Societas Linguistica Europeae 49 (University of Naples Federico II)

Number Features and Numerals

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1. Introduction

- traditional wisdom: **natural classes** defined by features in phonology and morphology

- roles of features in syntax?
  operations in narrow syntax: Merge, Agree

> MAJOR CLAIM OF THIS TALK
> Natural classes of structural configurations in syntax are defined through selection/licensing by features: numerals licensed/selected by [+/–augmented]

2. Basic Arguments

(1) Number features (Noyer 1997, Harbour 2007, Nevins 2011, Watanabe 2015)
  a. Singular: [+singular, –augmented]
  b. Dual: [–singular, –augmented]
  c. Plural: [–singular, +augmented]

(2) Feature definitions
  a. [+singular] = λx[atom(x)]
  b. [+augmented] = $\lambda P.\ \lambda x\colon P(x).\ \exists y[P(y) \wedge y \subset x]$

— 1-deletion (Watanabe 2010, 2014): restricted distribution of number features due to the omission of the predictable [–augmented] from the full specification of singular

(3) a. Singular: [+singular]
  b. Dual/Plural: [+augmented]

(4) a. *-ty*: [+augmented]
  b. *ten*: elsewhere

(5) Numerals are licensed by [+/–augmented].

(6) **one ten*, **one-ty* vs. *six-ty,* cf. *six hundred*(**s*)

(7) a. Singular: [–augmented] ☜ 1-deletion disallowed
  b. Dual/Plural: [+augmented]

— classifiers vs. numerical bases/measure nouns in Japanese (Watanabe 2010, 2014)

(8) a. hito-**ri** (-no gakusei)
1-cl -link student
b. futa-**ri**
2-cl
c. san-**nin**, yo-**nin**, go-**nin**, etc.
3-cl 4-cl 5-cl

(9) a. (*iti-)zyuu, ni-zyuu, san-zyuu, etc.
1-10 2-10, 3-10
'ten' 'twenty' 'thirty'
b. iti-meetoru, ni-meetoru, san-meetoru, etc.
1-meter 2-meter 3-meter

=> no classifier after a single digit numeral in multiplicative numerals and measure phrases

(10) a. A numeral classifier appears in Japanese only when both [+/–singular] and [+/–augmented] are specified.
b. Numerical bases and measure nouns in Japanese are featurally defective.
c. [+/–augmented] always selects a numeral in Japanese.

=> 1-deletion impossible for classifiers

3. Measure Nouns and 1-Deletion in Japanese

3.1. Liters

(11) a. **rittaa**/***rittoru** hyaku-go-zyuu-en-no gasorin [+singular]
liter/liter hundred-five-ten-yen-link gasoline
b. iti-**rittoru** hyaku-go-zyuu-en-no gasorin [–augmented]
one-liter hundred-five-ten-yen-link gasoline
'gasoline that costs a hundred fifty yen per liter'

3.2. Days

(12) a. iti-**niti**
1-day
b. futu-**ka**, …, too-**ka**
2-day 10-day
c. zyuu-iti-**niti**, zyuu-ni-**niti**, …
10-1-day 10-2-day
'eleven days' 'twelve days'

(13) **hi**-ni/iti-**niti**-ni san-kai-no tooyaku
day-per/1-day-per three-time-link medication
'three medications per day'

(14) a. Singular: [–augmented] or [+singular]
b. Dual/Plural: [+augmented]

(15) a. *-ka*: [+augmented] with a simplex numeral for $n \leq 10$ (or with a complex numeral ending with the digit numeral for 4, or the special numeral for 20)
b. *hi*: [+singular]
c. *-niti*: elsewhere

(16) go-roku-**niti**
5-6-day
'five or six days'

3.3. Weeks and months: Separate placement of [±augmented]

(17) **syuu**-ni/is-**syuukan**-ni san-kai-no kaigi
week-per/1-week-per 3-time-link meeting
'three meetings per week'

(18) a. san-**syuukan** (combination of Sino-Japanese morphemes)
3-week
b. kon-**syuu** (combination of Sino-Japanese morphemes)
this-week

=> *-kan* as the carrier of [+/–augmented] for "week"

(19) a. (hito-)**tuki**-ni san-kai-no kaigi
1-month-per 3-time-link meeting
b. ik-**kagetu**-ni san-kai-no kaigi
1-month-per 3-time-link meeting
'three meetings per month'

(20) a. mi-**tuki** (combination of native morphemes, limited to paucals)
3-month
b. san-**kagetu** (combination of Sino-Japanese morphemes, fully productive)
3-month
c. kon-**getu** (combination of Sino-Japanese morphemes)
this-month

=> *ka-* as the carrier of [+/–augmented] for the Sino-Japanese morpheme expressing "month"

3.4. Years

(21) (iti-)**nen**-ni san-kai-no kaigi
1-year-per 3-time-link meeting
'three meetings per year'

(22) a. san-**nen** (combination of Sino-Japanese morphemes)
3-year
b. ko-**tosi** (combination of native morphemes)
this-year

4. Quasi-Numerals

(23) a. nan-**nin** (-no gakusei)
what-cl -link student
'how many (students)'

b. suu-**nin** (-no gakusei)
number-cl -link student
'several (students)'

(24) a. nan-shuu**kan**
what-week
'how many weeks'

b. suu-shuu**kan**
number-week
'several weeks'

(25) a. nan-**ka**getu
what-month
'how many months'

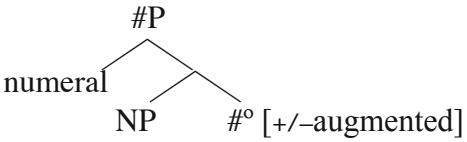
b. suu-**ka**getu
number-month
'several months'

(26) a. nan-**nen**
what-year
'how many years'

b. suu-**nen**
number-year
'several years'

=> *nan-* and *suu-* classified as numerals
=> [+/–augmented] defining a structural configuration

(27)



5. Morpheme Class Effects on "Days"

5.1. Combination of a quasi-numeral and the expression for "day"

(28) a. nan-**niti**
what-day
'how many days'

b. suu-**zitu** <= !!
number-day
'several days'
c. *suu-**ka** / *suu-**niti**

(15) a. *-ka*: [+augmented] with a simplex numeral for $n \leq 10$ (or with a complex numeral ending with the digit numeral for 4, or the special numeral for 20)
b. *hi*: [+singular]
c. *-niti*: elsewhere

(29) a. yoku-zitu, syuku-zitu, sai-zitu, hei-zitu, etc.
'next day' 'holiday' 'holiday' 'weekday'
b. syo-niti, kon-niti
'first day' 'period including the day of speech time'

(30) a. $\textit{-zitu}_{SJ}$: with *suu-*, *yoku-*, *syuku-*, *sai-*, *hei-*, etc. (list given priority for realization)
b. $\textit{-ka}_{N}$: [+augmented] with a simplex numeral for $n \leq 10$ (or with a complex numeral ending with the digit numeral for 4, or the special numeral for 20)
c. $\textit{hi}_{N}$: [+singular]
d. $\textit{-niti}_{SJ}$: elsewhere

CLAIM
The ban on combining native and non-native morphemes in the domain involving numerals, measure nouns, and classifiers (cf. Downing 1996) acts as a filter *minimal numeral_{α}-$\text{MN}_{-\alpha}$/$\text{CL}_{-\alpha}$, where α is [+/–native], after morphological realization.

(31) phonological processes sensitive to the native/non-native distinction (Ito and Mester 2003)
a. sequential voicing (or *rendaku*)
b. post-nasal voicing

5.2. Allomorphy driven by morpheme class combinatorics

— two series of cardinal numerals in Japanese

(32) Native series

a. ——	fut**u**-ka,	mik-ka,	yok-ka,	itu-ka,	mu**i**-ka,	na**no**-ka,	y**oo**-ka,	kokono-ka
	2-day	3-day	4-day	5-day	6-day	7-day	8-day	9-day
b. hito-tu,	futa-tu,	mit-tu,	yot-tu,	itu-tu,	mut-tu,	nana-tu,	yat-tu,	kokono-tu
1-cl	2-cl	3-cl	4-cl	5-cl	6-cl	7-cl	8-cl	9-cl

c. hito-ri, futa-ri (classifiers for human beings, also in (33a))
1-cl 2-cl

(33) Sino-Japanese series

a.	——	——	san-nin,	yo-nin,	go-nin,	roku-nin,	nana-nin,	hati-nin,	kyuu-nin
			3-cl	4-cl	5-cl	6-cl	7-cl	8-cl	9-cl
b.	iti-dai,	ni-dai,	san-dai,	yon-dai,	go-dai,	roku-dai,	nana-dai,	hati-dai,	kyuu-dai
	1-cl	2-cl	3-cl	4-cl	5-cl	6-cl	7-cl	8-cl	9-cl

— the ban on combining native and non-native morphemes for phrases with a numeral

(34) a. *iti-ri, *ni-ri — SJ + native — cf. (32c)
b. *hito-dai, *futa-dai — native + SJ — cf. (33b)

(35) a. *suu-tu — SJ + native — cf. (32b)
b. *nan-tu — SJ + native
cf. c. iku-tu ‘how many’ — native + native

(36) iku-ka ‘how many days’ — native + native in Old Japanese (Yasuda 2015)

(37) a. zyuu-bako ‘layered serving box’ — SJ + native
b. ba-syo ‘place’ — native + SJ

— only the last digit numeral relevant

(38) a. san yok-ka
3 4-day
‘three or four days’
b. zyuu yok-ka
10 4-day
‘fourteen days’

— Sino-Japanese numerals recruited from the native vocabulary with phonological modification

(39) a. yon ⇐ yo ‘four’ (19th century?) (Komatsu 1981, Yasuda 2015)
b. nan ‘how many’ ⇐ nani ‘what’ (Yasuda 2015)

— phonological shape of Sino-Japanese morphemes (Ito and Mester 1996, 2015; Kurisu 2000)

(40) disyllables
a. (C)Vtu: atu 圧 ‘press’, situ 室 ‘room’
b. (C)Vku: hoku 北 ‘north’, iku 育 ‘raise, educate’
c. (C)Vki: eki 益 ‘benefit’, riki 力 ‘power’

(41) exceptional disyllables
iti ‘one’, siti ‘seven’, hati ‘eight’, niti ‘day, sun’, kiti ‘good luck’

=> special status of numerals and (temporal) measure nouns
=> recruitment of *nana* 'seven' for the Sino-Japanese series (18th century?: Yasuda 2015) problematic phonologically
=> the elsewhere status of -*niti*$_{SJ}$ as a reflection of the tendency to avoid excessive markedness?

(42) monosyllables
a. (C)V: gu 具 'material', i 胃 'stomach'
b. (C)VV: sui 水 'water', bee 米 'rice'
c. (C)VN: kon 今 'this', en 遠 'distant'

5.3. Independent nouns

(43) a. hito-/is- siai, futa-/ni- siai, san-siai, ... (si_{SJ} + ai_{native})
1- game
b. hito-kire, futa-kire, mi-/san- kire, yon-kire, ... (native) => paucal / [+augmented]??
1 slice
c. hito-tubo, futa-tubo, san-tubo, ... (native, obsolete)
1-MN

=> combination of an independent noun and a numeral
=> the ban on mixing different classes of morphemes sensitive to morphological tightness

6. Conclusion

- structures with a numeral defined as forming a natural class by [+/–augmented]

- the ban on mixing native and non-native morphemes in the structure consisting of a numeral and a genuine classifier or measure noun as a filter

- binary opposition of morpheme classes (native vs. Sino-Japanese and Western)

- an itemized list more specific than an abstract statement for morphological realization

- morpheme class status not exclusively determined by origin (cf. iti-wa 一羽)

- the classifier for humans displaying the suppletive pattern SG/DU vs. PL of lexical nouns (Moskal et al. 15)

Appendix. Phonological Evidence for the Phrasal Status of Complex Numerals

(A1) a. sen | ni-hyaku | hati-zyuu nana
thousand two hundred eight-ten seven
'1,287' (Vance 2013)

b. sen | ni-hyaku | hati-zyuu nana-niti
thousand two hundred eight-ten seven-day

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