The most important news of the autumn 2019

Dear colleagues! We are very pleased to inform our readers, including English-speaking ones, that after a long agreement with the International telecommunication Union (ITU), we received ITU's consent, important for all specialists in the field of noise-resistant coding, for the free distribution of our first major monograph on the Optimization Theory (OT) of noise-resistant coding in English, published in 2015, the authors of which are leading Russian specialists, heads of our scientific school OT V.V. Zolotarev, Yu.B. Zubarev and G.V. Ovechkin.

This book "Optimization Coding Theory and Multithreshold Algorithms" you can now freely rewrite from our website by hyperlink http://www.mtdbest.ru/articles/Zolotarev_ITU.pdf.

The importance of the publication of such a unique monograph after **its careful and strict examination directly in the ITU** by the fact that it first presented to our foreign colleagues a full complex of closely interacting **theoretical and experimental intelligent software** that created dynamically developing OT that when a **single evolution theory and experiment** gave a synergistic acceleration of solving basic applied problems **for all classical channels** considering in the theory of error-correcting coding. This book was the first experience of a large-scale presentation abroad of a very special style of research of the digital world, which has its roots **in the first scientifically prepared experiments on decoding messages** with new special majority methods in the conditions of great noise in 1970-72.

These works still then became a fine illustration of that extremely rigid and irresistible circumstance, hitherto not understood by the majority of "theorists", that **the coding theory even initially was not a mathematical problem at all**. In fact, it is the domain of the special art of constructing and researching algorithms and fine philosophical theory **to solve a whole class of optimization problems**. These problems are always formulated and then solved in such a way that the final reliability of any effective decoding algorithms, **never theoretically calculated** at high noise levels, is quickly and accurately **determined just in the experiment**. As the coding history of the last 50 years has shown, **there are no at all other methods for searching the error probabilities** of effective algorithms at high noise. And the experiment - it can be both hardware, which our school has repeatedly demonstrated, **and software**, which has been actively developed and promoted by us in coding technologies **during more than half a century**.

Russian experts have been able to observe these complex processes throughout this time in more than half a thousand articles, books and patents of our scientific school OT, including, by the way, a patent for **a very simple version of the block Viterbi algorithm**. The monograph, supported by ITU, for the first time told in detail in the anniversary year for ITU 2015 about these complex, but mandatory circumstances, and now to English-speaking specialists.

Our second English-language book of 2018 (Coding Theory as a Simple Optimal Decoding near Shannon's Bound), which is also already available on our

portal and absolutely completes all the works in coding theory at the level of fundamental researches and in the style of the ITU monograph, gave a solution to all problems of high-reliability communication and storage of digital data near the Shannon's bound. In it, as in its almost analogous Russian monograph "Coding Theory as a Problem of Global Extremum Search", published a little earlier, the special compressed style **of the new "quantum mechanics" of information theory**, as we named our OT, is especially clearly expressed. This **special system-philosophical monograph** contains a very small number of necessary formulas, which, however, allow us to evaluate the characteristics of all the algorithms used in the OT and the applied channel models. They can consider, that **OT is roughly on 3 decimal order more compact** than former extremely formal and mathematized theory coding, which has become history, far youth of real current well already completed theory, our OT. This property of our new "quantum mechanics" in information theory particularly accurately and clearly demonstrates **the real perfection and completeness of OT**. And a smoother immersion in the methods and OT technologies allow them to carry out our reference books, previous monographs and many hundreds of articles, now always supported **by various software platforms of our network portals** on decoding algorithms, the largest resources in the world on this topic: **www.mtdbest.ru** and **www.mtdbest.iki.rssi.ru**.

It should be noted that now in a number of publications on the system foundations and philosophy of OT development, for example, in plenary reports at the International DSPA conferences in Moscow and in the journal "Telecommunication", other aspects **of the development and contradictions of theoretical and experimental methods of science** are highlighted. This particularly painful **topic** for theorists is sometimes discussed in publications **placed on the portal of the Russian Academy of** Sciences **www.ras.ru**. As the dramatic history of the development of various **scientific schools and so called "schools"** in the field of theory and coding technologies has shown, their consideration should become mandatory when planning works in this field of information theory.

Well, recall again to our readers that OT offers not at the level of needlessly complex theories or unbridled fantasy, but as a particular philosophy **ideology, paradigms and technologies to create the simplest possible method with linearly growing with the code length decoding complexity and arbitrary reliability for their application close to Shannon's bound**. And it makes sense to study our ideology for a very long time simply because only a good understanding of OT will allow specialists to realize the live need to make the right emphasis in the development of research on even larger problems of noise-resistant coding on the full expansion of **the fine experimental work** on modeling channels and decoding algorithms working in them. It was this **precisely calibrated balance between theory and experiment** that at one time brought OT to the absolute ideological leaders in the main branch of information theory. The entire world of digital methods specialists will now have to overcome the huge gap in technologies that has been created by the scientific school OT during 50 years of

hard work in theory and, especially, **in the creation of an experimental base of research on codes.** And our school, of course, will help all enthusiasts of science to quickly overcome this so far too large lag in technology and science, separating the new "quantum mechanics" in information theory, our OT of the rest world of the former "theoretical" bustle, being many decades in the deepest crisis.

We are confident that the highest level of logic, naturalness and clarity of all the ideas of OT will help all specialists in the field of theory and applied issues of coding to quickly and successfully master all the technologies and paradigms of OT. The art of coding for all major types of classical channels has already brought the characteristics of most of the necessary decoders based on OT to a very high level of perfection. Our OT now provides for the next generations of scientists and engineers the opportunity **to apply the best achievements of OT** to design fundamentally new complex systems of storage and transmission of information, which will serve to further accelerate the development of our technological information civilization.

On behalf of the Russian scientific school
on Optimization Theory (OT)
of error correction coding
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