"Concept" and "Interdisciplinary Integration" to Complete Linguistic Evolution of *Homo Sapiens*

Kumon Tokumaru (Digital Linguist)

E-mail: kalahari145ma@y-mobile.ne.jp

Digital linguistics (DL) identifies human language as a digital evolution of mammalian analog vocal communications, which is operated by the vertebrate spinal sign reflex mechanism. Biologically it is the inside ventricle system (VS) immune cell networks. (Table-1) Immune cells are mobile neurons capable of providing more than 10 million sign and receptor specificity pairs. Vocabulary is not human unique but can be shared by any vertebrates as Dr. DoLittle demonstrated in the novel.

Genetic networking regulation and representation of Eukaryote and Computer networks are digital. Digital is an automatically regulated networking mechanism to produce complex system. (Table-2) By comparison, it is evident that *Homo Sapiens* is still on its way of digital linguistic evolution by mastering the correct use of "Concept" and achieving "Interdisciplinary Integration" of sectorial scientific concepts. (Table-3)

There are three digital breakthroughs in communication signals in outside brain physical layer (Figure-1): (i) acquisition of syllables, (ii) the invention of a character set to write down syllables in written text format, and (iii) an interactive electronic data. Then, linguistic humans invented special brain adaptation to take full benefit of syllabic, written and electronic linguistic information.

With the acquisition of syllables, grammatical demodulation started as a dualistic integration of a word sign and grammatical sound vector at the brainstem auditory nuclei at the expense of the sound localization function of sign reflex.

Written text helped create civilization. Schooling started with the invention of cuneiform. Written language is automatically translated into inner speech inside the brain with the help of memorized orthography. Monasteries and universities are

low noise environment to allow deep and thorough thoughts, and to generate scientific concepts.

Concepts are products of generalization. DL identifies that the breakthrough from signs to concepts is in applied logics, from “If A then B” one to one connection, to logic of mathematical groups, 1 to All. Concepts must fulfill five conditions of “combinativity, reversibility, associativity, general operation of identity, tautology or special identities”. (Figure-2)

Electronic linguistic information is interactive and searchable with keywords. We can obtain relevant information within seconds through the internet. It is necessary to enhance our learning ability to read carefully and in depth regardless to the sectorial disciplines. Concepts are the key for interdisciplinary integration of sciences. The author envisages to establish error-corrected collective human intellectual genomes so that future generation can easily inherit human intellectual efforts.

Table 1. Network Requirement Analysis for Vertebrate Sign Reflex Mechanism

Nomenclature	Memory Type	Molecular Structure	Location	Mobility
CSF Contacting Neurons	Soundwave	Antigen terminal with cilium	Brainstem Reticular Formation	Fixed
B-lymphocytes (mobile neurons)	Soundwave Receptors& Networking	Antibody (= 3 antigen CDRs *)	Floating inside CSF	Mobile
Microglia	Soundwave & Sensory Memories	Antigen terminal	Neocortex	Fixed

Inside CSF immune cell networks can serve for word sign reflex. (* CDR: Complementarity Determining Region)

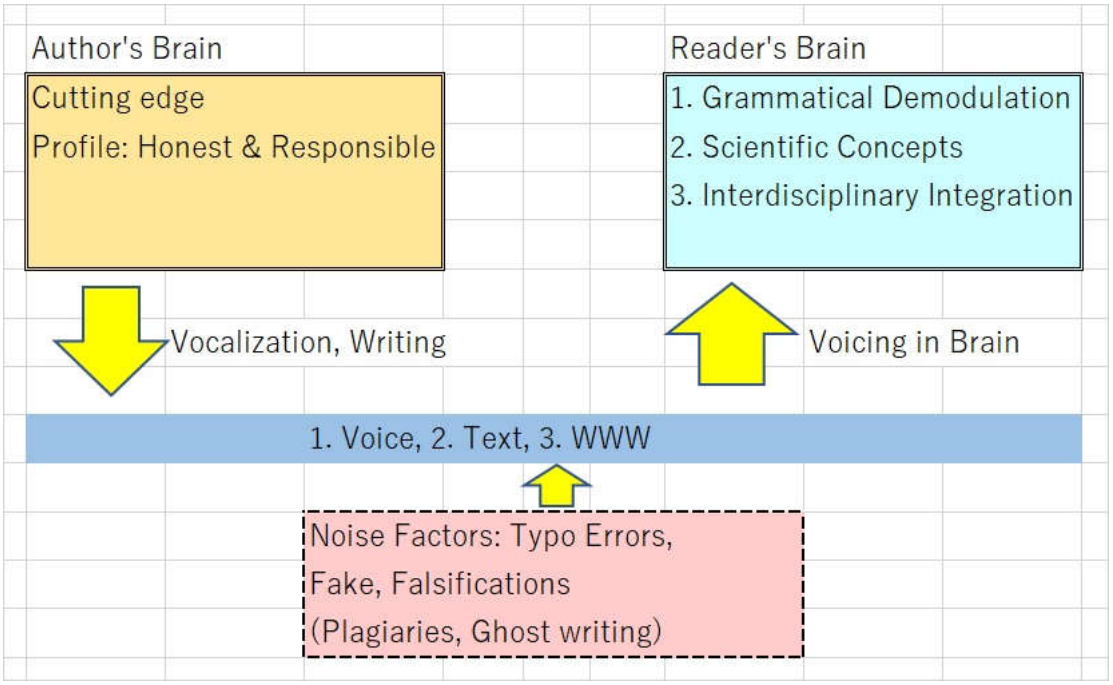
Brief Comparison of Digital Systems			
System	**Computer Networks**	**Genetic Expression in Eukaryote**	**Human Language and Intelligence**
Digital Signal Unit	Voltage Bit	RNA	**Syllables containing phonemes and morae**
Micro Energy	Repulsive Force of Electron	Chemical Bonding	Accented Waveform
Multi Value	2 (Binary, On/Off)	4 (A=U, G≡C)	112 (Japanese),
Low Noise Environment	CPU Register	**Inside Nucleic Membrane ***	Inside CSF in Ventricular System
Modulation Switches	Communication Protocol Switches	Non-Coding RNA	Grammar
Modulation Mechanisms	Protocol Switches	Post Transcriptional Modulation	Auditory Nuclei in Brainstem and Celia of CSF Contacting Neurons
Content	**Data**	**Genome**	**Concept & Collective Human Intelligence**
Pattern Recognition	n/a	Translation by tRNA	Antigen-Antibody Response
Information Unit	***Packet***	***mRNA***	***Sentence***
Error Avoiding Redundancy System	**Verification of Error Correction Code ***	Degeneracy in Codon (64 → 20 amino acid)	Sound Symbolism
Long Term Memory	Magnetic/Optical Media	DNA Double Helix	Character Set
Digital Evolution Trigger / Digital Breakthrough	Error Correction Code and High Speed CPU	Nucleic Membrane for Low Noise Environment	Syllables containing micro-energy enabled by Laryngeal Descent
Interactive nature	Electronic data	nucleotides	Electronic data
Analog System before Evolution	Computer Communication	Prokaryote	Sign Reflexes using Analog signs

Table-2 Comparison of Digital Systems

Table 3. Digital Evolution in Physical and Logical Layers

Digital Evolution/Adaptation	**Digital Breakthrough**
1. Laryngeal Descent:	**1. Vocalization of Syllables containing Phonemes & Morae**
1) Sign reflex mechanism	1) (PHY) Infinite word signs
2) Monaural audition of mother tongue	2) (LOG) Grammatical demodulation
2. Character Set & Literacy	**2. Long lasting Syllables**
1) Education & Publication	1) (PHY) Civilization
2) Conversion to 1-to-All logic in low noise asylum	2) (LOG) Scientific **Concepts**
3. Computer Networks & Group Theory Operacy*	**3. Interactive Syllables & Conceptual Operation**
1) Media Literacy, Keyword Searches and Enhancement in Memorization	1) (PHY) Overflow of linguistic information of uncertain quality
2) Overcoming sign reflex restrictions, exploiting redundancy and reconfiguration of consciousness	2) (LOG) Forward Error Correction, **Interdisciplinary Integration** and Intellectual Genome

* Operacy is automatic application of group theory to incoming concepts.



(Figure-1) Linguistic Information Networking Model on OSI Reference Model and Noise Source

(I) Combinativity: $x + x^1 = y$; $y + y^1 = z$; etc.

(II) Reversibility: $y - x = x^1$ or $y - x^1 = x$.

(III) Associativity: $(x + x^1) + y^1 = x + (x^1 + y^1) = (z)$.

(IV) General operation of identity:

$x - x = 0$; $y - y = 0$; etc.

(V) Tautology or special identities:

$x + x = x$; $y + y = y$; etc.

Figure-2 Piaget's five conditions to fulfill the requirements for groups.

References

Piaget, J. (1947) La psychologie de l'intelligence, Paris, Armand Colin.

Tokumaru, K. (2018a) A Mobile Hypothesis of Neural Networks for Spinal Reflex and Linguistic Processing (Digital Linguistics) *Linguistics and Literature Studies, 6, 267-277* (6MKR Presentation)

Tokumaru K. (2018b) Towards the Completion of the Modern Human Linguistic Evolution – The Restrictions of Vertebrate Spinal Sign Reflexes Should Be Overcome – The Digital Linguistics, *International Journal of Latest Research in Humanities and Social Science (IJLRHSS), Volume 01 - Issue 10, pp84-101*

Tokumaru K. (2019a) Mobile Neural Networking Hypothesis for Complex Concept and Its Logical Structure (Digital Linguistics), *International Journal of Computer Theory and Engineering, Vol. 11. No.3 June 2019 pp51-55*

Tokumaru K. (2019b) An Information Theory of Language – (Digital Linguistics) *Linguistics and Literature Studies, 7, 206-219* (7MKR Presentation)

Vygotsky, L. (1935) Thinking and Speech (Jap. tr. by Shibata Y. Tokyo, Meiji Shoin 1956)