OPINION

by Assoc. Prof. Dr. Rosen Ivanov Pasarelski
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professional field: 5.3 Communication and computer technology

for obtaining the scientific-educational degree "Doctor" in the professional field:
5.3 Communication and Computer Engineering,
with candidate Krasnomir Milkov Krachunov
with a doctoral thesis on "Modeling knowledge for the needs of intellectual systems"

Date..08.04.2022г.

Sigh.....

1. Structure and evaluation of the content of the doctoral thesis

The doctoral thesis is formed in a total volume of 223 pages, figures, tables and diagrams. It is structured in 9 chapters, including contributions, deliverables, conclusions and opportunities for future development. The dissertation presents appendices, a list of terms, a list of diagrams, figures and tables, as well as cited literature sources. In terms of quantity, the presented doctoral thesis meets the requirements for writing a doctoral thesis at the New Bulgarian University.

In the doctoral dissertation an analysis of the existing general state of knowledge by different authors is made. This knowledge, formed in essence, is in six separate parts. The model is accepted that knowledge corresponds to certain manifestations in nature and thought. The ways of using abstract and ideal objects in knowledge processing, communication and areas of knowledge application are considered. Areas of application of knowledge as bases and principles of different logics are offered.

2. Significance of the researched problem in scientific and scientific-applied relation

The doctoral thesis is on "Modeling knowledge for the needs of intellectual systems" and the problem that the PhD student poses to study is quite philosophically oriented. In the research, the doctoral student relies on the idea that the transfer of knowledge is always at some distance. In this context, it is defined as accompanying the importance of telecommunications. It has been suggested that telecommunications should not be seen as "simple transmitters of signals", but as a means of communication through the transmission of knowledge. The term "intellectual system" has been introduced as a system that uses, processes, manages and produces knowledge. Each participant in an intellectual system has a certain amount of available knowledge. By managing this knowledge, the participant models it and thus uses it in communication, perception of knowledge from different sources, in the production of new knowledge.

The doctoral student presents his / her doctoral dissertation for obtaining the educational and scientific degree "Doctor" in the professional field 5.3 "Communication and Computer Engineering". For his part, the dissertation examines and analyzes mainly philosophical problems, thus it is assumed that the doctoral student aims to present the philosophical aspect of telecommunications. Technical issues and issues that bring significant scientific and scientific-applied contributions in the professional field 5.3 "Communication and Computer Engineering" are not thoroughly touched upon. The doctoral dissertation can be considered to have a certain scientific and applied character as a study of the philosophical aspects of telecommunications.

3. Justification of the goals and objectives in the dissertation

The main goal of the doctoral dissertation is to find the availability of general knowledge to serve as a starting point in the modeling of knowledge for different intellectual systems.

The following additional objectives have been formulated:

- to determine the place of general knowledge in a formal presentation of all knowledge.
- To systematize the general knowledge in a certain system or to build an appropriate model.
- To find a way to present general knowledge for use in communication and computer technology.

To achieve the above goals, the following tasks and methodology are set:

- to separate the many known and studied phenomena from the general phenomena and, as far as possible, to find and build a system in which these general phenomena are connected in certain ways.
- To consider and analyze a natural system composed of a number of objects.

• To consider and make a comparative analysis with another system, through which to separate at least some of the general phenomena. Carrying out a similar analysis with several other different systems will allow us to outline a range of phenomena that can be assumed to be really common.

• To develop a system of general phenomena.

• To consider and analyze the influence of this system on different moments of knowledge and in general on human activity.

The doctoral dissertation lacks research and analysis related to the scientific field of "Communication and Computer Engineering". The doctoral student has formulated and set as tasks for research mainly philosophical problems and their possible applicability and use in telecommunications. If we assume that telecommunications is an interdisciplinary field, then there is some justification for the goals and objectives set in the dissertation, but it is appropriate to set goals and objectives, focused and consistent with the claimed scientific direction 5.3.

4. Correspondence between the chosen methodology and research methodology and the set goal and objectives of the dissertation

The purpose of the doctoral dissertation is to substantiate and present the statement that there are a finite number of phenomena that meet the following conditions:

• these phenomena are common to all types of objects;

• These general phenomena are not composite - they are shown as elementary;

• Each such phenomenon has two opposites;

• Through these simple phenomena, many composite general phenomena can be constructed or formed. In principle, their number can tend to infinity;

• These general phenomena are involved in every particular subject area of nature.

• In order to achieve completeness in each private area, those private phenomena that in turn are common to the given private area must be added to the general phenomena.

The dissertation mainly examines and analyzes Gödel's theorem, the statements and proofs of the incompleteness of a wide class of formal systems, including axiomatic set theories and the arithmetic of natural numbers. In such systems, there are always situations that are unprovable and irrefutable within them. The conclusion is that there is no possibility of complete formalization of scientific knowledge. The following questions were asked philosophically:

• Once the impossibility of complete formalization of knowledge has been proven, what are the positions in the aggregate body of knowledge that are unprovable and irrefutable?

• Are there such unprovable and irrefutable positions in the system of knowledge about natural objects and phenomena?

• Are there phenomena in nature that meet such conditions - to be observed and described, but are unprovable and irrefutable? Are there such phenomena that cannot be formally explained, but only pointed out as existing?

• How do these states of knowledge relate to relevant unprovable and irrefutable natural phenomena?

• Can these phenomena be found in the general case - in relation to nature as infinity?

With the dissertation work the doctoral student sets himself the task to give some positive answer to the questions posed in this way. It is argued that in the general case, with regard to scientific knowledge, there are unprovable and irrefutable statements that correspond to a certain system of phenomena. The aim is to separate the general phenomena from the infinite number of phenomena and, as far as possible, to find and build a system of knowledge in which these general phenomena are connected in certain ways.

I believe that the goals and tasks set in this way, considered and analyzed in the philosophical aspect of telecommunications are in accordance with the chosen research methodology in the dissertation.

5. Scientific and scientific-applied contributions of the dissertation

The main contributions of the doctoral dissertation are:

1. Provisions have been found that apply to all natural manifestations and meet two conditions: 1) to be elementary; 2) according to Gödel's theorem, they are neither proved nor disproved.
2. The main task set as the goal of the research has been solved. With regard to natural science knowledge, those unprovable and irrefutable positions are indicated and arranged in a system, which perform the functions of axioms or accepted positions, from which according to certain rules knowledge for different areas of human knowledge and existence is built and used.
3. A list of the obtained axioms is made and the places are indicated by schemes and tables, where their place in a general structure is described. Those natural manifestations that are described with this knowledge are indicated. These axioms correspond to a certain number of natural manifestations, which can be mentioned as general. A selection of manifestations in nature has been made, which are listed as common.
4. At least one desired and desired result has been obtained - these initial phenomena as concepts and categories can and do serve as a basis for creative techniques.
5. A general type of research task for the presentation of knowledge is indicated: general provisions are defined as primitives through which manifestations are obtained. Manifestations are disposition, movements, actions and connections. These manifestations can be taken for granted or primitives, from which the provisions concerning communication or communication are derived. The main areas of application of knowledge can be defined by the following opposites: material-ideal, perceived-represented. These four positions can be changed and arranged in the following sequence: Material - perceived - presented - ideal. A scheme has been developed for these four main points, which makes it possible to illustrate the use of knowledge and some conclusions.
6. The connection between the main areas of knowledge and the logics by which knowledge is built and expressed is indicated. By nature - cause and effect, perceptions give us the identification or recognition of things. Imagine - you can choose from many options. From the ideal objects - accuracy in comparing things. The developed example shows a way to use the available knowledge and their structuring according to the development.
7. A proposal for a project for smart cities and funding has been presented. The practical implementation of such a project is possible with the joint work of many organizations of different types. Phases of implementation of a possible project have been introduced, as follows:

- making a decision to build such a system in a city - municipal decision.
- Necessary technologies.
- Ability to process large data sets, turn them into knowledge and make regulatory decisions. Need to manage relevant knowledge.
- Management of such a system - centralized in relation to the whole city. It is done through artificial intelligence. Appropriate software is required. Which means the participation of computer and software companies.

• Communication system - ensures the transmission of data from various sources to the artificial intelligence system and the transmission of relevant instructions to the end units. In general, data sources and endpoints are different.

• Necessary funds. Financial and partnership.

• Survey of public attitudes.

• Legal security. Personal integrity and space.

• Copyright, Patents, know-how. The general provisions of knowledge allow them to be used in the development of each specific project and each of its parts.

The contributions indicated in the doctoral thesis can be defined as scientific-applied, taking into account that the dissertation considers and analyzes mainly philosophical aspects. Technical issues and issues that bring significant scientific and scientific-applied contributions in the professional field 5.3 "Communication and Computer Engineering" are not thoroughly covered.

6. Evaluation of the dissertation publications

A total of 6 publications on the topic of the dissertation are presented. As numerical indicators, the publications meet the requirements regarding the volume of publication. The publications are of scientific-applied nature. Significantly, these publications would be high in another professional field, such as 2.3 Philosophy.

7. Citation from other authors, reviews in the scientific press and others

Citation from other authors and reviews in the scientific press about the dissertation and the presented publications of the doctoral student are not known to me.

8. Opinions, recommendations and comments

I will allow myself to make two recommendations to the PhD student and the presented dissertation:

- to find a better balance between the scientific and applied orientation of the research and the performed analyzes by linking it to a current problem in the field of communication and computer technology.
- To publish future scientific and applied articles with technical orientation in more peer-reviewed and referenced Bulgarian and international specialized publications, registered in world databases, as well as presenting the reports at prestigious international scientific forums. This will provide opportunities for wider acquaintance of the scientific community with the results of the author's research, for the implementation of citations, reviews in the scientific press and to establish useful contacts and possible cooperation with Bulgarian and foreign scientists and professors.

My personal opinion is that the doctoral dissertation has many merits and I advocate that the doctoral student needs to link the researched and analyzed problems in his work with topics in the professional field 5.3 "Communication and Computer Engineering", in which he is a candidate for scientific and educational degree "doctor".

9. Conclusion

The presented dissertation work by the doctoral student Krasnomir Milkov Krachunov explores a philosophically oriented problem of modeling knowledge for the needs of intellectual

systems. As a volume and structure, the presented doctoral dissertation meets the legal requirements and the normative requirements for writing a doctoral dissertation at the New Bulgarian University. The materials submitted in this procedure as publications are of scientific-applied nature and meet the requirements regarding the volume of publication.

In conclusion and based on all the above, I believe that the doctoral dissertation has many merits, but it is necessary for the PhD student to link the researched and analyzed problems in his work with topics in the professional field 5.3 "Communication and Computer Engineering".

I abstain and recommend to the members of the Scientific Jury to vote for the scientific-educational degree "Doctor" in professional field 5.3 "Communication and Computer Engineering" at the New Bulgarian University by PhD candidate Krasnomir Milkov Krachunov on inner feeling and dignity of work.

08.04.2022

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