Icon Language
—A Shortcut to Global Semantic Communication*

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Abstract: Icon has long been used to express isolated concrete concepts such as the signs of parking. In this article, we extend its usage in two aspects. First, we define a set of icons to represent abstract concepts such as conjunctions. Second, we present a unified format to construct icons into structural language. This Icon Language has the potential to become the common language for all people in different nations, because it can be learned in one day. It is based on the principles of semiotics, artificial intelligence, system theory, and computer language. This article is an abbreviation of the book *Global Icon Language for International Travel*, in which a detailed introduction and explanation of motivations of Icon Language are presented along with extensive examples.

1. Introduction

It has been the common dream of humans to communicate directly between different nations and comprehend each other. Thus it is also the most important subject and task for Semiology. Using the theories of Semiology and many other disciplines, we created a symbolic language—Icon Language (abbreviated as IL). IL uses symbols to represent both concrete and abstract concepts in daily life, and defines an icon vocabulary that is sufficient to describe any events or the

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process in social life. By using a set of semantically logical expressions as the structure of sentences, people can combine icons with native words in formalized manner to express any logic. In this sense, IL is a simple symbolic language system. IL can also be used for inter-lingual chatting on Internet or as a communication tool in the international travelling and commercial affairs.

2. Why Icon Language

The international communication has become more frequent nowadays, prompting the need for international language. It seems that in high level social communication, English is the de facto common language, even though eighty percent of all population on the planet don't use English.

Let's look at the following facts:

- No single language can be accepted as the common language by the whole mankind, including the artificial language *Esperanto*, because of vastly different grammars and vocabulary.
- The inherent irregularity of natural languages causes great difficulty for automatic information processing.
- As machine translation cannot overcome the irregularity of the logical models of all natural languages such as the irregularity of grammar and implied knowledge in natural languages, machine translation cannot produce semantically credible and correct language.

We, therefore, see a need for a simple, yet logically sound international language.

Table (1) represents three forms of natural language system: voice, Written Words and graphical symbols.

Table 1 The system of mankind's thought medium (in the broad sense of language)

Verbal (voice)	Written Words	Icon Language
		Various symbols

While English must be used in complex social events, Icon Language (IL) can serve as supplement to simple scenes in life.

Table 2 System of international language in common use

Complex social intercourse	English
Simple social intercourse	Icon Language

Table 3 The advantages of Icon Language as compared with English

	Applicable scenario	Expressiveness	Learning time	Learning effort	Potential users
English	Complex intercourse	Precise	> 1 year	Difficult	Limited to native and educated population
Icon Language	Simple intercourse	Rough	< 1 day	Easy	Unlimited

Icon Language can be expressed at two levels: base level for human-human communication and extension level for human-machine interfacing. Base level expression forms the logic and structure of the sentence, while the optional extension level refines individual elements of the sentence in more precise manner. Thus base level must be expressed in IL vocabulary, while the extensions can take the form of native language, bar code or even machine language. The motivation lies in two perspectives: firstly, elements of such language are easy to guess as the overall logical structure is known, using native language as extension to individual elements of the sentence, avoiding possible big confusion; secondly, such language can express a limited number of abstract concepts, namely, it's possible to cover abstract concepts with limited icons. With regard to concrete concepts, as nouns are unlimited, extension in the form of native language is necessary.

Table 4 The structure of Icon Language

Extension level	Written word	Bar code	Machine conversation
Base level	Vocabulary of IL		
	Sentence pattern of IL		

3. Unified Grammar

We recognized that the two most intuitive forms of expression are graphics and forms. They take no or minimum learning effort. Icon Language has only one unified grammar, which looks like a form.

Sentence ⇒ Conjunction, Basic sentence

Basic sentence ⇒ Subject [Extension] Predicate [Extension] Object [Extension]

Extension ⇒(? | modifier)

e. g. You provide (?) 100 Laptop (Lenovo x61s)

means "Can you provide 100 Laptop whose model is Lenovo x61s?"

Please note: The basic logic function of the computer language has these four kinds of sentence patterns only:

- Declarative sentence
- Interrogative sentence
- Imperative sentence
- Judgment sentence

These sentence patterns can derive from IL standard sentence.

So, the Icon language can describe the arbitrarily logic process like computer language, and becomes a global language that both the people and computer can recognize. It, therefore, has an enormous social effect.

4. Construction of Vocabulary

IL has about 300 words in 14 categories. Each category has only a few radicals, from which unlimited new words can be constructed. However, to construct intuitive new words, you have to grasp the meaning of each radical and understand the four principles used to create them.

Exact symbols are not the focus of this article, nor are we claiming those given here are the most intuitive ones. We merely use them to demonstrate the principles.

4.1 Use Graphics

- "Space" ⊡ means "the sky is round and the earth is square".
- "Time" ⊤ is the symbol of the three clock hands; by introducing the concept of coordinates, it constitutes the "past" ↰⊤, the "present" ⊤↓, the "future" ⊤↱ etc., to define the time relations.
- "Information" *i* looks like a torch (a symbol) to deliver information in ancient times, and it also refers to "situation", "performance", "specification" and "function", etc.
- "Do" 𝒹 is the image by hand, which is the capital letter of the word "Do" (by handwriting).
- "Use" ⊔, the image meaning the useful tool, it symbolizes a tool, and it is the capital letter of the word "Use" (by handwriting).
- "High" ⊟, "low" ⊞ look like a ladder and the capital letter of the word "High".
- "Long", ⊫ "short" ⊩, "breadth" ⊔, "narrow" ⊔, use the capital letter of the word "Length" which looks like a ruler or a cord.
- "Weight" ⍒ looks like a balance, and it is the capital letter of the word

"weight".

- "Buy or sell" looks like a balance, and it is the capital letter of the word "Market".

4.2 Use Conventions

4.2.1 Use domain standards

Punctuation marks, mathematic symbols, as well as other current public signs are all applied or brought into the Icon Language system.

"To be" , "not to be" , "to be" or "not to be" ; "at / in" ; "belong to" , "include/have got" ; "positive" , "negative" ; "Because... so..." ; etc.

4.2.2 Use common knowledge

"I" , "you" , "he" represent respectively the first person, second person and third person; The possessive forms of , , and can be made by adding " ' " to their upper right corners, like , , and . Their plural forms can be made by adding "s" to the , , and , meaning "we", "you", "they/them".

4.2.3 Imitate gestures

"Come"  , "go"  ; "All" /"everything"  , "part"  ; "this"  , "that" ; "here" , "there" , etc.

4.3 Use Association

4.3.1 Association based on antithesis

"To have not"  , "to have"  ; "big"  "small"  ; "above"  , "under"  ; "heavy"  , "light"  ; "high" , "low" ; "near" , "far" ; "enter" , "out" ; etc.

4.3.2 Association with numbers

Use the mathematical symbol, coefficient or a power n of X^n to express the comparative degree of the noun or the adjectives and the adverbs. For example:

"Big"  , "bigger"  , "very big"  ; "Often come" , "come always"  ; "Common document"  , "more importance/ higher class document"  , "very important document"  ; etc.

4.3.3 Association based on extension and compounding

- "Structure"  comes from "space"  ; "Arrangement/ deployment"  comes from "to do" + "structure".
- comes from "Let", "becomes"  from , extending the meaning of "occurrence/ creation / appear".
- The heart is used for "thinking", which extends the meanings of various minds: "Approve / want"  , "objection/ hate"  , "opinion"

, "remember" , "forget" , etc.

- The facial features of the human body are used for related emotions, feelings and actions, these words are intuitive, and well known.

4.4 Combine Icon with Extensions or Other Icons

The Icon Language is an open system. When pure icon is not expressive enough, use extensions in natural language. For example:

- Insert the natural language: The Hotel Peking {Beijing}
- Insert the Bar Code of the exact product: MP3 {Sony-123, BC-12367291876}
- Insert domain specific icons (both parties must consent to the domain icons) Tax dues ${}

5. Categories of Icons

According to the artificial intelligence knowledge representation, 14 categories of the vocabulary in five groups are sufficient to describe any events or the process on the social life.

14 types of words in the vocabulary are:

Ⅰ. For description of the Main body (subject) / object
1. Personal pronoun (30)
2. Demonstrative pronoun (9)
3. Commonly used noun (32 +30)

Ⅱ. For description of the environment / properties of the events
4. Quantity (5)
5. Space (29)
6. Time (19)
7. Properties (17)

Ⅲ. To describe the interaction of objects
8. Yes/no (10)
9. Ordinary verb (33)
10. Auxiliary verb (10)
11. Intention (21)
12. Emotion (17)

Ⅳ. For the question
13. Interrogative (20)

Ⅴ. To organize the complex sentence
14. Conjunction (7)

The vocabulary is showed as appendix 1. (Total about 300)

References

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Appendix 1: The Icon Vocabulary

①人	Personal Pronouns, Nouns [for the subject, object]									
0	0	1	2	3	4	5	6	7	8	9
1	I	II	III							
2	I′	II′	III′							
3	I_s	II_s	III_s							
4	I'_s	II'_s	III'_s							
5										
6								♀	♂	
7										
8			$		$/					
9										
10										
②⊤◎	Time, Space, Attribute, Number [for the Adjective, adverbial]									
0	0	1	2	3	4	5	6	7	8	9
1. time										
2										
3. space										
4										
5. attribute										
6										

(Continued)

7										
8. quantity										
③	Verb, Linking verb, Feelings, Ideas [for Predicate]									
0	0	1	2	3	4	5	6	7	8	9
1										
2										
3										
4										
5										
6										
7										
8										
9										
④	Combination of Words									
0	0	1	2	3	4	5	6	7	8	9
	Compound noun									
1 -										
2										
3										
4										
5										
6										
	Compound verb									
9 -										
10										

Appendix 2: Examples

The examples of Icon Language—The Dialog of Transactions

Ⓐ: I  100. MP3(ILC—102, BC—24516272829).

〖Chinese〗我要 100 台 MP3(ILC-102,条纹码-24516272829)。

〖English〗I want 100 MP3(ILC-102,bar code-24516272829).

〖French〗Je veux 100 MP3 (ILC- 102, barre code-24516272829).

Ⅱ (|?|).

〖Chinese〗你能提供(|?|).

〖English〗You can provide(|?|)

〖French〗Vous pouvez fournir (|?|)

Ⓑ: I ⊃ 100. MP3(IT—234). Ⅱ  (|?|).

〖Chinese〗我有 100. MP3(IL—234)。你要(|?|).

〖English〗I have 100 MP3. (IT—234). You want(|?|)

〖French〗J'ai 100 MP3 (IT—234). Vous voulez (|?|)

Ⓐ: Ⅲ' $/ = ⊙.

〖Chinese〗其价格是什么((?)).

〖English〗What([?]) is its price / How much([?]) is its price.

〖French〗Ce qui ([?]) est son prix.

Ⓑ: $/ = $ 30 usd.

〖Chinese〗价格是 30 美元。

〖English〗The price is 30 U. S. dollars.

〖French〗Le prix est de 30 dollars.

Ⓐ: L $/ Γ (|?|) 80%.

〖Chinese〗把价格可(|?|)降到 80%.

〖English〗The price can(|?|) dropped to 80%.

〖French〗Le prix peut le (|?|) a chuté à 80%.

Ⓑ: 90%, L Ⅱ .

〖Chinese〗90%吧, 请你考虑。

〖English〗90% of it, you may consider.

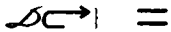
〖French〗90% de lui, vous peut considérer.

Ⓐ: Ⅱ (|?|丁).

〖Chinese〗你 交(|?|)何时)货.

〖English〗You hand over (|?|) when) goods.

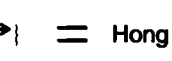
〖French〗Vous remettez (|?| quand) marchandises.

Ⓑ: 2007.06.29,  Shenzhen.

〖Chinese〗2007 年 06 月 29 日。交付地点是深圳。

〖English〗June 29, 2007. Delivery locations is Shenzhen.

〖French〗29 juin 2007. Emplacements de livraison est Shenzhen.

Ⓐ:   Hong Kong,  I  .

 I  .

〖Chinese〗如果交付地点是香港,那么,我要;否则,我不要。

〖English〗If the place of delivery is Hong Kong, then I will take;
otherwise, I do not want to take.

〖French〗Si le lieu de livraison est de Hong Kong, alors je vais prendre;
Sinon, je ne veux pas prendre.

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