# O P I N I O N

**of a dissertation for obtaining an educational and scientific degree "Doctor"**
**Author:** Mag. Yordanka Lyubomirova Boneva
**Topic:** OPTIMIZATION OF TRAFFIC IN URBAN ENVIRONMENT
**Field:** 5. Technical sciences,
**Professional field:** 5.2. Electrical engineering, electronics and automation
**Scientific specialty:** "Application of the principles and methods of cybernetics in various fields of science"
**Member of the Scientific Jury:** Prof. Dr. Dimitar Karastoyanov, IICT-BAS

The dissertation presented for my opinion is structured in Introduction, 4 chapters and Conclusion. It has a volume of 132 pages with 37 figures and 11 tables. The bibliography includes 122 literature sources (103 in Latin and 19 in Cyrillic). In connection with the work are presented 5 publications (2 are in magazines, 3 are in conference proceedings). 4 of the publications are independent, 2 of them are with SJR. There are 2 citations and 2 participations in projects. No documents for protection of intellectual property have been submitted.

The work was developed at IICT under the scientific guidance of Prof. Dr. Todor Stoilov.

### 1. Relevance of the problem developed in the dissertation in scientific and scientifically-applied terms

The dissertation is in a promising and current field of technologies for optimizing traffic in urban environments, which has been the subject of intensive research in recent years. The proposed approach through bi-level optimization and simulations in Aimsun environment enriches and further develops the knowledge and methods for solving problems in the field, leads to increased functions and capabilities and creates conditions for expanding the areas of application. All this determines the relevance and significance of the research in scientific and applied terms.

### 2. Degree of knowledge of the state of the problem and the literary material and creative interpretation of the literary material

Basic concepts in traffic management are systematized and an in-depth review and analysis of modern methods, tools, models and technologies for traffic management in urban environments is performed. As a result, unresolved issues have been defined. On this basis, the doctoral student has correctly formulated the purpose of the dissertation and the tasks for its achievement.

I believe that the candidate knows very well the current situation in the field and has the necessary capacity to obtain new results.

### 3. Correspondence of the chosen research methodology and the set goal and tasks with the achieved contributions

In accordance with the purpose of the dissertation, it analyses types of models and tasks for network management of intersections in urban environment and offers innovative approaches and simulations for solving a bi-level optimization problem.

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From the obtained results it can be concluded that the chosen research methodology is adequate to the set goal and objectives of the dissertation, which fully correspond to the achieved contributions.

### 4. Characteristics and evaluation of the dissertation

The PhD student demonstrates the in-depth knowledge of the problems and the use of appropriate modern tools for solving the set tasks. A mathematical model is proposed through two hierarchically related tasks for optimizing urban traffic. An innovative approach has been developed through a simulation computer model of a network of intersections, allowing to take into account additional conditions in traffic management. Experiments and simulations were performed with the proposed approach and structure for real-time management through a bi-level model. The obtained results are analysed and the efficiency of the development is proved. The presentation of the obtained results is in a methodical sequence, as they are commented in detail and are supported by data and evidence. Based on them, the relevant conclusions have been made.

I give positive evaluation to the research and the developments.

### 5. Scientific and scientifically-applied contributions of the dissertation

I accept the contributions formulated by the author, which are scientifically-applied and applied.

The received scientifically-applied and applied contributions can be referred to the groups: proving with new means of essential new sides of already existing scientific fields, problems, theories, hypotheses; creation of new classifications, methods, constructions, technologies and obtaining confirmatory facts, constructions and methods and enrichment of the existing knowledge with practical application.

### 6. Assessment of the degree of personal participation of the dissertation in the contributions.

The dissertation and its contributions are the personal work of the PhD student under the competent guidance of the supervisor.

### 7. Evaluation of dissertation publications

In connection with the dissertation 5 publications were made. There are 2 citations, results of the dissertation have been used in 2 research projects.

The presented publications on the dissertation work reflect sufficiently fully and accurately significant aspects of its content and promote the work done.

### 8. Significance of the results of the dissertation work in science and practice

The results of the dissertation can be relatively easily used in the activities of companies and organizations involved in building a system for urban traffic management.

### 9. Opinions, recommendations and remarks

The good literary awareness, the used appropriate methods and approaches for research, the obtained experimental material, its processing, presentation and its creative interpretation, speak about the high professional qualification of the PhD student and give the dissertation and work qualities of methodically correctly constructed, reliable and scientifically sound theoretical-experimental research, which also has a certain practical orientation and significance.

I have no significant remarks with which to dispute the main scientifically-applied and applied contributions of the candidate. Comments may be made regarding unresolved editorial, terminological and technical errors.

The topicality of the issue and the results obtained from the dissertation give me reason to recommend the candidate to look for opportunities to summarize the results in an appropriate form and publish them in indexed and referenced journals.

## CONCLUSION

Based on my acquaintance with the dissertation work and the materials on it, the fulfilled educational goal of the doctoral program, the topicality and significance of the achieved scientifically-applied and applied contributions, I confidently give a POSITIVE assessment of the dissertation work. All requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria, of the Rules for its implementation, as well as the Rules for specific conditions for the acquisition of scientific degrees and for academic positions at IICT-BAS regarding the scope, volume and quality of the dissertation.

On these grounds, I propose to Mag. Yordanka Lyubomirova Boneva to be awarded the educational and scientific degree "Doctor" in the field 5. Technical sciences, professional field: 5.2. Electrical engineering, electronics and automation, scientific specialty: "Application of the principles and methods of cybernetics in various fields of science".

18 February 2021
Sofia

Prepared by: ...................................
/ Prof. Dr. Dimitar Karastoyanov /