



# *International Academy of Noosphere*

## *Book Activity of Tallinn Research Group*

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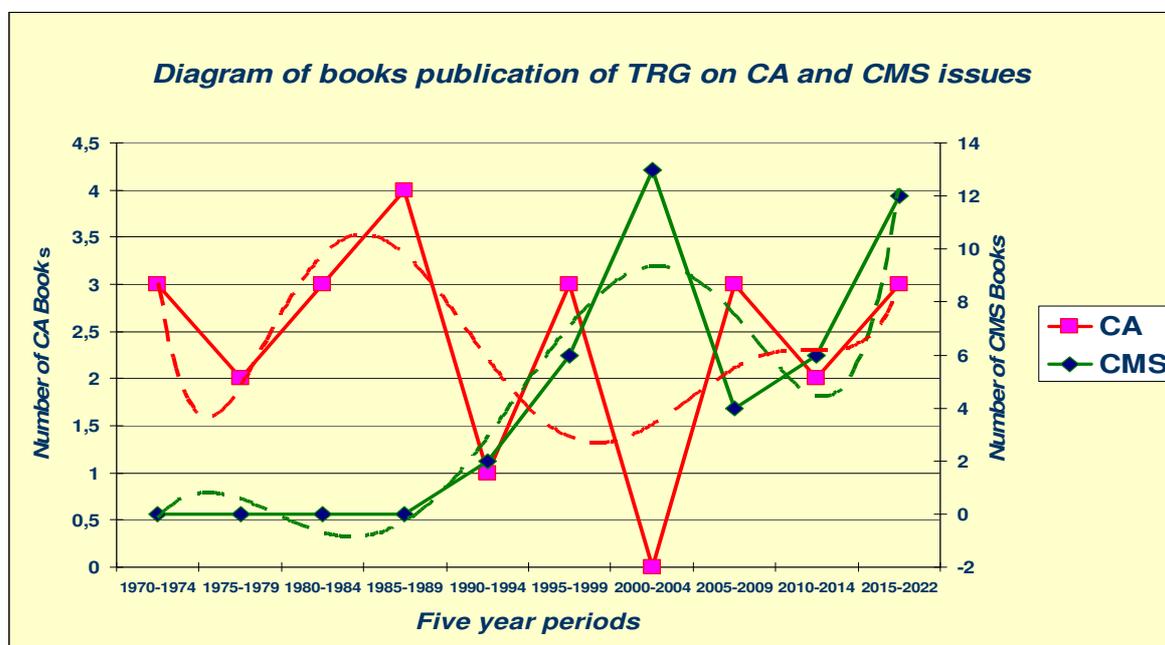
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Formation of *Tallinn Research Group (TRG)* dates back to **1969** with emergence of our interest in the problematics of *cellular automata (CA)*. Research in this direction led to publishing of ones of the first domestic works on *homogeneous structures (HS)* [1–3], this term subsequently was superseded by term "*classical cellular automata*". These publications, along with a number of fundamental results, introduced Russian-language terminology for the main definitions and concepts of the *CA* problematics, while book [3] was nominated as the best monographic publication of the Academy of Sciences of the *ESSR* for 1972. Starting his creative activity with intensive enough research on *HS/CA* problematics [4], subsequently *TRG* sphere of interest expanded significantly, covering such diverse areas as general statistics, operating systems and programming on larger computers and on personal computers, database management systems (*DBMS*), computer science, automated control systems (*ACS*), mathematical biology, preparation of articles, books, textbooks and monographs, conducting lecture courses on these and other topics. A review of the *TRG* activities during the period **1970–2022** can be found in monograph [5], whereas more detailed analysis of *TRG* activities over certain periods are presented in [6,7]. During their activity, the *TRG* members prepared and published (*mainly in Russian and English*) a large number of scientific and technical works of various types: articles, reports, books, textbooks and monographs. Meantime, it should be noted that over time, *TRG* activity in the above directions had a different degree of intensity, sometimes dropping to zero, but since **1985** such two directions of activity as cellular automata theory (*CA*) and computer mathematics systems (*CMS*) were always presented in the *TRG* sphere of interest.

Among the *TRG* publications on the above topics, the vast majority fall on the issues of *CA* and *CMS*, however, due to their multiplicity, we will analyze only comparative distribution of book publications over the five-year periods of *TRG* activity. In this regard, based on the series representing the distributions of the number of books that were published by *TRG* by cellular automata theory (*CA*) and computer mathematics systems (*CMS*) during five-year periods of activity, the diagram below is built which allows to visualize a number of properties of the considered book dynamics.

Firstly, it follows from the diagram below that the books publication on *CMS* issues originates to the period **1990–1994**, or rather at **1991**, whereas on *CA* problematics at the initial period **1970–1974**, or rather, at **1971**, that is, there is a rather significant time lag, almost **20** years, between both series of book publications. This time lag is

explained by a completely natural reason – if **TRG** research on **CA** problematics were as a basis for the formation of the **Group**, then work on **CMS** issues began already at the dawn of appearance of satisfactory enough samples of these systems on personal computers, i.e. at the end of the nineties of the last century. This shift in emphasis was due to both a sharp increase in interest in the **CMS** subject in various theoretical and applied areas, and their inclusion in university courses of natural science profile.



Secondly, the dynamics of book **CA** publications is to some extent periodic in nature to a certain extent reflecting the nature of **TRG** interest to this problematics, which is pretty clearly illustrated by the polynomial trend. A characteristic feature of the **CA** distribution is the presence of five periods with the same number of published books, more precisely three books in each of five considered periods (*of ten*), which in itself indicates a fairly high **TRG** activity at **CA** problematics. As for the **CMS** distribution, from the initial period (1990–1994), its polynomial trend also has a periodic nature, based in general on greater numbers of books (*the left Y-axis reflects the number of books on CA issues, whereas the right Y-axis – on CMS issues*). As a result, for the period 1970–2022 on **CA** issues, **TRG** published 24 books of various levels, and for the period 1990–2022 already 43 books on **CMS** issues, largely characterizing **TRG** preferences over time. In turn, **TRG** activity in other four base areas (*programming, computer science, general statistics, mathematical biology*) is characterized in general by the publication of only 23 book publications over 1970–2022. At the same time, in a series of books on **CMS** problematics, two large, practically independent subseries on *Maple* issues (22 books) and *Mathematica* issues (18 books) published in *Belarus, Russia, Ukraine, Estonia, Lithuania and the USA* can be distinguished, i.e. as a whole 40 of the 90 books concerning to all **TRG** activity directions. Generally speaking, the **TRG** has published several more than 90 books however books in excess of 90 belong to the “*exotic*” issues of **TRG** activity. It should be noted that, practically, already in 1990, **TRG** began to conduct research on **CA** problematics, mainly in the background, only occasionally intensifying the **CA** problematics, focusing itself attention on other

directions, including the **CMS** problematics. This message allows you to more clearly differentiate the levels of the **TRG** activity throughout period its existence.

It makes sense to dwell on one more moment. The **CA** and **CMS** problematics were largely determinative trends (*regardless of the time lag mentioned*) of **TRG** activity throughout its operations. Meanwhile, the results of work within both trends are not purely independent. The relationship between both directions was two-sided, whose essence was as follows. The **CMS** environment has developed a set of procedures and functions that provide experimental study and modelling of a number of fundamental issues of the dynamics of **CA** theory, on the basis of which both a large number of **CA** dynamic aspects are illustrated and interesting enough information was obtained for predictive analysis of certain important aspects of **CA** dynamics. On the other hand, during the creation of these software tools, a number of non-standard programming techniques were discovered which expand these systems and replenish them with new useful software tools that were reflected in the created *UserLib6789* library (*for Maple system*) and *MathToolBox* package (*for Mathematica system*). Both software tools are available on a freeware license basis and rather widely used both by universities and organizations and by individual users of the **CAS** mentioned. **TRG** itself successfully used both software tools to develop a range projects, as well as to conduct university courses on **CMS** in the **CIS** and **EU**. In particular, such courses were repeatedly held at universities and in other academic organizations in Belarus, Russia and Lithuania as part of the *Visiting Professor program* [8].

Based on **CMS**, rather effective algorithms of sequential calculators were developed intended for modelling of **CA**-like objects, allowing highly parallel processing and calculations. Moreover, one should bear in mind a rather fundamental difference in the orientation of both series of book publications on **CA** and **CMS** problematics – if the first, for the most part, is purely theoretical in nature, whilst the second is mainly focused on an applied nature with elements of educational orientation, in particular, textbooks and teaching aids in the field of programming in **CMS**. The latter confirms wide enough representation of our books on **CMS** issues in the lists of both mandatory and additional literature in many university programs of the **CIS** [5,8]. A number of our books on **CMS** and on some other issues are reflected in the *Wiki*.

## **References**

**1. Aladjev V.Z. To Theory of the Homogeneous Structures, no. 4204.– Moscow: VINITI Press, 1971, 140 p. (in Russian with extended English summary)**

*The conception of homogeneous structures was considered, the definition of its basic concepts and definitions was introduced, the range of researched problems was outlined both an independent mathematical object and as an environment for modelling various discrete processes and objects.*

**2. Aladjev V.Z. Computability in the Homogeneous Structures, vol. 1-2, no. 2850, 3023.– Moscow: VINITI Press, 1971, 120 p. (in Russian with English summary)**

*Homogeneous structures (HS) are considered as an universal calculator of highly parallel action. The results of modelling of known calculators (Turing machines, Post production systems, Markov algorithms, SS machines, etc.) by HS, and vice versa are given.*

**3. Aladjev V.Z. *To the Theory of the Homogeneous Structures.*– Tallinn: Estonian Academic Press, 1972, 259 p. (in Russian with extended English summary)**

*For the first time in the USSR, this monograph introduced Russian–language terminology that now is generally accepted of the basic concepts and definitions of the homogeneous structures theory (classical cellular automata), presented a number of new results and it was recognized as the best monographic publication of the Academy of Sciences of the ESSR in 1972, largely initiating interest in this problematics in the USSR as a whole.*

**4. Links on CA problematics <http://www.hs-ca.narod.ru> or <http://ca-hs.weebly.com>**

*During study in cellular automata theory (homogeneous structures) extensive enough bibliography of original sources of a various level (monographs, books, transactions, papers, etc.) as directly in the theory, and in its numerous appendices in various fields had been collected by us. Naturally, the bibliography is not exhaustive however it can present a certain interest for researchers in the given field, first of all, of beginners. The given bibliography ends in 2000 and, of course, involves further refinements, being of great interest in the historical aspect. Meanwhile, we hope, the bibliography will allow to outline better both a circle of researchers in the given field, and breadth of scope of the problems considered by them. First of all, it concerns the Soviet and Russian researchers who have received a number of priority results of fundamental character with which English–speaking researchers are familiar insufficiently well or are not familiar entirely. Subsequently some of them have been rediscovered by other researchers. It is especially topical and for the reason, a number of the Soviet researchers directly stood at the beginnings of the making given direction of modern mathematical cybernetics. Though basically, the represented bibliography is not annotated however headings of publications give the defined enough notion about the contents of the quoted material.*

**5. Aladjev V.Z. *Cellular Automata theory, Mainframes, Maple, Mathematica and Computer Science in Tallinn Research Group.*– USA: Kindle Press, 2022, 150 p., ISBN 9798447660208.**

*The book presents an expanded excursion into creative activities of Tallinn Research Group (TRG) over 1970–2022 with a focus on researches and development in such fields as mainframes, personal computers, general statistics theory, questions of parallel information processing and computing, computer mathematics systems (MathCAD, Maple, Mathematica), programming, automated control systems (ACS), mathematical biology, cellular automata theory, etc. Particular attention in the field of theoretical research was paid to the mathematical theory of classical cellular automata and their applications, whereas from the applied fields serious attention was paid to programming on larger computers and personal computers, computer mathematics systems, general statistics theory and to the ACS. To a large extent the book is of a pronounced final nature, relating to the activity of TRG and the associated Baltic branch of the International Academy of Noosphere.*

**6. Aladjev V.Z., Tupalo V.G. *Scientific and Practical Activity of the TRG: The final results for the 25–th anniversary (1969–1993).*– Moscow: the Russian Academy of Cosmonautics, 1994, 115 p., ISBN 5942003948 (in Russian with English summary).**

**7. Aladjev V.Z., Hunt Ü.J, Shishakov M.L. *Research Activity of the TRG: Scientific Report for Period 1995–1998.*– Tallinn: TRG Press, 1998, 80 p., ISBN 1406429856.**

*The content of books [6,7] clearly follows from their titles, including some rather useful statistics.*

**8. Links on free books and soft – <https://sites.google.com/view/aladjevbookssoft/home>**

*These sites present links on free download our books on cellular automata theory, general statistics theory, computer mathematics systems (Maple, Mathematica) written in Russian and English along with software tools for Maple and Mathematica systems. So, one of our books on CA problematics was included by BookAuthority in list of the **100** Best Discrete Mathematics eBooks of All Time. As featured on CNN, Forbes & Inc, the BookAuthority identifies and rates the best books in the World, based on recommendations by thought leaders and experts.*