REVIEW

by

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About the dissertation: *Modelling Knowledge to Meet the Needs of Intelligent Systems* by PhD Candidate Engr. Krasnomir Milkov Krachunov for acquiring an educational and scientific degree "Doctor" in professional field 5.3 "Communication and Computer Technology", scientific specialty *Telecommunications*

Представеният ми за рецензия дисертационен труд от Engr. Krasnomir Milkov Krachunov, year of enrollment 2014/2015, Assignment Order З-РК-№ 585/17.07.2014; Assignment Completion order З-РК-194/29.05.2019, F. No. 075319 – PhD student (with an individual program) within the Telecommunications Department, themed: *Modelling Knowledge to Meet the Needs of Intelligent Systems*, with a scientific advisor: Assoc. Prof. Iosef Avramov Avramov, PhD.; professional field 5.3 Communication and Computer Technology, scientific field *Telecommunications*. In his dissertation, the PhD student covers certain aspects of the intelligent systems, through which such knowledge-based interactions will be understood. The preliminary version of the dissertation consists of a basic text and two annexes and amounts to 265 pages in total, the bibliography contains 69 titles. Since, according to the author, the main objective of telecommunications is the transfer of knowledge and this explains the need to explore the knowledge in this area as well, as usual in a compressed format. What is outlined as the main goal of the dissertation is to find a set of general principles in the knowledge system, which should be used partly or together as a basis for modelling knowledge systems for different intellectual applications. What is set as a criterion for defining the general principles of knowledge is Goydel's conclusion on the incompleteness of formal systems, which when applied to knowledge means that within the knowledge database there are such principles, which are neither verified, nor refuted. Regarding natural scientific knowledge, such unverifiable and irrefutable principles, which correspond to a particular system of phenomena. This data set of knowledge describes the general principles of nature. The author expresses the hypothesis, that, for the purposes of communications, certain manifestations in nature can be described as entities of phenomena and interactions, which are shaped as packages, phases, and beats. Examples are also provided. A formal representation of knowledge is demonstrated. Presented as abstract objects of knowledge, including general principles, such entities can be used to develop any scientific theories. The observer or investigator is always center stage, due to certain limitations, perceives things with certain distortions. To obtain the true picture, a revision of the observations is carried out. The search for common and elementary phenomena will be carried out in two directions: from the point of view of nature and from the point of view of knowledge. The ways of examining, separating, and arranging the general principles in nature are based on the attitude of all things in nature and any natural manifestation, where each individual thing (any natural manifestation) plays the role of the touchstone (see Feinman's quote); Newton's Laws have also been used. Regarding knowledge of nature, these generalities correspond to a system of axioms, which are used in the development of various scientific theories. Using the general provisions, the dissertation schematically examines the structure of the general principles and conditions for the connection in telecommunications, smart cities, the financing of their construction. The thesis was duly shaped according to the standard requirements for interdisciplinary dissertation. The list of terms used indicates knowledge which different authors have identified as general.

CONTRIBUTIONS AND PERSPECTIVES OF THE DISSERTATION WORK

1. The principles that apply to all natural manifestations have been found and they meet two conditions: to be simple; according to Goedel's theorem to be neither verified, nor refuted. They are laid out in Table 2.2.

1. The main task set out in the introduction as the objective of the study has been. In terms of natural scientific knowledge, those unverifiable and irrefutable situations are specified and arranged in a system, they perform the functions of axioms or accepted positions, of which, according to certain rules, knowledge of different fields of human knowledge and existence is built up and used. Table 6.22 lists the axioms obtained and lists the places (diagrams and tables) where they are described in a common structure. These natural manifestations, which are described by this knowledge are pointed out. These axioms correspond to a certain number of natural manifestations that can be identified as general. The PhD student has selected events in nature that are referred to as general.

2. About creativity: At least one of the searched and desired results has been obtained – these initial phenomena such as concepts and categories can and do serve as the basis for creative techniques. A common type of research task is also indicated. Point 7.4

3. About the presentation of knowledge: The general provisions, laid out in Scheme 6.10, can be defined as primitive entities, through which the manifestations in Table 6.4 are achieved. The manifestations are positions, movements, actions, and connections. These manifestations can be taken for granted or can be primitive, and they render the positions in Table 6.6.

4. On communication: The main areas of application of knowledge can be determined by the following opposites: material vs. ideal, perceived vs. presented. These four positions may be amended and arranged in the following order: Material – perceived – presented – ideal. A scheme has been developed according to these four main positions, and it provides an opportunity to demonstrate the use of knowledge as well as to draw some conclusions. (Scheme 7.1, Scheme 7.2 и Scheme 7.3).

5. The link between the main areas of knowledge and the logic used to build up and express knowledge have been pointed out. From nature – cause and effect, perceptions give us the identification or recognition of things. The ideas – a choice can be made from many options. From the ideal objects – accuracy in comparisons of things. The characteristics of knowledge by area are set out in Fig. 7.1.

6. The example developed shows how to use the available knowledge and its structuring, according to the dissertation. Cf. Appendix No. 2 “Straight-line movement of a solid body”.

The possibilities for the practical implementation of such a project have been discussed with the possibility of working together with multiple organizations of different types.

1. Deciding to build such a system in a city – municipal decision.

2. Ability to process large data sets, their transformation into knowledge and making regulatory decisions. Необходимост от управление на съответните знания.

3. Managing such a system – centralized regarding the whole city.

4. It is carried out by artificial intelligence. Appropriate programming provision is required.

5. Which means participation of computer and software companies.
6. Communication system – provides the transmission of data from different sources to the artificial intelligence system and the transmission of the relevant instructions of the end points (traffic lights). In general, data sources and outputs are different.
7. Necessary means. Funds and partnerships.
8. Studying public attitudes.
9. Legal provision. Privacy and space.

1. Copyright. Patents, know-how.

Assessment of the degree of personal participation of the PhD Candidate in the contributions.

I have known Engr. Krasnomir Milkov Krachunov as a colleague in the New Bulgarian University Administration and I have great impressions of his professionalism, dedication, and loyalty. Considering the fact that the defence of his dissertation has been postponed several times, and it was not his fault, I believe that the revised work thus presented deserves to be assessed with due respect, and that it is an interesting insight into knowledge management systems and can serve as a starting point for future research for other professionals in the field of knowledge management in telecommunications.

PUBLICATIONS ON THE TOPIC

The PhD student has presented a total of six author's publications on the topic of the dissertation, covering the entire period when he has been assigned as a PhD student with an individual program 2010-2017г.

1. Krasnomir Krachunov, *Some specific features in the knowledge presentation and production and the possibility for their being used by robots*. Conference proceedings from the 19th Anniversary National Scientific and Technical Conference with international participation AUTOMATION OF DISCRETE PRODUCTION, ADP 2010, Publishing house of TU-Sofia, 2010, ISSN-1310-3946
2. Krasnomir Krachunov, *Presentation of knowledge about artificial intelligence. Theoretical possibility for a common solution*. Conference proceedings from the 21st International Scientific and Technical Conference AUTOMATION OF DISCRETE PRODUCTION, ADP 2012, Publishing house of TU-Sofia, 2012, ISSN-1310-3946
3. Krasnomir Krachunov, *Structural Diversity Of An Intellectual System – Attempt To for a Summary*. Bulgarian Journal of Engineering Design, Issue 11, April 2012, ISSN1313-7530
4. Krasnomir Krachunov, *About earth's initial history (hypothesis attempt),* Conference proceedings from the 3rd Annual Scientific Conference TURNING GREEN 2011, New Bulgarian University, http://ebox.nbu.bg/eko2012/ ISBN 978-619-233-047-7
5. Krasnomir Milkov Krachunov, *Areas of Knowledge Application*, Annual Academic Journal of the *Telecommunications* Department - eISSN 2534-854X, New Bulgarian University – Sofia, 2017, http://www.telecommunications.nbu.bg/bg/yearbook
6. Krasnomir Milkov Krachunov, *Areas of Knowledge Application*: Basics and Fundamentals for Different Logical Systems, , Annual Academic Journal of the *Telecommunications* Department - eISSN 2534-854X, New Bulgarian University – Sofia, 2017, http://www.telecommunications.nbu.bg/bg/yearbook

Conclusion:

I believe that the dissertation paper presented by Krasnomir Krachunov *Modelling Knowledge to Meet the Needs of Intelligent Systems* may be submitted for public defence before the scientific panel, by voting "FOR THE AWARD OF THE EDUCATIONAL AND SCIENTIFIC DEGREE “DOCTOR".

28.03.2022 Signature: .....

/Assoc. Prof. Georgi.Petrov, PhD/