SYSTEMATIZATION OF THE STROKE ORDER OF CHINESE CHARACTERS FOR FOREIGN STUDENTS

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In what stroke order do you write this character?

覧

覧 =↓B(→B(臣,↓B(𠂉,一)),見)
覧 =↓B(→B(→B(丨,↓B(一,丨,↓T(冂,一),丨,一)),↓B(→T(丿,一),一)),
↓B(？？(→T(丨,冂),一,↓T(一,一)),→T(丿, 乚)))

Background

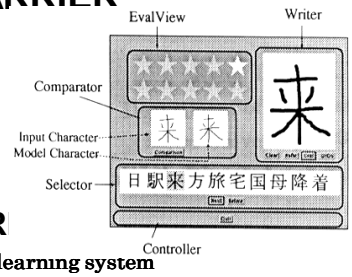
Increase of the foreign students in Japan

↓

KANJI = **CHINESE CHARACTER**

IS A **BIGGEST BARRIER**

- for their **daily life** : (about) **1000 char.**
  Reading: it can be learn by books
  Writing: (the study of **movement /order**)



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CAI SOFTWAR

Development of an Internet Kanji learning system

QUESTIONS for CAI SYSTEMS

- **Does the stroke order have any effectiveness**?

" HITUJUN SHIDO NO TEBIKI"(Guidebook of Stroke Order Education, published by the Ministry of Education)

- **Ease of writing**
- **Legibility**
- **Ease of learning**
- **Traditions**

↓

already published (in Japan)

- **Is there a meaning in learning all of 1000 character simply?**
  - the order of AIUEO ?
    - (like ABC..)
  - the order of stroke counts ?

↓

necessity of efficient method to learn

OUTLINE OF THIS STUDY

PURPOSE : **SYSTEMATIZATION** of stroke order of Chinese character(for making a **LEARNING COURSE**)

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METHOD : By making a **NOTATION SYSTEM** of the stroke order (**various purpose, using computer**)

↓

RESULTS : Some **analytical DATA** of writing **MOVEMENT** and the **ORDER**

↓

Decrease of learning quantity : **80%** (predicted value)

CHARACTERISTICS :

- The notational system for multi-purpose
- Analytical data for the Chinese writing movements

sample of the notation

(a character ‘E (hui, picture)’

Level 6 : 絵 = →Ｅ(糸, 会)

Level 3 : 絵 = →Ｅ(糸, 会)

Level 2 : 絵 = →Ｅ(↓Ｅ(幺, 小), 会)

Level 1 : 絵 = →Ｅ(↓Ｅ(幺, ←→(丨, ハ)),
↓Ｅ(人, 二, ム))

Level 0 : 絵 = →Ｅ(↓Ｅ(↓Ｐ(く, 乙, 丶), ←→(丨,
→Ｐ(ノ, 乀))), ↓Ｅ (Ｈ→(ノ, 乀),
↓Ｐ(一, 一), →Ｔ(乙, 丶)))

- The notations are unraveled automatically
- We can analyze by general tools such as SED

Sample of constructive factors

for the notation

(a) stroke patterns (15)

丶一丨ノ𠂉乀フ
レレ乙くㄟㄣㄋ

(b) elements (582)

- (character) 二口木日
- (radicals) 氵辶艹艹⺍
- (original) く刂𠂉ク主

(c)direction marks(14)

↓Ｐ : top to bottom (strokes.)

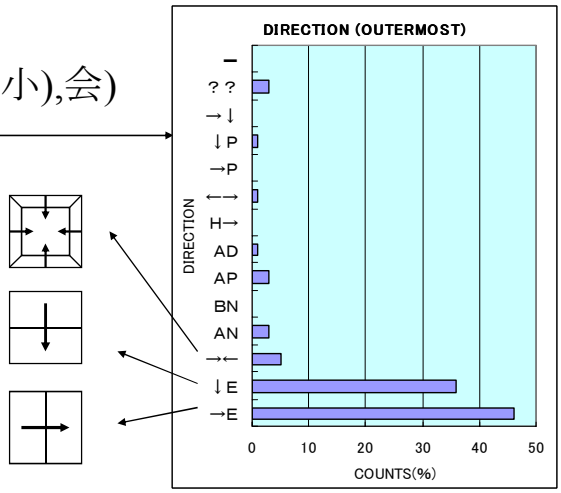
→Ｅ : left to right (elements)

→← : outside to inside
←→ : inside to outside

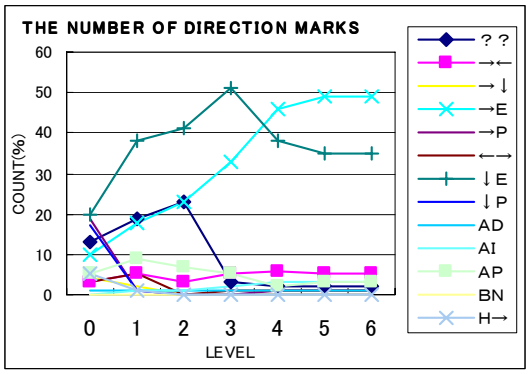
？？：others

Analytical Results (1) DIRECTION: outermost direction marks

絵＝
→E (↓E(幺,小),会)



Analytical Results (1) DIRECTION: directions used in each level



•Many kinds of direction marks are used at L0-1.
•[left to right(e)]+[top to bottom(e)] are over 80% at L4-6.
•[left to right(e)] and [top to bottom(e)] are reversed between L3-4.
•Elements increase, parts decrease about [top to bottom] between L2-3.

・. Thus, if a student studies elements from Level0-2 and knows that the orders over level3 are usually [left to right] and [top to bottom], then this knowledge is adaptable to nearly any character

Analytical Results (1) DIRECTION: directions used in each level

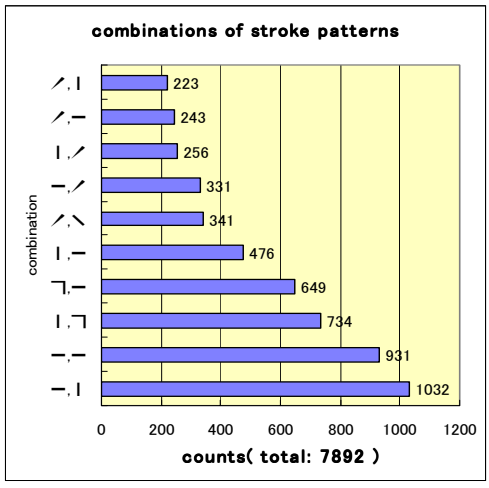
example: 「朗」

Level0: 朗= →E(↓E(丶, ？？(↓P(冂, ー, ー), レ, 丶)), →←(→P(丨, 冂), ↓P(ー, ー)))
Level4: 朗= →E(良, 月)

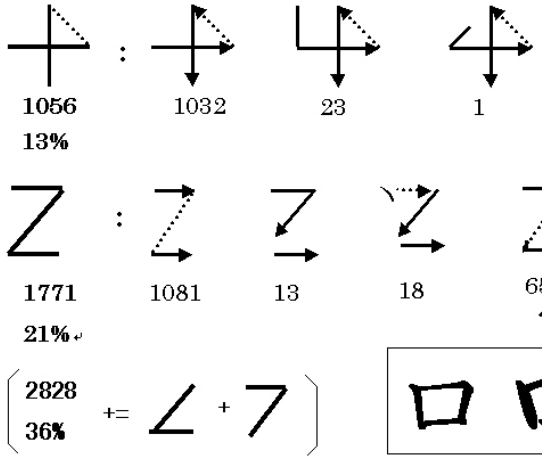
Level0: 二 = ↓P(ー, ー)
Level1: 月 = →←(冂, 二)
Level2: 且 = ？？(彐, レ, 丶)
Level3: 良 = ↓E(丶, 且)

Analytical Results (2) MOVEMENT: combinations of stroke patterns

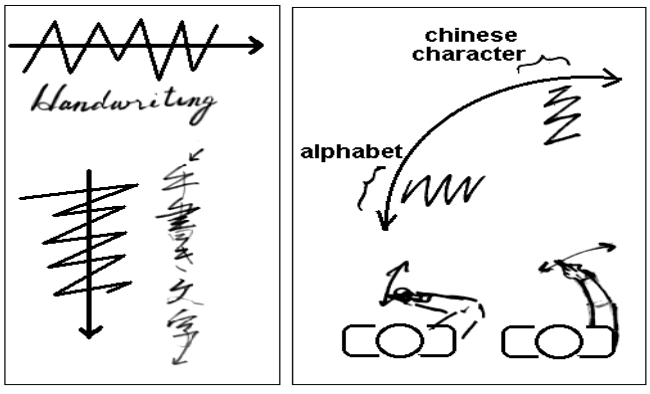
Number of stroke patterns			
ー	2932	ノ	93
丨	2041	乙	74
ノ	1317	く	62
丶	934	レ	34
冂	861	𠂆	27
乀	629	乚	23
𠂇	238	𠃌	14
乚	154		



Analytical Results (2) MOVEMENT: Z type and + type

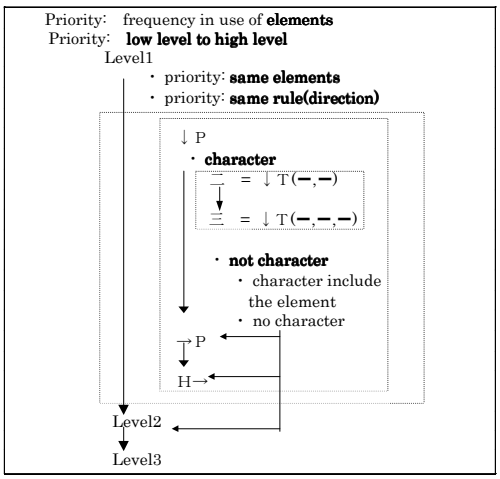


Analytical Results (2) MOVEMENT: A hypothesis from Z type movement



We have not yet verified this enough.

Procedure of learning course



Learning quantity(predicted value)

systematic	overlap removing	learning quantity				total	decrease	
		Character		Elements				
		Counts	bytes	Counts	bytes			
non-systematic	non	1,006	79,870	0	0	79,870	0	0%
	Existed character	1,006	27,927	227	11,614	39,541	−40,329	50%
	Existed radicals	1,006	56,810	63	1,563	58,373	−21,497	27%
	Original elements	1,006	48,543	120	4,826	53,369	−26,501	33%
	all	1,006	9,976	410	18,003	27,979	−51,891	65%
systematic	all	1,006	9,976	410	5,442	15,418	−64,452	80%

why this is predicted value :

・Learners acquire the same rule by learning it repeatedly.

・Learners has an ability to arrange the knowledge which he or she has already learned and also an ability to apply it to other characters.

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