for finite numbers to the case of infinite and infinitesimal numbers have been proposed in literature (see, e.g., [1–3, 6, 7] and references given therein). However, these generalizations are quite different with respect to the finite arithmetic we are used to deal with. Moreover, very often they leave undetermined many operations where infinite numbers take part (e.g., $\infty - \infty$, $\frac{\infty}{\infty}$, etc.) or use representation of infinite numbers based on infinite sequences of finite numbers.

In spite of these crucial difficulties and due to the enormous importance of the concept of infinite and infinitesimal in Science, people try to introduce these notions in their work with computers. Thus, the IEEE Standard for Binary Floating-Point Arithmetic (IEEE 754) being the most widely-used standard for floating-point computation defines formats for representing special values for positive and negative infinities and NaN (Not a Number) (see also incorporation of these notions in the interval analysis implementations e.g., in [18]). The IEEE infinity values can be the result of arithmetic overflow, division by zero, or other exceptional operations. In turn, NaN is a value or symbol that can be produced as the result of a number of operations including that involving zero, NaN itself, and infinities.

Recently, a new applied point of view on infinite and infinitesimal numbers has been introduced in [8, 11, 13–15]. With respect to the IEEE 754 standard, the new approach significantly extends the variety of operations that can be done with infinity. It gives a possibility to work with various infinite and infinitesimal quantities *numerically* by using a new kind of a computer—the Infinity Computer—introduced in [9–11]. A number of applications related to the usage of the new approach for studying fractals (being one of the main scientific interests of the author (see, e.g., [16, 17]) has been discovered (see [13, 14]).

The new approach is not related to non-standard analysis ideas from [7] and does not use Cantor's ideas (see [2]) either. The Infinity Computer works with infinite and infinitesimal numbers numerically using the following methodological principles having a strong applied character (see survey [15] for a detailed discussion on the new approach).

Postulate 1 Existence of infinite and infinitesimal objects is postulated but it is also accepted that human beings and machines are able to execute only a finite number of operations.

Postulate 2 It is not discussed *what are* the mathematical objects we deal with; we just construct more powerful tools that allow us to improve our capacities to observe and to describe properties of mathematical objects.

Postulate 3 The principle formulated by Ancient Greeks 'The part is less than the whole' is applied to all numbers (finite, infinite, and infinitesimal) and to all sets and processes (finite and infinite).

Due to this declared applied statement, such traditional concepts as bijection, numerable and continuum sets, cardinal and ordinal numbers are not applied when one works with the Infinity Computer because they belong to Cantor's approach having significantly more theoretical character and based on different assumptions. However, the methodology used by the Infinity Computer does not contradict Cantor. In