

R E P O R T

on the competition with a single applicant

Dr. Todorka Gerasimova Aleksandrova

Scientific field: **4. Natural sciences, mathematics and informatics**

Professional field: **4.6. Informatics and computer science (Human-Computer interaction)**

Announced in “Durzhaven vestnik” no. 52/02.07.2019.

The competition is announced in “Durzhaven vestnik” no. 52/02.07.2019 g. There is one application for the position by:

as. d-r Todorka Gerasimova Aleksandrova.

1. Personal Data

Todorka Aleksandrova is born on 01.03.1978 in Sofia. She graduates from the Faculty of Mathematics and Informatics at Sofia University in 2003 with a specialization in algebra. In 2008 she receives a PhD degree from the University of Electro-Communications in Tokyo, Japan, for a thesis entitled. “A study of (t, n) -threshold secret sharing schemes based on a vector space construction”. In the years from 2008 through 2018 she is a research assistant in Tokio Metropolitan University, assistant, assistant professor and associate professor at Waseda University in Tokyo. Since November 2018 to present, she is an assistant in the Institute of Mathematics and Informatics - BAS.

2. Research Activity

The applicant presents 22 scientific articles. Three of the are published in respectable scientific journals with an IF. The remaining articles are published in workshop proceedings. Five of the have SJR and the rest are indexed by Scopus or are visible in the ACM Digital Library. The papers are published as follows:

- Multimedia Tools and Applications Journal - 2; (IF 1.530; 1.331)
- Multimedia Systems Journal - 1; (IF 0.596)
- Advances in Intelligent and Soft Computing - 1; (SJR 141)
- Lecture Notes in Computer Science - 2; (SJR 0.346)
- Lecture Notes in Electrical Engineering - 2; (SJR 0.115)
- Proc. of the Int. MindTrek Conference (MindTrek2013) - 1.

- Proc. of ACM SIGCHI Conf. on Human Factors in Computing Systems - 3;
- Proc. of the 22nd Int. Conf. on World Wide Web - 1;
- Proc. of the 6th Int. Conf. on Advances in Computer-Human Interactions - 2;
- Proc. of the 2012 Int. Symp. on Inf. Theory and Its Applications – 1;
- Proc. of the 2011 IEEE Int. Conf. on Service-Oriented Computing and Applications - 1;
- Proc of the 2011 Int. ACM Workshop on Ubiquitous Mate User Interfaces - 1;
- Proc. of the 17th IEEE Int. Conf. on Embedded and Real-Time Computing Systems and Appl. - 1;
- Proc. of the 9th Int. Conf. on Mobile and Ubiquitous Multimedia - 1;
- Proc. of the 2010 Int. Symposium on Information Theory and its Applications -1 ;
- Proc. of the 2010 IEEE Int. Conf. on Wireless Comm. Networking and Information Security - 1.

Ten of the presented papers have two co-authors, eleven have three, and one has five co-authors.

All papers are written and published after the acquisition of the PhD degree.

The scientific research of the applicant corresponds thematically to the description of the position.

- **Navigating human behaviour by enhancing the real world with information technologies.**

In this group fall publications [1,2,3,4,7,8,9,11,12,13,14,15,17]. They have as common feature the use of information technologies for enhancing the real world and its improvement.

Papers [1] and [7] discuss two versions (a computer and a table version) of the so-called Trading Card Game and considers possibilities for the improvement of the computer version. The authors suggest a new version the – Augmented Trading Card Game. It is presented in detail in publications [8], [9] i [12].

In [17] several ideas are presented for preserving or recovering the reality of the virtualized world. It is believed that these ideas are important in the design of future cyber-physical systems.

Papers [13] and [15] describe three examples of adding virtual forms to really existing objects these are Virtual Aquarium, Augmented Go and Augmented Trading Card Game. Paper [2] continues and generalizes the previous two papers. The focus is on

the development of intelligent artifacts enhanced with virtual forms that influence the human attitude and behaviour.

Paper [11] investigates the possibility to gamify the daily activities by embedding computers in our environment. The authors propose a value-based gamification framework for increasing intrinsic motivation in daily life.

In [3] and [4] a new approach is investigated to the problem of the people motivation to participate in activities supporting and contributing to the sustainability of small common resources. The used method is crowdfunding. It is based on the idea of local currency and supports the social mechanisms to achieve balance between economic and social structures.

Paper [14] proposes a novel approach to persuasive technology based on children-parent interaction. It is implemented in a smart pad application and is expected to contribute to the natural resource consumption problem by raising awareness and encouraging informed decisions.

- **Using crowdsourcing for knowledge search and exchange.**

This group involves papers [5,6,16,18,19,20]. They are devoted to a new technology called crowdsourcing based on Web 2.0. It consists in engaging a group of people for the achievement of a common goal. This might be an innovation, solution of a problem or simply the achievement of a higher efficiency.

In [16,19,20] a crowdsourcing platform UbiAsk is presented. It is based on social media and offers a translation from Japanese to foreigners in Japan. The solution differs from the usual image recognition which is quite ineffective in real situations. A real-time experiment is performed to investigate the speed in getting an answer. In [18] the authors discuss the idea of applying gamification in designing intelligent environments to improve the overall user engagement. The considered examples are the applications UbiAsk and EcoIsland, which motivates the users to participate in the reduction of carbon emissions.

Paper [6] describes a real-time service MoBoQ, deployed in China. It is location-based and consists in asking questions that are temporal- and geo-sensitive and answering them by crowdsourcing from other users. The system analyzes the live stream from public microblogging service Sina Weibo to identify people who are at place that is associated with the question and to send them the unsolicited question. In a follow-up paper [5] a crowd-based system is explored for facilitating natural information flow among different types of people.

- **Applications of secret sharing schemes**

In the papers in this group the Dr. Aleksandrova investigates various applications of secret sharing schemes to data protection of the transmitted data in computer

networks. These are papers [10], [21] and [22]. These papers treat subjects close to the reserch of the candidate in her PhD Thesis.

In papers [10] and [21] methods for achieveing anonymity in peer-to-peer networks are presented. They make use of known secret sharing schemes. A mutually anonymous decentralized protocol is presented which achieves a higher level of security. In [22] The proposed algorithm for secret sharing of images is realized by applying secret sharing schemes based on two variable one-way functions and Shamir secret sharing schemes.

3. Main results

In my opinion the most important scientific results of the candidate are the following:

- (1) A conceptual framework for gamification is developed which increases the motivation of the users and encourages a certain type of behaviour.
- (2) A system for microcrowdfunding is developed which motivates people to participate in activities supporting and contributing to the sustainability of small common ressources.
- (3) A mobile crowdsourcing platform UbiAsk is developed based on social media.
- (4) A mutually anonymous decentralized protocol is developed that uses threshold secret sharing schemes and achieves higher security level than the existing ones.

4. Teaching Activity

Dr. Aleksandrova is an experienced lecturer. She taught courses in various desciplines like Introduction into computer science, Information security, Linear algebra, Probability and statistics, Discrete mathematics, Codes and ciphers, Mathematical foundations of computer science at Waseda University and the University of Electro-Communications, Tokio. She is the advisor of two PhD students who already obtained their degree, as well as of several mastrs students. In 2016 she received the best teacher award of Waseda University for the course "Introduction to probability and statistics".

5. Projects, Conferences etc.

In 2014-2015 Todorka Aleksandrova is the coordinator of a research project in Waseda University entitled "Achieving Mutual Anonymity and churn resilience in peer-to-peer networks using regenerating codes". She participated with talks in many conferences on Informatics mainly in Japan and the Far East.

Since her arrival in Bulgaria Dr. Todorka Aleksandrova participates actively in the project activities of Department "Mathematical foundation of informatics" at IMI BAS. In the period 2000-2005 she took part in the organization of the international workshops on ACCT, as well as in the national seminars on Coding Theory and applications.

6. Numerical Data

The presented papers by Dr. Aleksandrova can be classified as follows:

- scientific journals with IF: 3
- scientific journals with SJR: 1
- conference proceedings with SJR : 4
- conference proceedings without SJR : 14

The total impact factor of the presented papers is 3.457, and the total SJR index is 1.063. The candidate has presented for the competition 20 citations. Thirteen of them are in refereed journals and seven in the proceedings of scientific conferences.

7. Critical Remarks.

I have no notable critical remarks.

8. Personal Remarks.

I have known the candidate for twenty years. I have attended several of her talks at various workshops. My impression is that she is a serious researcher with deep knowledge in the field of cryptography and informatics, in general. It is beyond any doubt that she meets all requirements for the academic position of associate professor at IMI - BAS.

9. General Assessment of the Applicant

In my opinion Dr. Aleksandrova has obtained important scientific result that are original and match the level of contemporary informatics. Thus I assess positively the application of Dr. Aleksandrova for the position of Associate Professor in IMI - BAS in the professional field 4.6. Informatics and computer science (Human-Computer interaction).

Conclusion

I deeply convinced that **Dr. Todorka Gerasimova Aleksandrova** has all the merits and professional qualifications required for the position of associate professor of the Institute of Mathematics and Informatics at the Bulgarian Academi of Sciences. She fulfills all the legal requirements plus the specific ones of IMI at BAS for the scientific field 4. Natural sciences, mathematics and informatics, professional field 4.6 Informatics and computer science (Interaction Human-Computer). I strongly recomend her application for the position of an associate professor at IMI - BAS.

Sofia, 25.10.2019

Member of the Scientific Panel:

(Prof. DSc Ivan Landzhev)