Universal Mathematics: Discovering Zero Nature, Emptiness and Continuum Uniparticles Universality, and Invented Over(Infinite) Measurability

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Abstract

Supplementing the reals with infinite cardinals and zero inversions gives the uninumbers for uniquantities. They are element quantities unisums in quantisets with unimeasuring (over)infinities, solving Zeno's paradoxes, and discovering the uniparticles of continuum, probability density, space, and time. Negativity-conserving multiplication always gives base-sign-conserving exponentiation. Universal methods, theories, and sciences provide uniestimation, solving problems, and best data processing.

Keywords: uniphilosophy, unimathematics, potential and actual overinfinity, hypernumber, continuum uniparticle, Zeno's paradox, negativity-conserving multiplication, base-sign-conserving exponentiation.

UDC 1, 125, 50, 51, 53

Summary

Mathematics is usually divided into pure, applied, and computational mathematics. Pure mathematics can be further divided into fundamental and advanced mathematics.

Classical mathematics, its concepts, approaches, methods, and theories are based on inflexible axiomatization, intentional search for artificial contradictions, and even their purposeful creation to desist from further research. These and other fundamental defects do not allow us to acceptably and adequately consider, formulate, and solve many classes of typical urgent problems in science, engineering, and life. Mathematicians select either set theory or mereology as if these were incompatible. The real numbers cannot fill the number line because of gaps between them and hence evaluate even not every bounded quantity. The sets, fuzzy sets, multisets, and set operations express and form not all collections. The cardinalities and measures are not sufficiently sensitive to infinite sets and even to intersecting finite sets due to absorption. No conservation law holds beyond the finite. Infinity seems to be a heap of very different infinities the cardinality only can very roughly discriminate and no tool can exactly measure. Known hypernumber systems, starting with nonstandard analysis, demonstrate the possibility of their construction and use to more intuitively prove well-known theorems but cannot namely quantitatively solve many classes of typical urgent problems. Operations are typically considered for natural numbers or countable sets of operands only and cannot model any mixed magnitude. Exponentiation is well-defined for nonnegative bases only. Exponentiation and further hyperoperations are noncommutative. Division by zero is considered when unnecessary, ever brings insolvable problems, and is never efficiently utilized. The probabilities not always existing cannot discriminate impossible and other zero-measure events differently possible. The absolute error is noninvariant and alone insufficient for quality estimation. The relative error applies to the simplest formal equalities of two numbers only and even then is ambiguous and can be infinite. Mathematical statistics and the least square method irreplaceable in overdetermined problems typical for data processing are based on the noninvariant absolute error and on the second degree analytically simplest but usually very insufficient. This method is unreliable and not invariant by equivalent transformations of a problem, makes no sense by noncoinciding physical dimensions (units) in a problem to be solved, and can give predictably inacceptable and even completely paradoxical outputs without any estimation and improvement. Artificial randomization brings unnecessary complications. One-source iteration with a rigid algorithm requires an explicit expression of the next approximation via the previous approximations with transformation contractivity and often leads to analytic difficulties, slow convergence, and even noncomputability. Real number computer modeling brings errors via built-in standard function rounding and finite signed computer infinities and zeroes, which usually excludes calculation exactness, limits research range and deepness, and can prevent executing calculation for which even the slightest inconsistencies are inadmissible, e.g. in accounting. The finite element method gives visually impressive "black box" results not verifiable and often unacceptable and inadequate.

Every new alternative mathematics can be considered as an external revolution in mathematics which becomes megamathematics. In any new alternative mathematics itself, creating its own cardinally new very fundamentals replacing the very fundamentals of classical mathematics can be considered as an internal revolution in alternative mathematics also if classical mathematics itself remains unchanged.

Mega-overmathematics (by the internal entity), or unimathematics (by the external phenomenon), created and developed has the character of a superstructure (with useful creative succession, or inheritance) over conventional mathematics as a basis without refusing any achievement of ordinary mathematics. Moreover, unimathematics even calls for usefully applying ordinary mathematics if possible, permissible, acceptable, and adequate.

In these names, the prefix "mega" means infinitely many distinct overmathematics with including different infinities and overinfinities into the real numbers.

The prefix "uni" is here associated both with the union, or the general system, of these infinitely many distinct overmathematics and with the universality of these union and system.

The prefix "over" here means:

1) the superstructural character of mega-overmathematics, or unimathematics, with respect to conventional mathematics;

2) the addional nature of new possibilities offered by mega-overmathematics besides the usual opportunities of ordinary mathematics;

3) overpossibilities as the qualitatively new features of mega-overmathematics in setting, considering, and solving whole classes of typical urgent problems so that these overpossibilities often have a much higher order of magnitude compared with the possibilities of conventional mathematics. For example, one of such overpossibilities is oversensitivity as perfect unlimited sensitivity with exactly satisfying universal conservation laws and with complete exclusion of any absorption so that infinitely or overinfinitely great magnitudes are exactly separated from one another even by infinitesimal or overinfinitesimal differences.

Unimathematics can be called not only universal and unified but also general, natural, physical, intuitive, nonrigorous, free, flexible, perfectly sensitive, practical, useful, exclusively constructive, creative, inventive, etc.

Mega-overmathematics is a system of infinitely many diverse overmathematics which differ by possible hyper-Archimedean structure-preserving extensions of the real numbers via including both specific subsets of some infinite cardinal numbers as canonic positive infinities and signed zeroes reciprocals as canonic overinfinities, which gives the uninumbers. They provide adequately and efficiently considering, setting, and namely quantitatively solving many typical urgent problems. In created uniarithmetics, quantialgebra, and quantianalysis of the finite, the infinite, and the overinfinite with quantioperations and quantirelations, the uninumbers evaluate, precisely measure, and are interpreted by quantisets algebraically quantioperable with any quantity of each element and with universal, perfectly sensitive, and even uncountably algebraically additive uniquantities so that universal conservation laws hold. Quantification builds quantielements, integer and fractional quantisets, mereologic quantiaggregates (quanticontents), and quantisystems with unifying mereology and set theory. Negativity conserving multiplication, base sign conserving exponentiation, exponentiation hyperefficiency, composite (combined) commutative exponentiation and hyperoperations, root-logarithmic overfunctions, self-root-logarithmic overfunctions, the voiding (emptifying) neutral element (operand), and operations with noninteger and uncountable quantities of operands are also introduced. Division by zero is regarded when necessary and useful only and is efficiently utilized to create overinfinities. Unielements, unisets, mereologic uniaggregates (unicontents), unisystems, unipositional unisets, unimappings, unisuccessions, unisuccessible unisets, uniorders, uniorderable unisets, unistructures, unicorrespondences, and unirelation unisystems are also introduced. The same holds for unitimes, potential uniinfinities, general uniinfinities, subcritical, critical, and supercritical unistates and uniprocesses, as well as quasicritical unirelations. Unidestructurizators, unidiscriminators, unicontrollers, unimeaners, unimean unisystems, unibounders, unibound unisystems, unitruncators, unilevelers, unilevel unisystems, unilimiters, uniseries uniestimators, unimeasurers, unimeasure unisystems, uniintegrators, uniintegral unisystems, uniprobabilers, uniprobability unisystems, and unicentral uniestimators efficiently provide unimeasuring and uniestimating. The universalizing separate similar (proportional) limiting reduction of objects, systems, and their models to their own similar (proportional) limits as units provides the commensurability and comparability of disproportionate and, therefore, not directly commensurable and comparable objects, systems, and their models. The unierror irreproachably corrects and generalizes the relative error. The unireserve, unireliability, and unirisk based on the unierror additionally estimate and discriminate exact objects, models, and solutions by the confidence in their exactness with avoiding unnecessary randomization. All these uniestimators for the first time evaluate and precisely measure both the possible inconsistency of a uniproblem (as a unisystem which includes unknown unisubsystems) and its pseudosolutions including quasisolutions, supersolutions, and antisolutions. Multiple-sources iterativity and especially intelligent iterativity (coherent, or sequential, approximativity) are much more efficient than common single-source iterativity. Intelligent iterability universalization leads to collective coherent reflectivity, definability, modelablity, expressibility, evaluability, determinability, estimability, approximability, comparability, solvability, and decisionability. This holds, in particular, in truly multidimensional and multicriterial systems of the expert definition, modeling, expression, evaluation, determination, estimation, approximation, and comparison of the qualities of objects, systems, and models which are disproportionate and hence incommensurable and not directly comparable, as well as in truly multidimensional and multicriterial decision-making systems. Sufficiently increasing the exponent in power mean theories and methods can bring adequate results. This holds for linear and nonlinear unibisector theories and methods with distance or unierror minimization, unireserve maximization, as well as for distance, unierror, and unireserve equalization, respectively. Unimathematical data coordinate and/or unibisector unipartitioning, unigrouping, unibounding, unileveling, scatter and trend unimeasurement and uniestimation very efficiently provide adequate data processing with efficiently utilizing outliers and even recovering true measurement information using incomplete changed data. Universal (in particular, infinite, overinfinite, infinitesimal, and overinfinitesimal) continualization provides perfect computer modeling of any uninumbers. Perfectioning built-in standard functions brings always feasible and proper computing. Universal transformation and solving algorithms ensure avoiding computer zeroes and infinities with computer intelligence and universal cryptography systems hierarchies. It becomes possible to adequately consider, model, express, measure, evaluate, estimate, overcome, and even efficiently utilize many complications such as contradictions, infringements, damages, hindrances, obstacles, restrictions, mistakes, distortions, errors, information incompleteness, variability, etc. Unimathematics (mega-overmathematics) also includes knowledge universal test and development fundamental metasciences.

Unimathematics as a megasystem of revolutions in mathematics is divided into fundamental, advanced, applied, and computational unimathematics as systems of revolutions in fundamental, advanced, applied, and computational mathematics.

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References to some subsequent works of the author on the subject are added

Универсальная математика: открытие природы нуля, всеобщности пустоты и уничастиц непрерывного, измеримости бесконечного и изобретённого сверхбесконечного

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Аннотация

Пополнение действительных чисел бесконечными кардиналами и обращениями нулей ведёт к уничислам для уникоичеств. Эти унисуммы количеств элементов в количественных множествах измеряют (сверх)бесконечности и решают апории Зенона с открытием уничастиц

континуума, пространства и времени. Сохраняющее отрицательность умножение всегда даёт возведение в степень, сохраняющее знак основания. Всеобщие методы, теории и науки обеспечивают униоценивание, решение задач и обработку данных с опорой на наилучшие.

Ключевые слова: унифилософия, униматематика, потенциальная и актуальная сверхбесконечность, гиперчисло, уничастица континуума, апория Зенона, сохраняющее отрицательность умножение, сохраняющее знак основания возведение в степень.

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Мюнхен: Издательство Всемирной Академии наук «Коллегиум», 2014
Добавляются ссылки на некоторые последующие труды автора по теме

«Никакой достоверности нет в науках там, где нельзя приложить ни одной из математических наук, и в том, что не имеет связи с математикой... Ни одно человеческое исследование не может называться истинной наукой, если оно не прошло через математические доказательства» (Леонардо да Винчи).

«Процветание и совершенство математики тесно связаны с благосостоянием государства» (Наполеон).

«Только допустив бесконечно малую единицу для наблюдения – дифференциал истории, то есть однородные влечения людей, и достигнув искусства интегрировать (брать суммы этих бесконечно малых), мы можем надеяться на постигновение законов истории...» (Л. Н. Толстой, «Война и мир»).

«Если кто-либо хочет кратким и выразительным словом определить само существо математики, тот должен сказать, что это наука о бесконечности» (Анри Пуанкаре).

Реферат

Классическая математика [2–4] основана на канторовых множествах и действительных числах. Однако явно не канторово непрерывное множество (континуум) содержит отдельные элементы-точки, но не может только из них состоять и быть составленным. Ведь множество всех отдельных элементов-точек непрерывного множества (континуума) даёт нулевой вклад в размерность и меру самого непрерывного множества (континуума). Действительные числа лишь конечны и непригодны для бесконечно больших и малых. Бесконечность представляется собранием очень разных бесконечностей, ничем не измеряемых точно и только грубо разбиваемых кардинальными числами на весьма широкие классы. Так, множества точек единичного отрезка и всего бесконечного не

более чем счётномерного пространства имеют общую мощность непрерывности (континуума). Меры длины, площади и объёма чувствительны только к своим размерностям. Для целого, включающего части разных размерностей, общей меры нет. За пределами конечного не действуют законы сохранения ввиду поглощения при сложении не только бесконечно малого ненулевым конечным, конечного бесконечным и бесконечности бесконечностью более высокого порядка, но и любой положительной бесконечности самой собой (даже её умножение на себя не меняет её). Действия рассматриваются только для не более чем счётного множества чисел и не позволяют выражать смешанные именованные величины. Так, нет известного действия между 5 л и водой: умножение не подходит. Степенные и показательные функции определены лишь для неотрицательных оснований. Возведение в степень и последующие гипероперации не перестановочны. Деление на нуль рассматривается без необходимости, ведёт к неразрешимым проблемам и совсем не используется. Не всегда существующими вероятностями нельзя различить невозможные и по-разному возможные события нулевой меры, а смысл плотности вероятности является чисто формальным (производная интегральной функции распределения). Абсолютная погрешность меняется при умножении равенства на число, модуль которого отличен от единицы. Относительная погрешность двузначна и может превышать единицу и даже быть бесконечной. Метод наименьших квадратов с опорой на худшие данные обычно ведёт к предсказуемым неприемлемым изъянам, извращениям и парадоксам. Последовательное приближение из одного начала с жёстким алгоритмом требует явного выражения последующего приближения через предыдущие со сжимаемостью отображения, весьма затруднительно и медленно сходится. Машинное вычисление вносит погрешности и часто неосуществимо.

Созданная по принципам унифилософии [30, 46] **униматематика** [5–46] как надстройка над классической математикой расширяет действительные числа до уничисел включением аналогов избранных бесконечных кардинальных чисел. Униколичества количественных множеств с любым количеством каждого элемента даже несчётно алгебраически аддитивны с точным выполнением всеобщих законов сохранения. Открыты унимножественные природа, сущность и строение непрерывного множества (континуума) из произвольных наследующих его размерность актуально континуально бесконечно малых уничастиц. Введены сохраняющее отрицательность умножение, сохраняющее знак основания возведение в степень, пустой нейтрализующий элемент (операнд) и операции с нецелым количеством и даже несчётным множеством операндов. Деление на нуль рассматривается только при необходимости и полезности и применяется для создания сверхбесконечностей. Приведение к собственным подобным пределам как единицам обеспечивает соизмеримость не соизмеримых объектов. Унипогрешность исправляет и вполне обобщает относительную погрешность. Унизапас, унинадёжность и унириск дополнительно оценивают объекты по степени уверенности в их точности и меру противоречивости задачи, или меру несовместности совокупности условий такой задачи. Многоначальное и особенно разумное последовательное приближение гораздо полезнее обычного и в принятии решений. Целесообразно распределённое взвешивание обеспечивает опору именно на наилучшие данные с полезным применением выбросов, противоречий и других осложнений. Универсальные преобразования и алгоритмы решения позволяют всегда осуществлять машинное вычисление. Открытия и изобретения униматематики впервые почти за 2500 лет решают апории Зенона, исключают парадоксы и ведут к новым горизонтам мировоззрения с решением ранее непосильных задач жизни, естественных, технических и общественных наук.

1. Some Fundamental Principles of Uniphilosophy

Targeting ORIGINS (1.1. PURPOSE, 1.2. PERFORMANCE) and Principles

1.1.1. Beneficence: goodness, charity, true-heartness, healing, clearance, support.
1.1.2. Urgency: necessity, urgency, need, demand, satisfaction, possibility.
1.1.3. All-Usefulness: enforceability, applicability, utilization, usability, improvement, development.
1.1.4. Constructivism: indestructibility, peacemaking, understanding, assumption, diversity, superstructuring.
1.1.5. Wholesomeness: consolidation, comprehensiveness, exhaustivity, superposition, attraction, architecture.
1.1.6. Agreement: compatibility, proportionality, flexibility, majesty, grace, self-sufficiency.
1.2.1. Composition: matching, interaction, performance, enhancement, increase, self-development.
1.2.2. Development: growth, deepening, strengthening, education, upbringing, comprehension.
1.2.3. Targeting: circumstantiality, valuability, setting, purposefulness, will, attainment.
1.2.4. Leadership: invocation, passion, following, incorporation, beginning, continuation.
1.2.5. Activity: effectiveness, fruitfulness, winning, economics, connaturality, easing.
1.2.6. Efficiency: summation, qualitativeness, productivity, clarity, ease, futurity.

Essential ORIGINS (2.1. ENLIGHTENMENT, 2.2. INVESTIGATION) and Principles

2.1.1. Naturalness: expectation, sensation, feeling, obviousness, deducibility, jurisprudence.
2.1.2. Intuitiveness: presage, premonition, anticipation, prevision, clarification, manifestation.
2.1.3. Single-Mindedness: liberation, independence, honesty, daring, unselfconsciousness, upgrading.
2.1.4. Creation: observation, testing, reasoning, concept, forming, perfection.
2.1.5. Accomplishment: detection, clarification, research, discovery, invention, establishment.
2.1.6. Expression: notion, multilingualism, word creation, proposal, comparison, writing.
2.2.1. Creativity: vitality, understanding, exploration, tasting, learning, inclusion.
2.2.2. Inheritance: retrieving, inspection, composing, comparison, reward, importation.
2.2.3. Justifiability: basicality, verification, correction, replaceability, implementation, linguistics.
2.2.4. Management: challenging, approximation, estimation, teaching, prediction, incarnation.
2.2.5. All-Utilization: diverging, interaction, harmony, fulfillment, extraction, sophistication.
2.2.6. All-Responsibility: perfectionism, hypercriticality, thought, tightening, result, defending.

Methodological ORIGINS (3.1. COGNITION, 3.2. GENERALIZATION) and Principles

3.1.1. Realization: contradictoriness, dialectics, denomination, substance, spirituality, unification.
3.1.2. Construction: thought, fundamentality, nurturing, revitalization, embedding, certification.
3.1.3. Understanding: incarnation, rising, presentation, determination, identification, determination.
3.1.4. Ascension: spiritualization, impersonation, invigoration, flight, pacification, magic.
3.1.5. Self-Expression: neologisming, calculus, unicalculation, unimeasurement, uniapproximation, uniestimation.
3.1.6. Resolution: solution, quasisolution, pseudosolution, supersolution, antisolution, extrasolution.

3.2.1. Diversity: imagination, multipossibility, multi-implementation, multicreation, multimeaning, uni-imagery.
3.2.2. Multilevelness: equalization, differentiation, clarification, usability, forming, metaleveling.
3.2.3. Multiknowledge: multi-approach, multiway, multimethod, multitheory, multidoctrine, multiscience.
3.2.4. Branching: outlining, rooting, undertaking, principiality, regularity, exactness.
3.2.5. Interpretation: preparation, heartfeeling, thinking, multi-understanding, meaning-leveling, meta-understanding.
3.2.6. Methodology: uniformity, multiplicity, reassurance, message, predominance, metascience.

2. Some Fundamental Principles of Unimathematics

2.1. Some basic principles of unimathematics

1. Typical urgent problems priority and exclusiveness.
2. Intuitive conceptual and methodological fundamentality priority.
3. Collective coherent reflectivity, definability, modelablity, expressibility, evaluability, determinability, estimability, approximability, comparability, solvability, and decisionability.
4. Reasonable fuzziness with useful rigor only.
5. Unrestrictedly flexible constructivism.

2.2. Some noncontradictoriness principles of unimathematics

1. The unificability of membership, inclusion, and part-whole relations.
2. Necessary and useful creativity exclusiveness.
3. The efficient utilizability of contradictoriness and other complications.
4. Symbolic feasibility.
5. Decision-making delayability.

2.3. Some efficiency principles of unimathematics

1. Uniproblem unisolvability.
2. Tolerable simplicity.
3. Knowledge efficiency.
4. Free intuitive intelligent iterativity.
5. General noncriticality.
6. General nonlimitability.

2.4. Some principles of fundamental unimathematics

1. Infinite cardinals canonizability.
2. Zeros reciprocals overinfinities canonizability.
3. Hyper-Archimedean axiomability.
4. Exactness of the infinite and the overinfinite.
5. General (nonlogical) quantificability.
6. Separate similar (proportional) limiting universalizability.
7. Perfect manipulability.
8. Conservation laws universalizability.

2.5. Some principles of advanced unimathematics

1. Universal perfect operability.
2. Separate limiting universalizability.
3. Operations and overoperations utility universality.
4. Exponentiation and hyperoperation generalization commutativity.

2.6. Some principles of applied unimathematics

1. Unitransformability.
2. Uniestimability.
3. Uniapproximability.
4. Unisolvability.
5. Intelligent uni-iterativity.
6. Unisystematic developing testability.

2.7. Some principles of computational unimathematics

1. Uninumber continualization.
2. Efficiently perfectioning built-in standard functions transformations.
3. Software efficiency.
4. Universal algorithmizability.
5. Inventive computational intelligence.
6. Free intuitive intelligent multi-sources multidirectional uni-iterativity.
7. The universality of power mean distances and unierrors.
8. Data approximability via unibisectors.
9. Unigrouping data in the coordinates and/or unibisectors.
10. The unimeasurability and uniestimability of data trend and scatter.

11. The unidivisibility of a point into any parts.
12. Outlier points efficiency.
13. Complications efficiency.
14. Inventive and discovering creative purposefulness and dedication.

3. Fundamental Unimathematics (Universal Mathematics)

In classical mathematics [2–4], division by zero is considered when unnecessary, ever brings insolvable problems, and is never efficiently utilized. The real numbers R evaluate no unbounded quantity and, because of gaps, not all bounded quantities. The same probability

$$p_n = p_N$$

of randomly sampling a certain

$$n \in N = \{1, 2, 3, ...\}$$

does not exist in R, since

$$\Sigma_{n\in N}\, p_n$$

is either

$$0 \text{ for } p_N = 0$$

or

$$+\infty \text{ for } p_N > 0.$$

The probabilities of many typical possible events vanish (e.g., that of the choice of a certain point on a segment of a straight line or curve), as if those were impossible events. There is no perfectly sensitive universal measure with conservation laws in the finite, infinite, and infinitesimal and even for sets with parts of different dimensions. The sets, fuzzy sets, multisets, and set operations express and form not all collections. Infinity is a heap of very different infinities the cardinality only can very roughly discriminate and no tool exactly measures. Operations are considered for natural numbers or countable sets of operands only. Concrete (mixed) physical magnitudes cannot be modeled because, e.g., by 5 liter water, no known operation unifies "5 L" and "water".

Fundamental universal mathematics [5, 7, 12, 13, 16, 33, 35, 36, 42] first explicitly directly used division by zero to further extend all the infinitesimal, finite, infinite, and combined pure (dimensionless) amounts and to conveniently operate on them with holding the conservation laws. It introduced the emptying (voiding) operation transforming any object to the empty (void) object (element) # (or the empty set Ø so that

$$\# \in Ø$$

and

$$\# = Ø).$$

Using the empty (void) operand # (or Ø) excludes (drops, neutralizes) any operation on this operand. Then the "result" of performing no operations at all (hence on no operands, arguments, or inputs) equals namely # (or Ø), which is universal. Zero 0 may be nonnumber which does not belong to the natural numbers N, integers Z, reals R, complex numbers C, etc. The uninumbers generalize the real numbers via including some analogues of the selected infinite cardinal numbers (or their minimal ordinal numbers) among ω_0, ω_1, ω_2, … [3, 4] as canonical positive infinities (with signed reciprocals

$$\pm\theta_0 = \pm 1/\omega_0,$$
$$\pm\theta_1 = \pm 1/\omega_1,$$
$$\pm\theta_2 = \pm 1/\omega_2, \ldots)$$

and signed zeros ±0 (with common modulus

$$\Theta = +0 = 0_+ = |\pm 0|)$$

reciprocals

$$\pm\Phi = \pm 1/\Theta = \pm 1/|0| = \pm 1/|\pm 0|$$

as canonical overinfinities. Typically include ω (the analogue of the countable Cantorian cardinal

$$\aleph_0 = \omega_0)$$

and Ω (the analogue of the continuum cardinality **C**). See a conditional finite scale of the uninumbers including zero, quasizeroes θ_n, infinitesimals, nonzero reals, infinities, and overinfinities (Figure 1) using interval (-5, 5) on the homogeneous s-axis:

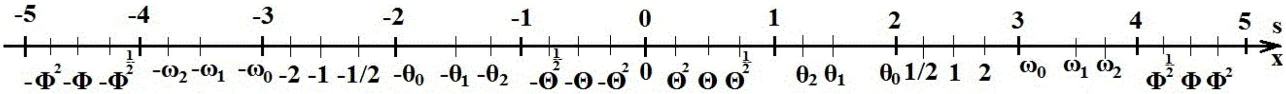

Figure 1. Conditional finite scale interpretation of the uninumbers x

Also see a conditional finite scale of the uninumbers including zero, infinitesimals, nonzero reals, and infinities (Fig. 2) using interval (-3, 3) on the homogeneous s-axis:

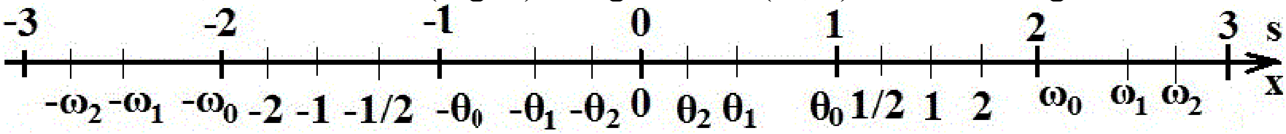

Figure 2. Conditional finite scale interpretation of uninumbers x including zero, infinitesimals, nonzero real numbers, and infinities

Quantification builds algebraically quantioperable quantielements $_q a$ (e.g., $_{5\ L}$water) and quantisets

$$\{_{q(j)}a(j) \mid j \in J\}$$

with any quantity

$$q(j) = q_j$$

of each element

$$a(j) = a_j$$

which both are any objects indexed via any (possibly uncountable) index set J. Quantiset uniquantities

$$Q = \Sigma_{j \in J}\, q_j$$

are universal, perfectly sensitive, and even uncountably algebraically additive measures with universal conservation laws. Canonical sets interpret canonical positive infinities:

$$Q(N) = Q\{1, 2, 3, \dots\} = \omega$$

and

$$Q]0, 1] = Q\{r \mid r \in R, 0 < r \leq 1\} = \Omega$$

(R the reals). In uniarithmetics, quantialgebra, and quantianalysis of the finite, infinite, and overinfinite with quantioperations and quantirelations, the uninumbers evaluate, precisely measure, and are interpreted by quantielements and quantisets with uniquantities, e.g. (a, b ∈ R):

$$Q\{a + bn \mid n \in N\} = \omega/|b| - a/b - 1/2 + 1/(2|b|),$$

$$Q]a, b[^n = [(b - a)\Omega - 1]^n,$$

$$Q[a, b]^n = [(b - a)\Omega + 1]^n,$$

$$Q(R^n) = 2^n\omega^n\Omega^n.$$

Also introduce symmetric both half-interval and half-segment |a, b| as a quantiset in which the both endpoint quantities are 1/2 and the quantity of every intermediate point is 1:

$$|a, b| =^\circ {}_{1/2}a +^\circ]a, b[+^\circ {}_{1/2}b =^\circ {}_{-1/2}a +^\circ [a, b] +^\circ {}_{-1/2}b$$

where

=° is quantitative equality of quantitative elements and sets,

+° is quantitative addition of quantitative elements and sets,

the both satisfy the universal conservation laws.

The quantielements can form: together with quantiaddition and quantimultiplication – a commutative additive group with zero and additive inverse, a commutative multiplicative group with unit and multiplicative inverse, and a commutative field; together with quantiunification and quantiintersection – a so-called extremely Boolean algebra. The integral (fractional) quantisets form: together with quantiaddition and quantimultiplication – a ring with unit and an algebra (a field and an algebra, respectively), together with quantiunification and quantiintersection – a so-called extremely Boolean algebra (a distributive algebra, respectively).

Fundamental unimathematics gives the above probabilities

$$p_N = 1/Q(N) = 1/\omega > 0,$$

as well as

$$p_{|a,\,b|} = 1/Q|a, b| = p_{[a\,,\,b[} = 1/Q[a, b[= p_{]a\,,\,b]} = 1/Q]a\,,\,b] = 1/[(b - a)\Omega] > 0 \ (a \leq b \in R),$$

$$p_R = 1/Q(R) = 1/(2\omega\Omega).$$

To solve Zeno's paradoxes (5th century BC), simply divide the whole 1 into any uninumber u of equal parts and obtain uninumber 1/u for any part and

$$u * 1/u = 1.$$

Fundamental unimathematics discovered the essence, nature, and structure of any continuum as an extensional set, as well as the qualitative dimensionality-measure phenomenon by unifying all the separate, isolated elements into their continuum.

In any continuum (an extensional set) [2–4], for example, on a line, in a surface, or in a space, it is possible to distinguish usual points as elements.

Define a *separated continuum* to be the set of all the separate, isolated elements, or points, of a certain continuum.

Each point as an element both of a continuum and of its *separated continuum* is zero-dimensional and zero-measure. Adding any set of zeros gives zero. Hence every *separated continuum* is zero-dimensional and zero-measure, too, even if its continuum itself is of positive dimensionality and measure. Therefore, a *separated continuum* gives namely zero contribution to its continuum dimension and measure. That is why a continuum of positive dimensionality and measure cannot coincide with its *separated continuum* and cannot consist of their usual elements, or points, only. Points as elements cannot be continuum parts. So classical mathematics based on the Cantor set theory [3, 4] cannot provide understanding continuum nature, essence, and structure. Additionally, distinguishing between belonging and inclusion leads to many well-known contradictions not only in mathematics [4], but also in philosophy [1] and life.

Universal philosophy, mathematics, physics, and metrology by the author [5-46] unify the relations of unibelonging and uni-inclusion on the base of the philosophical [1] and, in particular, mereological relationship between the whole and its parts and exclude many well-known contradictions. For example, uni-identify both a set consisting of one element and this element itself. The key Cantor concept (of a set as gathering definite, distinct objects of our perception or of our thought – which are called elements of the set – into a whole [3, 4]) remains. The same holds for the possibilities to distinguish set elements and to select and consider anyone or some of them. But it is not necessary that a set *consists* of its elements *only* and can be *reduced* to them. Any continuum (extensional set) of positive dimensionality and measure is a counterexample. Such a set and its *separated continuum* are very different but satisfy the Cantor set equality definition which is not valid at least for continua. Unlike a continuum (extensional set) of positive dimensionality and measure, a *separated continuum consists* of its usual elements, or points, which are hence its *parts* but cannot be *continuum parts*.

For introduced quantitative elements and quantitative also continual sets, define arbitrarily *correctly and properly* partitioning (splitting) them into any parts if and only if the universal conservation laws hold. This means that for any element, its quantity in a quantitative set is equal to the universal sum of the quantities of this element in all the parts of this set. Also define *regularly* partitioning (splitting) a set if and only if its parts are of equal universal measure. Such regular *continuum parts* inherit its dimensionality, have an actually continually infinitesimal unimeasure in every dimension, and are called *continual uniparticles*.

See the following example of *correctly*, *properly*, and *regularly* partitioning (splitting) symmetric both half-interval and half-segment $|0, 1|$ into $Q|0, 1| = \Omega$ also linear uniparticles of the same actually continually infinitesimal unimeasure $1/\Omega$ in the simplest first order consideration (with the first degree, or power, Ω):

$$|0, 1| =^\circ |0, 1/\Omega| +^\circ |1/\Omega, 2/\Omega| +^\circ \dots +^\circ |(\Omega - 1)/\Omega, 1| =^\circ \Sigma^\circ{}_{i=1}{}^{\Omega}|(i - 1)/\Omega, i/\Omega|.$$

The same also holds for any linearly modeled variable, e.g. for time. We may freely *correctly*, and *properly*, but not necessarily *regularly* partition (split) an n-dimensional space ($n \in N$). We may provide this purely geometrically or introduce in it any coordinate system, e.g. cylindrical or spherical. By using a Cartesian coordinate system and *correctly*, *properly*, and *regularly* partitioning (splitting), a *continuum uniparticle* is an n-dimensional parallelepiped whose dimensions are of actually continually infinitesimal unimeasures. They are equal to one another if and only if the same holds for the corresponding coordinate axes units. If and only if all of them coincide and a Cartesian coordinate system is rectangular, then a *continual uniparticle* is an n-dimensional actually continually infinitesimal cube.

Like any continuum, a *continual uniparticle* contains its separate points *belonging* to it but it cannot *consist* of them *only*.

4. Advanced Unimathematics (Universal Mathematics)

Classical mathematics [2–4] defines power and exponential functions for bases $a \geq 0$ only. By $a < 0$, raising is well-defined for even positive integer exponents only, see

$$(-1)^3 = -1 \neq 1 = [(-1)^6]^{1/2} = (-1)^{6/2},$$
$$(-1)^{1/3} = -1 \neq 1 = [(-1)^2]^{1/6} = (-1)^{2/6}.$$

Exponentiation and further hyperoperations are noncommutative and nonassociative:

$$2^3 = 8 \neq 9 = 3^2,$$
$$2\hat{}3\hat{}4 = 2\hat{}(3\hat{}4) = 2^{81} \neq 2^{12} = (2\hat{}3)\hat{}4.$$

Also iterated (nested) power-exponential functions (power towers), e.g.,

$$y = x^x = {}^2x,$$
$$y = {}^nx = x\hat{}x\hat{}...\hat{}x \text{ (n times)},$$

and

$$y = {}^xx,$$

are useful by $x \geq 1$ only.

Probability density

$$f(x) = dF(x)/dx$$

via integral distribution function $F(x)$ has this formal differential sense only, is no probability $p(x) = 0$ by continual distributions even for possible events, and does not exist by infinite-measure uniform distributions.

Advanced universal mathematics [5, 7, 13, 16, 33, 42] has introduced alternative negativity-conserving multiplication

$$"\Pi_{j\in J}\, a_j = \min(\text{sign } a_j \mid j \in J)\, |\Pi_{j\in J}\, a_j|$$

and base-sign-conserving exponentiation

$$a^{"b} = |a|^b \text{ sign } a$$

with extending to complex

$$a = re^{i\varphi},$$

$$|a| = r,$$
$$\text{dir } a = e^{i\varphi};$$
$$b = c + di \ (i^2 = -1):$$
$$a^{''b} = a^{''c+di} = |a|^{c+di} \text{ dir } a = r^{c+di} e^{i\varphi} = r^c r^{di} e^{i\varphi} = r^c e^{id \ln r} e^{i\varphi} = r^c e^{i(d \ln r + \varphi)};$$
$$(-1)^{''3} = -1 = [(-1)^{''6}]^{''1/2} = (-1)^{''6/2},$$
$$(-1)^{''1/3} = -1 = [(-1)^{''2}]^{''1/6} = (-1)^{''2/6}.$$

Tetration has possibly noninteger multiplicity with a > 0 and x used [a] + 1 times:

$$y = f(x) = {}^a x = x\text{^^}a = x\text{^}^2\, a = \exp_x^{[a]+1}\{a\} = x\text{^}x\text{^}...\text{^}x\text{^}\{a\},$$
$$[a] = \text{floor}(a),$$
$$\{a\} = a - [a].$$

Denote:

$$a^{b\backslash c\backslash d} = a\text{^}b\text{^}c\text{^}d;$$
$$a^\circ = \text{sign } a;$$
$$a? = \max(a, 1/a).$$

Transform

$$^n x = x\text{^^}n$$

via

$$y = f(x) = {}^{n''}x = x''\text{^^}n = x^\circ|x|\text{^}^{n-1}|x|?,$$
$$f(0) = 0$$

(see Fig. 1, n = x)

to introduce:
quanti-hyper-root-logarithm

$$y = \text{lh}2\backslash x$$

inverse to power-exponential function

$$y = x''\text{^^}2,$$

quanti-hyper-root-logarithm

$$y = \text{lh}a\backslash x$$

inverse to

$$y = x''\text{^^}a,$$

and self-hyper-root-logarithm

$$y = \text{lh } x$$

inverse to

$$y = x''\text{^^}x = (\text{sign } x)\ |x|\text{^}\max(|x|, 1/|x|)\text{^^}(x - 1);$$

power-sum exponentiation:

$$E\Sigma_{j\in J}\ a_j = {}^{\wedge+}{}_{j\in J}\ a_j;$$
$$a \ {}^{\wedge+}\ b = a^b + b^a;$$
$$2 \ {}^{\wedge+}\ 3 = 2^3 + 3^2 = 17;$$

power-modulus-sum exponentiation:

$$|E|\Sigma_{j\in J}\ a_j = {}^{|\wedge|+}{}_{j\in J}\ a_j;$$
$$a \ {}^{|\wedge|+}\ b = |a^b| + |b^a|;$$

power-sum-modulus exponentiation:

$$E|\Sigma|_{j\in J}\ a_j = |E\Sigma_{j\in J}\ a_j| = {}^{\wedge|+|}{}_{j\in J}\ a_j;$$

$$a \ ^{\wedge|+|}\ b = |a^b + b^a|;$$

modulus-power-sum exponentiation:

$$E\Sigma_{j\in J} |a_j| = {}^{||\wedge+}{}_{j\in J}\ a_j;$$

$$a \ ^{||\wedge+}\ b = |a| \ ^{\wedge+}\ |b| = |a|^{|b|} + |b|^{|a|};$$

sign-power-modulus-sum exponentiation:

$$^{\circ}|E|\Sigma_{j\in J}\, a_j = {}^{\circ|\wedge|+}{}_{j\in J}\ a_j;$$

$$a \ ^{\circ|\wedge|+}\ b = a^{\circ}|a^b| + b^{\circ}|b^a|;$$

sign-power-sum-modulus exponentiation:

$$^{\circ}|E\Sigma|_{j\in J}\ a_j = {}^{\circ|\wedge|+}{}_{j\in J}\ a_j;$$

$$a \ ^{\circ|\wedge+|}\ b = |a^{\circ}|a^b| + b^{\circ}|b^a||;$$

sign-modulus-power-sum exponentiation:

$$^{\circ}||E\Sigma_{j\in J}\ a_j = {}^{\circ||\wedge+}{}_{j\in J}\ a_j;$$

$$a \ ^{\circ||\wedge+}\ b = a^{\circ}|a|^{|b|} + b^{\circ}|b|^{|a|};$$

modulus-sign-power-sum exponentiation:

$$|^{\circ}E\Sigma|_{j\in J}\ a_j = {}^{|\circ\wedge+|}{}_{j\in J}\ a_j;$$

$$a \ ^{|\circ\wedge+|}\ b = |a^{\circ}|a|^{|b|} + b^{\circ}|b|^{|a|}|;$$

power-sum-modulus-sign exponentiation:

$$|E\Sigma|^{\circ}{}_{j\in J}\ a_j = {}^{|\wedge+|\circ}{}_{j\in J}\ a_j;$$

$$a \ ^{|\wedge+|\circ}\ b = (a + b)^{\circ}|a^b + b^a|;$$

power-modulus-sum-sign exponentiation:

$$|E|\Sigma^{\circ}{}_{j\in J}\ a_j = {}^{|\wedge|+\circ}{}_{j\in J}\ a_j;$$

$$a \ ^{|\wedge|+\circ}\ b = (a + b)^{\circ}(|a^b| + |b^a|);$$

modulus-power-sum-sign exponentiation:

$$||E\Sigma^{\circ}{}_{j\in J}\ a_j = {}^{||\wedge+\circ}\ {}_{j\in J}\ a_j;$$

$$a \ ^{||\wedge+\circ}\ b = (a + b)^{\circ}(|a|^{|b|} + |b|^{|a|});$$

power-sum maximum-exponentiation:

$$E^{?}\Sigma_{j\in J}\ a_j = {}^{?\wedge+}{}_{j\in J}\ a_j\ ;$$

$$a \ ^{?\wedge+}\ b = a^{b?} + b^{a?};$$

power-modulus-sum maximum-exponentiation:

$$|E|^{?}\Sigma_{j\in J}\ a_j = {}^{?|\wedge|+}{}_{j\in J}\ a_j;$$

$$a \ ^{?|\wedge|+}\ b = |a^{b?}| + |b^{a?}|;$$

power-sum-modulus maximum-exponentiation:

$$E^{?}|\Sigma|_{j\in J}\ a_j = {}^{?\wedge|+|}{}_{j\in J}\ a_j;$$

$$a \ ^{?\wedge|+|}\ b = |a^{b?} + b^{a?}|;$$

modulus-power-sum maximum-exponentiation:

$$E^{||?}\Sigma_{j\in J}\ a_j = {}^{||?\wedge+}{}_{j\in J}\ a_j;$$

$$a \ ^{||?\wedge+}\ b = |a|^{|b|?} + |b|^{|a|?};$$

sign-modulus-power-sum maximum-exponentiation:

$$E^{\circ||?}\Sigma_{j\in J}\ a_j;$$

$$a \ ^{\circ||?\wedge+}\ b = a^{\circ}|a|^{|b|?} + b^{\circ}|b|^{|a|?};$$

sign-power-sum-modulus maximum-exponentiation:

$$a \ ^{\circ||?\wedge|+|}\ b = |a^{\circ}|a|^{|b|?} + b^{\circ}|b|^{|a|?}|;$$

modulus-power-sum-sign maximum-exponentiation:

$$a \ {}^{||?\wedge+\circ}\ b = (a + b)^{\circ}(|a|^{|b|?} + |b|^{|a|?});$$

power-product exponentiation:

$$E\Pi_{j\in J}\ a_j = {}^{\wedge\times}{}_{j\in J}\ a_j;$$
$$a \ {}^{\wedge\times}\ b = a\text{^}b\ b\text{^}a = a^b\ b^a;$$

modulus-power-product exponentiation:

$$E\Pi_{j\in J}\ |a_j| = {}^{||\wedge\times}{}_{j\in J}\ a_j;$$
$$a \ {}^{||\wedge\times}\ b = |a|^{|b|}\ |b|^{|a|}.$$

Advanced unimathematics creates fundamentally new opportunities to set and solve many earlier principally unsolvable urgent problems.

Uninumber uniprobability U(x) [5, 7, 13, 16, 33, 35, 42–45] positive for possible events always exists and has both mathematical and physical sense.

5. Applied Unimathematics (Universal Mathematics)

Classical applied mathematics [4] has many fundamental defects. Absolute error Δ is multiplication-noninvariant

$$(\Delta_{1\ =?\ 0} = 1,$$
$$\Delta_{10\ =?\ 0} = 10)$$

and insufficient for quality estimation

$$(\Delta_{1000\ =?\ 999} = \Delta_{1\ =?\ 0} = 1).$$

Relative error δ applies to formal (true or false) equalities

$$a =?\ b$$

of two numbers only

$$(\delta_{1\ -\ 2\ +\ 3\ -\ 4\ =?\ -1}$$

is unclear), is ambiguous (either

$$\delta_a = |a - b|/|a|$$

or

$$\delta_b = |a - b|/|b|),$$

and can exceed 1:

$$\delta_{0;\ 1\ =?\ 0} = +\infty,$$
$$\delta_{1=?-1} = 2$$

also for

$$\delta_{mean} = |a - b|/[(|a| + |b|)/2],$$
$$\delta_{max} = |a - b|/\max(|a|, |b|).$$

The least square method (LSM) [4] practically the unique known one applicable to contradictory problems is unreliable and not invariant by equivalent transformations

$$(x = 1 \wedge x = 2 \rightarrow x = 3/2;$$
$$10x = 10 \wedge x = 2 \rightarrow x = 102/101;$$
$$x = 1 \wedge 10x = 20 \rightarrow x = 201/101),$$

makes no sense by noncoinciding physical dimensions (units) in a problem, provides cardinally false principle "The worse data, the greater influence", and can give completely paradoxical outputs [5, 7, 9, 10, 13, 17, 23, 27–29, 33, 35, 37, 42–45]. Fitting two points (1, 1) and (10, 15) via line

$$y = kx$$

gives greater (even absolute) errors by smaller absolute values:

$$k = 151/101,$$
$$\Delta_{(1, 1)} = 51/101,$$
$$\Delta_{(10, 15)} = 5/101.$$

Minimizing the sum of the squared differences of the alone preselected coordinates (e.g., ordinates in a two-dimensional problem) of the graph of the desired approximation function and of every given data depends on this preselection, ignores the remaining coordinates, and provides no coordinate system rotation invariance and hence no objective sense of the result. Moreover, the LSM can be correct by constant approximation or no data scatter only and gives systematic errors increasing together with data scatter and the approximation deviation (i.e. declination α) from a constant. Namely [40], whereas α increases from 0 to $\pi/2$, the LSM gives a smaller declination β increasing from 0 to β_{max} and then paradoxically decreasing to 0.

There is no estimating the confidence, or reliability, of exactness at all, e.g., for differently reliable exact solutions

$$x_1 = 1 + 10^{-10}$$

and

$$x_2 = 1 + 10^{10}$$

to inequation

$$x \geq 1.$$

Applied unimathematics [5–29, 31–45] universally models, estimates, and approximates objects. A general problem is a quantisystem

$${}_{q(\lambda)}R_\lambda[_{\varphi\in\Phi}\ f_\varphi[_{\psi\in\Psi}\ z_\psi]]\ (\lambda \in \Lambda)$$

of known relations R_λ over unknown functions f_φ of known variables z_ψ, all of them belonging to their vector spaces, and indexes λ, φ, and ψ belonging to their sets Λ, Φ, and Ψ. Here

$$[_{\psi\in\Psi}\ z_\psi]$$

is a set of indexed elements z_ψ,
$q(\lambda)$ is the own quantity-weight of the λ-th relation, and
$Q(\Psi)$ is the uniquantity of Ψ.
Introduce extended division:

$$a//b = a/b \text{ by } a \neq 0$$

and

$$a//b = 0 \text{ by } a = 0 \text{ and any } b.$$

The linear and quadratic unierrors (always in [0, 1]) for formal vector equality

$$(\Sigma z(\psi\in\Psi) =)\Sigma_{\psi\in\Psi}\ z_\psi =?\ 0$$

are

$$E_{\Sigma z(\psi\in\Psi) =?\ 0} = ||\Sigma_{\psi\in\Psi}\ z_\psi||//\Sigma_{\psi\in\Psi}||z_\psi||:$$
$$E_{1=?0} = 1,$$

$$E_{1=?-1} = 1,$$
$$E_{100-99=?0} = 1/199,$$
$$E_{1-2+3-4=?-1} = 1/11;$$
$$^2E_{\Sigma z(\psi\in\Psi) =? 0} = ||\Sigma_{\psi\in\Psi}\, z_\psi||//[(Q(\Psi)\Sigma_{\psi\in\Psi}\, ||z_\psi||^2]^{1/2}:$$
$$^2E_{1=?0} = 1/2^{1/2},$$
$$^2E_{1=?-1}=1,$$
$$^2E_{1-2+3-4=?-1}=1/155^{1/2}$$

both irreproachably correcting and generalizing the relative error. Unireserve r in [-1, 1], unireliability s and unirisk ρ both in [0, 1] based on unierror E additionally estimate and discriminate exact objects, models, solutions, and problems via the confidence in their exactness, e.g., for above inequation $x \geq 1$:

$$r_{x\geq1}(x_1) = E_{x\leq?1}(1 + 10^{-10}) = 10^{-10}/(2 + 10^{-10}),$$
$$r_{x\geq1}(x_2) = E_{x\leq?1}\, (1 + 10^{10}) = 10^{10}/(2 + 10^{10});$$
$$s_{x\geq1}(x_1) = [1 + r_{x\geq1}(x_1)]/2 = (1 + 10^{-10})/(2 + 10^{-10}),$$
$$s_{x\geq1}(x_2) = [1 + r_{x\geq1}(1+10^{10})]/2 = (1 + 10^{10})/(2 + 10^{10});$$
$$\rho_{x\geq1}(x_1) = [1 - r_{x\geq1}(x_1)]/2 = 1/(2 + 10^{-10}),$$
$$\rho_{x\geq1}(x_2) = [1 - r_{x\geq1}(x_2)]/2 = 1/(2 + 10^{10}).$$

In fitting two points (1, 1) and (10, 15) via line

$$y = kx,$$

the linear unierror

$$E_{\Sigma a(j) =? 0}$$

gives

$$|k - 1|/(|k| + 1) = |10k - 15|/(|10k| + |15|),$$
$$k = 1.5^{1/2},$$
$$\Delta_{k =? 1}=1.5^{1/2} - 1,$$
$$\Delta_{10k=?15}=15 - 10 \times 1.5^{1/2},$$
$$E_{k =? 1} = E_{10k=?15} = (1.5^{1/2} - 1)/(1.5^{1/2} + 1).$$

These uniestimators for the first time evaluate and precisely measure both the possible inconsistency of a uniproblem and its pseudosolutions including quasisolutions, supersolutions, and antisolutions also for decision-making.

6. Computational Unimathematics (Universal Mathematics)

Common computational mathematics [4] discretization with finite operability only (at most countable in mathematics) reduces the reals range (there are finite signed computer infinities and zeros). Following the inflexible algorithms restricts research range and deepness due to utilizing the second power basis only analytically the simplest but typically inadequate. One-source iteration requires explicit mapping contractivity and leads to difficulties, slow convergence, and even noncomputability. Built-in standard function rounding brings errors. The finite element method gives impressive "black box" results not verifiable and often inadequate.

Computational unimathematics [5–29, 31–45] with uninumbering, discovering, and inventive intelligence fully utilizing complications including outliers provides multiple-sources and especially intelligent iterativity (coherent, or sequential, approximativity). Sufficiently increasing the exponent (e.g., up to 6000 and greater) in power mean theories and methods can bring adequate results with recovering true measurement information via incomplete changed data. Perfectioning built-in standard functions brings always feasible and proper computing. Unlimitedly flexible universal intelligent transformation and solving algorithms ensure avoiding computer zeros and infinities and cryptography systems hierarchies. It becomes possible to adequately consider, model, express, measure, evaluate, estimate, overcome, and even efficiently utilize many complications such as doubt, challenges, contradictions, infringements, damages, hindrances, obstacles, restrictions, mistakes, distortions, errors, information incompleteness, variability, etc. Best data approximation science reliably ensures for the first time: The better data, the greater influence. Hence also very asymmetric and scattered data with outliers are fully adequately fitted.

Multiple-Sources Intelligent Iteration

A general pure inequation problem in individual vector spaces with indexes λ, φ, and ψ from sets Λ, Φ, and Ψ, respectively, is a quantiset

$${}_{q(\lambda)}\{L_\lambda\{_{\varphi\in\Phi}\ {}_{r(\varphi)}f_\varphi[_{\psi\in\Psi}\ {}_{s(\psi)}z_\psi]\}\ R_\lambda\ 0\}\ (\lambda\in\Lambda)$$

of known uniinequality quantirelations R_λ (with own quantities $q(\lambda)$), e.g.,

$$= , \approx , \sim , \neq , < , > , \leq , \geq ,$$

of known operators L_λ over unknown quantifunctions ${}_{r(\varphi)}f_\varphi$ (with own quantities $r(\varphi)$) of known quantivariables ${}_{s(\psi)}z_\psi$ with own quantities $s(\psi)$. Iteration begins with initial pseudosolution

$$[_{\varphi\in\Phi}\ {}^1f_\varphi[_{\psi\in\Psi}\ z_\psi]]$$

via approximations

$${}^{i+1}f_\varphi[_{\psi\in\Psi}\ z_\psi] = L_\varphi[_{\varphi\in\Phi}\ {}^if_\varphi[_{\psi\in\Psi}\ z_\psi]]\ (i \in N^+ = \{1, 2, \ldots\})$$

to solution

$$[_{\varphi\in\Phi}\ f_\varphi[_{\psi\in\Psi}\ z_\psi]].$$

General problem intelligent iteration theory calculates (via free pseudosolutions)

$${}^{i+1}f_\varphi[_{\psi\in\Psi}\ z_\psi] = {}^{i+1}M_\varphi\{{}^{i+1,\,1}L_\varphi[_{\varphi\in\Phi}\ {}^{1'}f_\varphi[_{\psi\in\Psi}\ z_\psi]],$$
$${}^{i+1,\,2}L_\varphi[_{\varphi\in\Phi}\ {}^{2'}f_\varphi[_{\psi\in\Psi}\ z_\psi]],$$
$$\ldots ,$$
$${}^{i+1,\,i}L_\varphi[_{\varphi\in\Phi}\ {}^{i'}f_\varphi[_{\psi\in\Psi}\ z_\psi]]\}.$$

Creative accelerating methods and know-how of rationally placing approximations table calculations rectangularly block-wise provide calculating a next approximation via right-direction adjacently placing the copy of the previous approximation design.

Conclusion

Unimathematics first exactly measures infinities, solves Zeno's paradoxes (5th century BC) and discovers (due to its positive-measure, namely actually continually infinitesimal, uniparticle) the nature, essence, and structure of continuum, space and time, rest and motion. Unimathematics creates fundamentally new possibilities and tools to intelligently solve earlier principally unsolvable urgent complicated problems with discovering phenomena and laws of natural, technical, and social sciences.

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