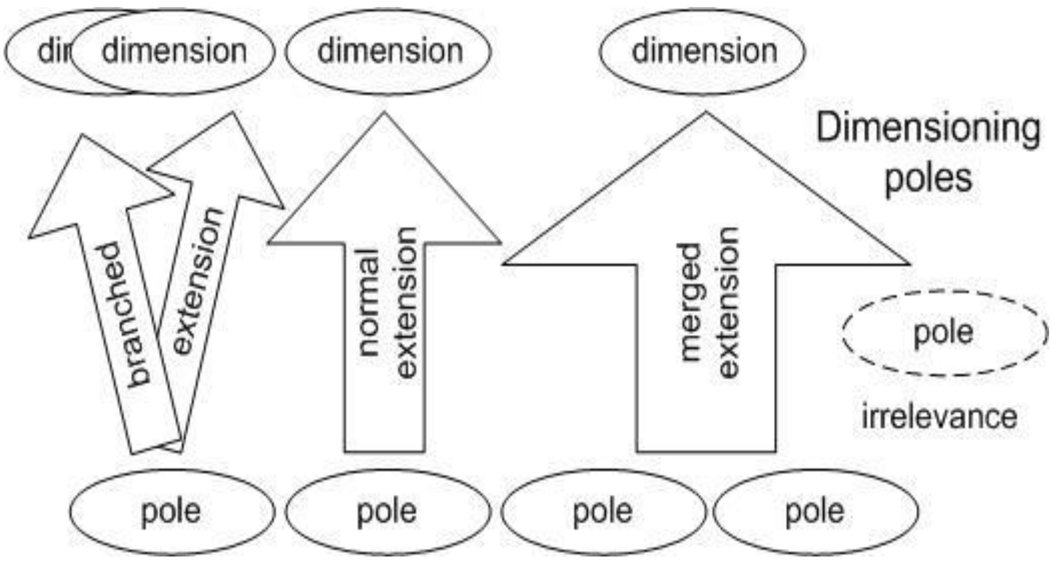


**Figure 2.** Dimensioning.

values. Thus, the value set of the function is the Cartesian product of scale values of dimensions.

The whole value set should be determined during the evaluation. The function values must be interpreted in a text-read way and extend them to sentences. This method creates the general logical aspect system. The number of the general logical aspect groups that are emerging is equal to the product of numbers of scale values. According to these aspect groups one can examine the concrete system. When applying the algorithm to a specific system the relevant aspects of the aspect groups are to be produced. This can lead to thousands of aspects of the examination depending on the complexity of the system.

## EXAMPLE FOR USE

In the following example IT clouds are examined from IT security aspect. The simplified general logical aspect of the study is generated by the algorithm. The emphasis is on examining technological and natural effects [8].

Each pole is used to produce the spatial structure. The scale values of existence dimension are determined according to the elements of the security paradigm [9-10]. The scale values of structure dimension are identified on the basis of layer structure of the cloud [8-9,11]. The scale values of function dimension are equivalent to the elements of the infocommunication paradigm [8]. The control and change poles are represented only by scale values which are added to the function dimension [3-4].

In this way a 3-dimensional space is formed (Fig. 3.). Dimensions and scale values are:

- security dimension {availability, integrity, consistency (derived from confidentiality)},
- structural dimension {fundamental-, hardware-, virtual-, operational-, management-layer},
- functional dimension {storing, transforming, transmitting, control, changeability}.

This method has a total $3 \times 5 \times 5 = 75$ general logical aspect groups. By the end of the specific evaluation, the complexity of the system can lead to hundreds of specific aspects for the study.

## CONCLUSIONS

System examinations are based on modeling. Generating a model is not easy, because reality is complicated [1-2]. In addition, the aspects of the disciplines are not uniform and the tests are often multidisciplinary. Therefore the production of the criteria system is a complex problem

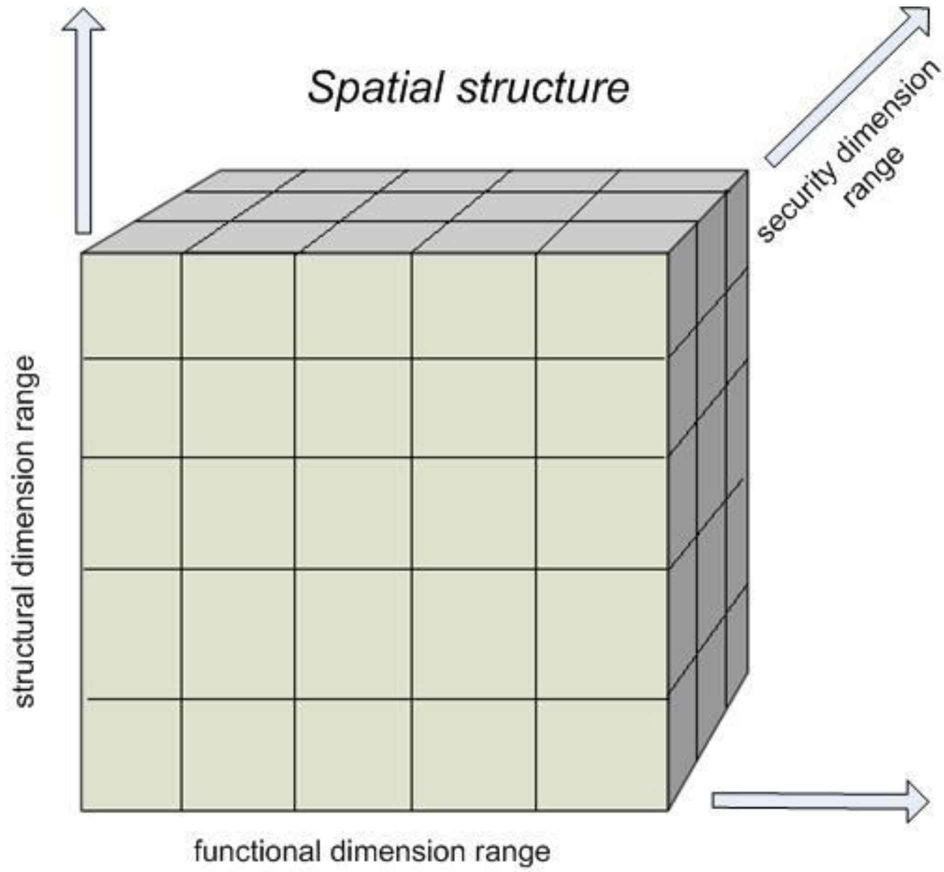


**Figure 3.** Spatial structure used for the example [8].

The previously described algorithm produces the aspect system of examination. The algorithm rests on philosophical basis. Philosophy is the ancestor of disciplines so the criteria system can replace the aspect system of the various disciplines in a uniform way [7]. Following the identification of the examination aspect system the system model is easier to create.

The starting points of the algorithm are the main philosophical themes. The boundary conditions, the orientation, and the need for details determine the algorithm. This allows to create a general logical system of criteria that is appropriate to the needs. Using this, the relevant aspect system can be produced. The example mentioned in this study confirms the usability of the algorithm.

This modeling is based on unified principles. Because of this the results of the tests are comparable [7]. In addition, this method makes easier to adapt the operation. For example, the operating principles of energetic, mechanical, IT and social organizations can be adapted to each other.

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