



Computer Arithmetic: Continuing a Long and Steady Emergence



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contribute to emerging trends and topics?" As written in 2016 in a column in *Computer*¹

“...after all, multiplication and addition haven't changed. Nevertheless, new architectures, processors, problems, application domains, and so forth, all require computations and are open to new challenges for computer arithmetic.”

Computer arithmetic is the art of representing and manipulating numbers in a computing device, where the word *number* has to be interpreted in a wide context: the usual integers and floating-point numbers of most programming languages but also big numbers, rational numbers, finite-field elements, and so forth. Having been one of the pillars of computer engineering since its early beginnings, a legitimate question is: “How can computer arithmetic

In 2016, so “only” six years ago, blockchain, artificial intelligence, machine learning, and in-memory computing (to pick a few) were just starting to walk their successful climbing trail to reach the top positions among today's most impactful technologies. Computer arithmetic has always been at the core of the digital age, and it is currently driving every single innovation in a widespread range of domains, such as those mentioned earlier, as well as many more, like high-performance computing, signal processing, and security, just to mention a few. It is a matter of fact that everything of numerical computing is built from the arithmetic operations: if these operations are not efficient

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or not reliable, then there is no hope of doing efficient and reliable computing. Even nonnumerical applications covertly use arithmetic since computing addresses in memory require additions and multiplications.

How about the future? Few predictions have been made today, but by living day by day, new research and technology advances will show new and emerging challenges. Today, we look and think at the implementation of quantum computing, sustainable computing, DNA computing, and so forth, and tomorrow will show us what is around the corner. A certainty is that no matter what the new impacting trends are, computer arithmetic will be at their service.

Since 1969, the IEEE Symposium on Computer Arithmetic (ARITH) symposia have served as the most important venue for presenting the latest research in computer arithmetic and related areas, originating from both academia and industry. The topics of ARITH include number systems; algorithms for operations and mathematical functions; implementations; validation; hardware and software designs; and the applications of computer arithmetic, including cryptography or machine learning.

ARITH symposia have taken place in several places around the world: from Kyoto to London; Lyon, France; Austin, Texas; Portland, Oregon; Cape Cod, Massachusetts; Santiago de Compostela, Spain; Adelaide, Australia; Asilomar, California; Grenoble, France; Santa Monica, California; Como, Italy; and many more other locations. Due to the recent pandemic, the decision was taken in 2021 to organize ARITH 2022 (<https://arith2022.arithsymposium.org/index.html>) as a virtual conference from September 12 to 14.

In partnership with the conference, at the end of 2021, *IEEE Transactions on Emerging Topics in Computing* (TETC)


launched a call for articles for a Special Section on Emerging and Impacting Trends in Computer Arithmetic (<https://www.computer.org/digital-library/journals/ec/cfp-trends-computer-arithmetic>). TETC has received 28 submissions from researchers from all over the world,

(<https://www.computer.org/digital-library/journals/ec/technical-tracks>). To stay up to date with the most recent research advances and to possibly contribute to the domain of computer arithmetic as well as to other topics of interest to TETC, please regularly visit our webpages as well as the TETC

Having been one of the pillars of computer engineering since its early beginnings, a legitimate question is: “How can computer arithmetic contribute to emerging trends and topics?”

seven of which²⁻⁸ were accepted and appeared in the first available issue of TETC. These articles were also invited for presentation at the symposium. ARITH 2022 also received 32 submissions for conference papers, out of which 16 were selected for publication and presentation at the conference.

As reported on its webpages (<https://www.computer.org/csdl/journals/ec/about/14393?title=About&periodical=IEEE%20Transactions%20on%20Emerging%20Topics%20in%20Computing>), TETC is a special sections-based journal (<https://www.computer.org/publications/author-resources/calls-for-papers?type=trans&publication=ec>). Our authors can find important guidelines at <https://www.computer.org/csdl/journals/ec/write-for-us/15071?title=Author%20Information&periodical=IEEE%20Transactions%20on%20Emerging%20Topics%20in%20Computing> and have the option to submit articles to a current special section (<https://www.computer.org/publications/author-resources/calls-for-papers?type=trans&publication=ec>) or to the continuous call for articles on some specific emerging topics of interest to the journal, called *technical tracks*

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