What is U-mentalism?

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***Abstract*—U-mentalism (Luís Homem, 2018) is a philosophical and programming idea that proposes a singular (one only and *individual*, *intensional*) and universal (all and wholly *comprehensive*, *extensional*) programming language which is, simultaneously, an inverted scheme of all the established computer architectures (prevalently more so the Princeton, or von Neumann, computer architecture). Its adequate *motto* is the layout of the prospect for, simultaneously, an indispensable new computer architecture and a new programming language where "each and every possible image is made capable of representing each and every possible abstract". This should come in substitution for the existent informatic rule and programming precept whereby "certain and few programming wordings represent certain and specific abstracts", basically the (syntactic and semantic) outline of the general theory and history of programming languages. U-mentalism should be interpreted both ontologically (every possible image in every possible spacetime composed in every possible mind and *n*-dimensionally by *perceived* photons of light), *parallel* with every possible abstract [U-mentalism and the "O" approach in ontology], inspired by Leibniz (Kantian, an *ideal* of programming reason), as more narrowly, at the implementation, informatic and informational levels, with 2-dimensional – not quite "numeric", nor "binary" – digital composed images as "effectively calculable means" (Alonzo Church, 1936) in a computer or an "*a*-machine" (Alan Turing, 1936) [U-mentalism and the "C" approach in computation].**

***Index Terms*—*a*-machine, U-mentalism, non-von Neumann architecture, visual machine learning.**

I. Introduction

By proposing a singular and universal programming language (PL), under both one broad ontology [U-mentalism in the "O" approach] and one specified programming language (or media) [U-mentalism in the "C" approach], the Leibnizian power of influence is clearly manifest and overarching. However true, U-mentalism [in the "O" approach] settles apart from one universal science based on the model of mathematics, i.e., a *mathesis universalis*. Although bearing a formal language in each every composed (digital) image, U-mentalism does not bear resemblance with any sort of *calculus ratiocinator* in the sense that, although effecting computability, it is the inductive supervenience of *imagetic* postulates what permits the *formal-deductive* axiomatization of the system, or better said, the PL mechanization. And to this we can add that the Leibnizian idea of one *characteristica universalis* is neither fully suitable to the concept of U-mentalism, for it is not at stake the realization of one symbolic language for the sake of science, mathematics, and metaphysics, but instead science, mathematics, and metaphysics realized into a symbolic *medium* (or language).

In truth, as it shall be seen, U-mentalism is, more sharply, neither binary, in the line of *Explication de l'Arithmétique Binaire* (1703) [1], nor evanescently monadic, charted by the congenial *La Monadologie* (1714) [2]. If anything, it hinges on the right equidistance of nominalism vs. realism, apriorism vs. empiricism, in a flagrant noetic-noematic balance, i.e., the right measure in between the intentional act of consciousness, and the (inner postulated) *noema* or object itself. Lastly, it should not be misunderstood as a sort of Fregean *Begriffsschriftit* [3], or a "concept-script", for U-mentalism's ideo-graphical approach is not *logicist*, neither by any means mathematical *foundational* (or now anti-*logicist*, and anti-*foundational* as the case may be), but, in truth, (philosophically and computationally) *imagetic* only.

Again, at its broadest ontological scope, U-mentalism states a *parallel* (classical Euclidean) line between the graphical and visual ["(concept)(o)*graphy*"] [3] of every possible image in every possible spacetime composed in every possible mind and *n*-dimensionally by *perceived* photons of light, with every possible abstract ["*concept*(o)(graphy)"] [3], in computability's proper *diagonalization* method (stemmed from Bolyai and Lobachevsky in geometry, Cantor, Gödel, and Turing in mathematics and logic).

In this line of thought, the referred right equidistance of nominalism vs. realism, and apriorism vs. empiricism brings about another middlemost (philosophical and programming) *intermittent* center, i.e., in between classical Euclidean (analitically self-consistent, but dialectically paradoxical) *parallels*, and non-classical Euclidean (analitically self-paradoxical, but dialectically self-consistent) *diagonalization*.

In truth, computability itself is befittingly described as, although "effective" (Alonzo Church, 1936) [4] and self-consistent as it might be, *paradoxical*, thus tangential to both *lines* of the classical and non-classical traditions. Indeed, without *diagonalization*, neither the so called "Gödelization" or "Gödel numbering" – "in a Σ-algebra A is a pair (C,β) with C as a recursive Σ-number-algebra and $\beta{:}A\rightarrow C$ as a Σ-algebra-morphism from A onto C" [5], with Σ as the signature, and "Gödelization" given as the encoding of the elements of A by natural numbers (with encoding inasmuch *naturalized* as natural numbers themselves) –, nor PL hierarchy and PL practicality, nor λ-functions unravelling, nor say arbitrary structured types of an universal two-level grammars algorithmic language (such as the PL Algol 68) would be possible. But this would be to say that *diagonalization* is to computability a principle of necessary reason, when it is, instead, a principle of sufficient reason, i.e., without which computability would not be possible: binary machine code settles various *diagonalization* processes so to arrive to high-level PL with drawn *parallels* contained in each hierarchy

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level (machine language, assembly language, and high level PL), and an "*a*-machine" (Turing, 1936) [6] prevails, in the overall, as being declaratively paradoxical and incomplete (after Gödel's incompleteness theorems) [7], inasmuch as procedurally consistent and decidable (after Gödel´s completeness theorem) [7].

In short, the "*a*-machine" (Turing, 1936) [6] likewise it betokened and augured the digital era of "mathematical communication" and "information theory" (Claude Shannon, 1937-1948) [8], cybernetics after "*Cybernetics or control in the animal and the machine*" (Norbert Wiener, 1948) [9], also foreshadowing the establishment of AI as a field (John McCarthy, 1955), indeed predating the automatic machine itself, was also an epilogue to a philosophical-mathematical vogue. With this, we are referring mainly – in spite of the well-known connection of the *Entscheidungsproblem* [6] with the original (10^{th}) problem posed on the determination on the solvability of a diophantine equation (W. F. Ackerman; David Hilbert, 1928) [10] – to the very first two problems in the same list (W. F. Ackerman; David Hilbert, 1928) [10]: the 1^{st} related with Cantor's problem on the cardinal number of the *continuum*, or the *continuum hypothesis* (Cantor, 1878), under which, very contra-intuitively $2^{\aleph 0}=\aleph_1$ - herein formalized accepting the (independent and ambivalent) axiom of choice (E. Zermelo1904) where the infinite cardinal number is equal to the powerset of $\mathbb{N}$, as the set of all functions to a given set of 2 elements - for which the union of sets as the infinite powerset of $\mathbb{N}$ is strictly smaller than the set of $\mathbb{R}$ - with the consequence that for any given equally defined function *f*, a set *W*, and a non-empty set $\boxed{Sw}$ to each $\boxed{w \in W}$, there is no other choice for any axiomatic construction except to choose the (ambivalent and independent) axiom of choice $f: W \rightarrow \bigcup_{w \in W} Sw$; and the 2^{nd} problem related precisely to the compatibility of the arithmetical axioms, indagating, thus, if the whole of arithmetic is consistent and free of internal contradictions, later proved to be false by Gödel's incompleteness theorems (Kurt Gödel, 1931), by virtue of the fact that in an arithmetically expressed formal system any formally-undecidable proposition can be found, i.e. a closed formula A such that neither A nor ¬A can be deduced from within the formal system itself [7].

This general synopsis of the just invoked mathematical vogue ended catastrophically, in a full debacle, with Gödel's incompleteness theorems (Kurt Gödel, 1931), in one such extent that the Kantian and post-Kantian metaphysical and mathematical nature of synthetic *a priori* judgements, the proper "history of pure reason" (Kant, 1781-1787) [11], the access to transcendental dialectic and the "ideal of pure reason" (Kant, 1781-1787) [11], were forever postponed, vanished and gone *in perpetuum*, just about the same time Nazis' ascension to power began (1931-1933).

The *annus mirabilis* of computability theory (Turing-Church, 1936), having drawn in the famous Turing-Church thesis, was totally unexcepted in this way. It was not by any chance forethought after the shock of Gödel's incompleteness theorems (Kurt Gödel, 1931), that whichever recursively undecidable predicative notion or predicate $P(x1, \dots, xn)$, indagated if true or false for the expressed values $(x1, \dots, xn)$ and the (impossibly affirmed or negated) total recursively decidable function could mean a full daybreak for the conceptual notion of both the modern computer (the Turing-machine) and the first PL (λ-Calculus), both of which would, as forerunner-states of the ACE (Automatic Computing Engine, 1945), herein presumed the method of *diagonalization* in cryptography, decisively win over Nazis World War II.

$$|x| = \begin{cases} (x1, \dots, xn) = 1(True) \\ (x1, \dots, xn) = 0(False) \end{cases}$$

Computability theory (dragging from the common ground of recursion theory that permitted Gödel to envisage the incompleteness theorems, all above the 2^{nd} incompleteness theorem which proscribes mathematics to a state of wrong number and paradox: mathematics (Peano & $\mathbb{N}$)-axiomatized, self-sufficient to prove its own consistency can only prove its own consistency if and only if it is inconsistent, was henceforward ruined and shattered in pieces. Such theorems devastated the whole edifice of the "queen of sciences" (C. F. Gauss). All the supine *antecedens* effort on arithmetization of analysis, ranging from all disciplines (logic: Boole, Peirce, and Frege; set theory: Cantor and Dedekind; arithmetic: Frege, Dedekind, and Peano; geometry: Pasch and Hilbert) [5] found wreckage.

It is, therefore, here contended that computability theory inaugurated a shift from the *calculus* tradition to the newest of *computus*, the reason being that the XIX^{th} century endeavor of laying $\mathbb{R} \rightarrow \mathbb{N}$ (a theory of reals from naturals), which necessarily implied 1) the establishment of traditional unmoving and pre-complexified concepts related to *limits*; 2) an overconfident and pre-deterrent effect on the power of *deduction*, afterwards deflated to the (intuionist and operationalist) *derivation* of theorems; and 3) the creation of the theory of real numbers with a Kantian foundational architectural sense, i.e., mathematics taken as an indestructible edifice, was forever lasting lost. Nevermore were they attained in the *computus* era: *limits* are complexified, *deductive* sciences are intrusive, and the *continuum* is now a complexified hypothesis.

This havoc of premises, nevertheless, solely, rapidly, and unexpectedly created the groundwork for not only XX^{th} century, but indeed all history's most prodigious artifact: the computer, and the upwind *computus* era. However, we are deeply plunged, contrary to Hilbert´s expectations (borrowing and combining Heidegger's metaphysics concept with the Hilbertian dream), in an *ignoramibus dasein*.

The Viennese author Ludwig Wittgenstein is very appurtenant to this topic, helping, in the shadow, to grasp the concept of U-mentalism [mainly in the "O" approach], for it summarizes a pre- and after- Gödel's incompleteness theorems (Gödel, 1931) mind-, language-, and mathematics-naturally antinomic philosophy, usually levelled out in the academic expressions "Wittgenstein I" and "Wittgenstein II" [12], [13]. Our stance presupposes that this antinomic Wittgenstein I and II mutual estrangement resides on the *calculus-to-computus* passage (taking into consideration that Wittgenstein lived up to the year of 1951, shortly after the machinery emancipation of computability, although his stress was, instead, on *operationalism*). According to this, we may settle the following divisor mainframe - where it is no coincidence that the *Tractatus Logico-Philosophicus*

(Wittgenstein, 1921) [12] projects over the pre-1931 world, contradictory in essence to the *sprachspiel* (language-game) incidental concept in the book *Philosophical Investigations* (1953) [13], a very different post-1931 world, where in the interim the modern analog-to-digital general purpose computer rose to existence - also fruitful to think ahead the differences between PL and U-mentalism:

Wittgenstein I: congruent with the "picture theory" of language, thus functionalist and operationalist *pictoric*; bound to externalism and reductionism; *in atomus*, spacetime localist; widely monist and fixist; consecutive to mathematical structuralism; necessarily sensical and overly referential; endowed with a lawful language grammar; logicist; with prevalence of the transcendental subject producing *schemata* within the unity of thought over the empirical image; close to sensibility, understanding, and reason; in the line of deduction and PL.

Wittgenstein II: congruent with the "language game theory" of language, thus functionalist and operationalist *imagetic*; bound to internalism and emergentism; *in continuum*, spacetime non-localist; widely pluralist and conventionalist; consecutive to mathematical formalism; modally non-sensical and overly non-referential; endowed with a rule-following grammar; constructivist; with prevalence of the empirical image over the transcendental subject producing *schemata*; close to imagination and judgement; in the line of induction and U-mentalism.

II. Development

Veritably, recurring to a sort of inference to the best explanation, the best way to describe U-mentalism [in the "C" approach] is to understand A. N. Whitehead and B. Russell's "theory of types" – originally a response to Frege´s naïve set theory, and following the study of various paradoxes (the Epimenides, the Burali-Forti, and Richard's) – henceforward in U-mentalism's as (digital printed) "movable types" (Guttenberg, c. 1450), wherein (digital composed) (*genetically* repeated and differentiated) images operate themselves as the axiom of reducibility. What this signifies is that by no means is it made possible for a contradiction to be stated in the form of *imagetic* self-referentiality or, typically, it is impossible in imagery terms the paradox of "the class of all classes that do not contain themselves as elements", notably due to the principle of "difference and repetition" (Deleuze, 1968) [14] applied to (digital composed) images, hereafter the informational "movement-image" (Deleuze, 1983) [15].

While the state of the art of PL (and CA) is routinely problematic in regard to the "von Neumann bottleneck" (John Backus, 1977) [16], and customarily afflicted with the P vs NP problem (Stephen Cook, 1971) [17], with U-mentalism PL theory and practice is not only expanded and unified, as it is also metamorphosed into the fields of computer vision & multiple-view geometry [18], [19], while the computer finally resolves to exemplary and *naturalistically* mimic the mind and the brain, in place of the accustomed (Cartesian) mind-body dualism and functionalism that is patent still in von Neumann's idea behind *The Computer and the Brain* (1958) [20]. In such fashion, computability and its equivalents – type-free λ-calculus, μ-recursive functions, Markov algorithms – precisely because of the purely *imagetic*, non-mathematical *foundational* (partial, yet independent of Plato, Frege, Hilbert and Brouwer) nature of U-mentalism, is set to be investigated in all the novelty of (digital) image processing –not exactly "numeric", nor "binary", but instead a continuous and analog spectrum of digital images – being thereafter imperative checking PL solely *imagetic* object of syntax and semantics in terms of memory, speed, and power. In this equation, it is fundamental to understand that to the right settled (philosophical and programming) equidistance in U-mentalism, it is also made allowance for a simultaneously perceptive, sensuous (digital), passive (scanner & kinescope) on one side, and on the other side an intellectual (informational), conceptual, active (printer & iconoscope) overall *schemata*, as an act of the synthesis of imagination, in Kantian terms.

Hence, one of the main goals of U-mentalism is the research on the *quasi*- $\mathbb{R}\backslash\overline{\mathbb{Q}}$ (real and transcendental, also in the Kantian sense) limits of computation. U-mentalism (although using *imagetic*, non-numeric, "Gödelization") should be well within the Turing-Church thesis, with an inherent negative answer to the *Entscheidungsproblem* (W. F. Ackerman; David Hilbert, 1928) [10]. Nonetheless, the boundaries of massive parallel computation by (digital composed) images [U-mentalism in the "O" approach], close to field theory $\mathbb{R}*$, on the axis of *diagonalization* technique (Cantor, Gödel, Turing), demands a new open question in proof and model theories.

Put all of this together, U-mentalism [namely in the "C" approach], however encompassing a non-von Neumann CA, gives yet a fundamental credit to the mathematician's cogitation in the *First Draft of a Report on the EDVAC* (von Neumann, 1945) in respect to the "iconoscope memory" (12.8) [21], where it is assumed to be "*prima facie* more natural" (12.8) [2]. However von Neumann didn't think of the "iconoscope memory" (12.8) [21] to be strictly *imagetic*, even though the Hungarian-American polymath came to reason upon it beyond mere binary logic states, bearing thus "several degrees of illumination" (12.8) [2], the "iconoscope memory" (12.8) [21] lies the idea of the placement of (M)emory by a light beam, in which a single unit would cover the entire (M)emory of the *EDVAC* ($\approx 250,000$). A single iconoscope through a dielectric plate holding independent memory units is "properly switched and gated" (12.8) [21], with a single electron beam mastering the steering and deflecting, at the end producing "a visual impression of a certain image" (12.8 (a)) [21].

U-mentalism [in the "C" approach] intends to design an *universal* programming "iconoscope" (Rosing; Zworykin) in an "*a*-machine" (Alan Turing, 1936) [6], with a computer vision & multiple-view geometry visual machine learning patterns recognizer (PL) model (printer, active, informational,

conceptual and intellectual, +), and a *singular* "kinescope" (Rosing; Zworykin) (scanner, passive, digital, perceptive and sensuous, -) digital composed images receiver (CA) model.

On the contrary to the "iconoscope memory" (12.8) [21], U-mentalism is just *imagetic* – not based on low-level Boolean logic, but instead on the multitude of "difference(s) and repetition(s)" (Deleuze, 1968) [14] in the composed image – , and it is immediately usable, not only as (M)emory, but also as the central processor unit (CPU) – thus a control (computer vision) unit (CU), although not with an arithmetic logic unit (ALU), except by secondary "Gödelization" of images onto numbers and functions – also constituted as a PL, all into one only electrical digital image computing and processing interface running in an "*a*-machine" (Alan Turing, 1936) [6].

U-mentalism makes only use of digital images, but it is, in truth, an analog machine, i.e., with continuously varying signals rather than digital, directly quantized values. Another important distinction between the "iconoscope memory" (12.8) [21] and U-mentalism relates with the fundamental discrepancy between one elementary area plate in the "iconoscope memory" (12.8) [21], thus fix and rigid, and the automatic temporal sequence of multitudinous different images in U-mentalism, thus moveable and transformational. While the iconoscope is at each moment in time stationary, either considering the light beam or the dielectric plate, U-mentalism is fully travelling and displaced, in one word cinematic.

If Kantian critic transcendental philosophy goes from the transcendental unity of apperception (Kant [A107]) [11], then to the pure categories of the understanding (Kant [A129-A130]) [11], and, finally, to the transcendental *schemata* of the principles of the understanding (Kant [A137-A147; B176-187]) [11] envisaging the hierarchical passage from empirical concepts to pure mathematical concepts in sensible objects, and, ultimately, to the pure concepts of the understanding *schemata*, with U-Mentalism what is emergent is the exact inverse method, i.e., we are equating any and all empirical image as a transcendental unity of any possible judgment, towards the end of producing imagery programming and computing transcendental *schemata*.

If we computationally understand geometry connected to the faculty of sensibility (informational digital impressions), topology, in turn, with the faculty of understanding (the reproduction of images in the synthesis of imagination), fundamentally by the perception of invariances in computer vision programming, and, finally, the faculty of reason (in relation to the patterns of the mind), we are advancing resolutely to a wider comprehension of both the *intensional* and the *extensional* limits of computation, specifically under U-Mentalism. Thus, in a formalized way, what is targeted is a new least upper bound of logarithmic-to-exponential (space)time computational complexity $O(\log N)$, setting a research on a higher real programming paradigm.

As Turing wrote: "The machine is supplied with a 'tape' (the analogue of paper) running through it, and divided into sections (called 'squares') each capable of bearing a 'symbol'." [3] (Alan Turing, 1936) [6]. With U-Mentalism (U-mentalism in the "C" approach), the "tape" is now film, "squares" are now frames, and the "symbol" the movement-image [15] (Gilles Deleuze, *Cinéma 1. L'Image-Mouvement*, 1983), while each (digital) image in film works as the "*r*-th bearing of the symbol which is 'in the machine'" [3] (Alan Turing, 1936) [6].

The focus on computer vision & multiple-view geometry as the building model for the PL and CA of U-mentalism – εἰκών ("image") and σκοπεῖν ("to observe") in the root of the iconoscope (Rosing; Zworykin; von Neumann) – should entail the intersection of both sides: the scanner (computer vision & multiple-view geometry) and the printer (PL abstracts and paradigms).

The scanner side of computer vision (probability, machine learning for machine vision, models for visual words, etc) [18] and multiple-view geometry (projective geometry, transformations and estimation, fundamental matrices, *n*-view geometry and computational methods, etc) [19] ought to be made, ergo, "truth-equivalent" (Tarski, 1933-56) [22] with the printer side (PL theory, abstracts, and paradigms). In this light, U-mentalism ought subsequently to impel a series of philosophical-technical reports on the scanner-printer formal correctness and semantic conception of truth equivalence (Tarski), in the line of computability theory (Kleene, Church, Turing).

More in depth, the digital composed image [U-mentalism in the "C" approach] should be made the material-(empirical) equivalent version of the abstract-(conceptual) programming idea in accordance with Tarski's semantic theory of truth, after the 1933 program featuring an object language and a metalanguage. On one hand, the scanner side [U-mentalism in the "C" approach] (computer vision & multiple-view geometry) – with topics ranging from computer vision random variables, common probability distributions, fitting probability models, machine learning for machine vision, modelling data densities, regression and classification models, graphics, chains, trees, and grids, per-pixel transformations, the pinhole and multiple cameras, shapes, styles, filters, visual words, and in multiple-view geometry 2D and 3D projections and transformations, many-view geometry and *n*-view methods with auto-calibration, degenerate configurations, etc. - in a rough analogue of the transfer principle (Tarski, 1940) in one such manner applied to (digital) images, ought to be made truth equivalent with the printer side [U-mentalism in the "C" approach] (PL theory, abstracts and paradigms) – with topics ranging from basic syntax and assignments, control flow and exception handling, enumerated types and conditional expressions, string functions, list comprehension, evaluation strategy, and object-oriented programming constructors -, inasmuch as in the von Neumann or Princeton CA, each hierarchy level communicates in *parallel*, the same as in the proper code processing "*a*-machine" (Alan Turing, 1936) [6].

It is well known that beyond Gödel's incompleteness theorems (Gödel, 1931), Tarski's undefinability theorem (Tarski, 1936) has a broader term application in relation to any sufficiently strong formal system, after the idea that truth standardly defined cannot be defined within the same system. This leads to the idea that U-mentalism [U-mentalism in the "C" approach] by direct use of (digital) images, shares the same restrictive powers in this regard as number theory and

algebraized problems, although the very same use of (digital) images liberates the core of U-mentalism programming, by means of settling a Turing-recognizable (herein not quite recursively enumerable, but instead "recursively" *imagetic*) meta-syntax for visual (digital inter-vector and -raster types) Type-0 grammar (Chomsky, 1956) [23], to be found on the basis of a noetic-noematic (objective external and subjective internal) arguments (past PL Type-2, expectedly apt to accommodate the universal PL and programming media of U-mentalism to the "recursively enumerable" Type-0 Turing-Machine).

This is not to say that U-mentalism would presuppose a particular class of total Turing machines, computing in (digital) composed *images* all of the total computable functions, and neither that the same (digital) composed images computed in U-mentalism could be extended so to form total computable functions, but instead that a more powerful, thus faster synthesis (in Kantian terms) of parallel (also *diagonalized*) computing would be achieved. Again, U-mentalism could represent a Turing-complete higher upper-bound $T(n)$ in computational time complexity, with inherent economy of the size of the instance PSPACE. Because PSPACE ⊆ EXPTIME ⊑ EXPSPACE, and U-Mentalism [U-mentalism in the "C" approach] is itself PSPACE-*imagetic* (in terms of memory, although only *algebraized* by secondary "Gödelization" in the "*a*-machine" [6]) if we concede that any (digital) frame as a collection of polynomial non-zero degree coefficients can perform the role of the isomorphic subfield of any algebraically closed field k, basically we meet a programming version of the transfer principle, by which many other order-preserving (informatic "truth-preserving") isomorphisms can be found by virtue of real closures of k. Hence, U-mentalism [U-mentalism in the "C" approach] can revive old classical computer analysis programs, such as chess, maps, graphs, geodesic affine connections, geometry-to-topology manifolds, and even biological imaging and satellite image processing. For the very same reason, the *imperative*, *procedural*, and *structured* focus of PL should serve as the backbone to *imagetic* translation and visual machine learning, i.e., directly observable circuitry "skeleton tables" (Alan Turing, 1936) [6] for different "*m*-configurations" (Alan Turing, 1936) [6], wherein U-mentalism can be said to make use of context-sensitive (digital) images as optimal-decidable programming "abbreviated tables" (Alan Turing, 1936) [6]. Now, because PSPACE ⊂ EXSPACE bypassing NP & P, and both PSPACE and EXSPACE seem to account also for PTIME and EXPTIME, insofar there is an inevitable physics-based *spacetime* convergence – reason why it is presumed that EXPTIME ⊂ EXPSPACE -, U-mentalism [U-mentalism in the "C" approach] can bring about at least a more defined spectrum of the P vs. NP divergence in the worst case scenario. Optimistically instead, it can offer *de revolutionibus orbium codicis* a more acute perspective over both the horizontal line of computational time complexity (P vs. NP), and the vertical line of all the computational time complexity hardness problems, at least considering the decidable problems (and languages), as the strict subset of Turing-recognizable problems.

Taking into consideration that pretty much all PL are Turing-complete if memory limitations are ignored, then in imagery programming as in U-mentalism [U-mentalism in the "C" approach], wherein many-valued-tuple sequences of "*m*-configurations" (Turing, 1936) [6] are synthetized in a snapshot, even more without standard classical algorithmic complexity, it is paved the way to an higher bound of *quasi*-hypercomputation (assuming, nevertheless, halting probability in the form of a non-computable normal and transcendental real number at each interval), if it was not for the necessarily associated algorithmic (PL abstracts and paragims) instructions that have to be programmed through "Gödelization" in imagery pointwise definitions [U-mentalism in the "C" approach].

This is the reason why a research route could be exploring the basic analogy between computable-equivalent λ-Calculus and U-mentalism pixel-point coarse-grained model. The context-free Type-2 grammars (Chomsky, 1956) [23] should be copied (printer side) to visual machine translation (scanner side) from *imperative*, *procedural* and *structured* languages dominant in the history of PL, with computation ahead possibly combining *circa* 5 trillion frames/per second, and dozens of trillions of digital images/per year as feed-in stacks for the U-mentalism technology. For similar reasons, it is suggested the use of the digital negative (DNG) open-access raw format (Adobe, 2004) in parallel with computer vision models & multiple-view geometry on the scanner side, in linear correspondence semantics with paradigms and abstracts of notable standardized PL, such as Algol 60/68, C/C++, Prolog, and Common Lisp, on the printer side.

If the Backus-Naur form (BNF) (Backus, 1960) [16] - decisively inspired in Pāṇini, the ancient Indian Sanskrit grammarian, whose work also shaped the Chomskyan generative grammar – introduced a metasyntax for Type-2 context-free grammars PL, now with U-mentalism [both in the "O" and the "C" approach] what is addressed is a full Type-0 natural-isomorphic EXPSPACETIME (recursively *imagetic*) grammar congruent with the Turing-machine. In this equation, attention is called upon the fact that any image (indeed any pixel-point) performs as a reducibility axiom, and that any missing abstract, if the printer-scanner bridge is duly isomorphic, can also be generated by a new image, and thus a nondeterministic Turing-Machine be set in the equivalence. The printer-scanner truth-equivalence should *ideally* be inasmuch a (kinescope-scanner-passive) photometry-radiometry image-orthicon (correctness being the arrow from syntax to semantics), and an (iconoscope-printer-active) machine learning beam of light (validity being the arrow from semantics to syntax), in what respect the flow and present-day constraints advise a pictorial-to-object approach, in a sort of parietal programming art, on the scanner-passive side, and a lambda-to-object approach, in a sort of recapitulation law of (programming) nature, on the printer-active side. It is also important not to forget the inherent philosophical limits of monadic-to-noumenal (Leibniz, 1714; Kant, 1781) [1], [2], [11] inceptions, and neither the "time-image" (Deleuze, 1985) [24] impossible apperception, all of which beyond U-mentalism and space(time) computational complexity.

It could be thought that the more the PL of U-mentalism is *singular*, the more it will be pertinent also a *singular* "*a*-machine" (Turing, 1936) [6], in which case a sort of programming (orthicon tube) great accelerator would be thought as adequate, i.e., a supercomputer singled out from

the general-purpose computing, under which topic a reflection as manifest in *Le Grand Accélérateur* (Paul Virilio, 2010) [25] is very opportune. Nevertheless, one of the features of U-mentalism [U-mentalism in the "C" approach] is the case that, insofar the omnipresent light is the programming *medium*, with "singular" here meaning just as much PL-paralleled as $P \overset{?}{=} NP$ unparalleled mechanization, the computability process, even if oracle-based and nondeterministic, should come across as informational (second ontology) *morphogenetic*, although not replicating neither mirroring beings of nature, but instead their informatic figurative and perceptive emergence (first ontology).

At the end and as a last note, we cannot neglect that U-mentalism [U-mentalism in the "C" approach] can also be appraised of possible other engagements and further work in progress under an optics-acoustics combined model, where to the (digital) image is also programming outlined the sound, with PL abstracts made too consistent with the (digital) sound, thus merging electromagnetic and mechanical waves. In this regard, the appraisal of music – and to a certain extent also the set apart discourse, under a "generative theory of tonal music" (Leonard Bernstein, 1973; Lerdhal; Jackendoff, 1983) [26] - as organized sounds, is the best and perfectly most exempt indicator to light and (digital) image of what it ought to look like computer vision hierarchy. Carrying on further research, different-level containment hierarchies should be also defined, as for instance, complementing the containment of the Chomsky hierarchy in computational complexity hierarchy by yielding both in a sort of U-complexity, inasmuch as contributing to compare therein visual (computer vision organized) and acoustic (music organized) generative grammars.

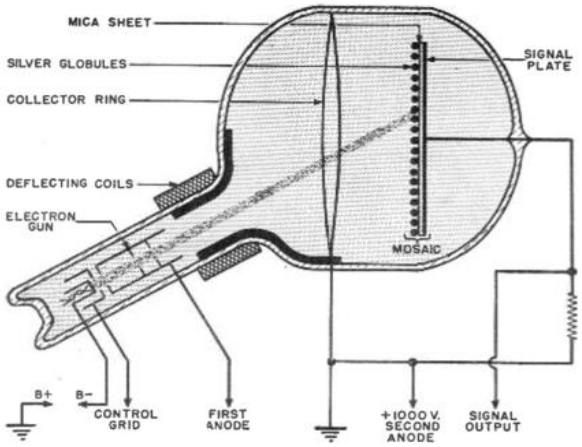

Fig. 1. The iconoscope diagram.

III. Conclusion

We choose to conclude with a very simple natural world analogy. By this we mean comparing U-mentalism programming with a phenomenon that succeeds in nature off from "nothing more than air, water containing mineral salts in solution, and light" [27], and which is the practical sole cause of the Earth's diverse life by release of oxygen into the atmosphere, and by consequently supplying the organic compounds in the form of energy. One such phenomenon is photosynthesis.

Photosynthesis is a "synthesis" of "light" performed most generally by (photoautotroph) plants, algae and some bacteria. In turn, U-mentalism is mainly intended to be a programming synthesis of light through (digital) images, organized as symbolic-informational truth-equivalent PL abstracts. Photosynthesis puts together a synthesis of light, carbon dioxide and water into glucose at reaction centers proteins with chlorophyll (digital images), wherein to the fore roots have absorbed water (computability) from the soil, through the stem (PL abstracts and paradigms) and through the leaves (PL). This is why to the exact chlorophyll complementary light (diagonalization) absorbance center chloroplast organelle (pixel) there is, at large, a leaf lamina (frame), as a surface area to capture the light, under light's every possible and each necessary time-image. There is, in the overall process of photosynthesis, a light-dependent cycle and a light-independent cycle. In a rough analogy, In the light-dependent or light cycle (scanner-kinescope), as an effect, short-term stores of energy are produced, enabling their transfer to drive other reactions (computer vision & multiple-view geometry), while in the light-independent cycle (printer-iconoscope), the so called Calvin cycle, the atmospheric carbon dioxide is incorporated into organic carbon compounds, and dependent on the previous light-dependent reactions (semantic correspondence), are then used to form further carbohydrates, such as glucose, the most important source of energy metabolism in bioenergetics (cybernetics).

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