



Feature Systems in Linguistics

郭志忠

工研院電通所 前瞻技術中心



Outline

- Phonetics and Phonology
- Brief of Phonology
- Feature Systems

Linguistics (語言學)

- Phonetics (語音學)
 - 語音的產生、接收、及訊號的種類與物理特性
- Phonology (音韻學、音系學)
 - 語音組合的型態、規則與相關問題
- Morphology (構詞學、形態學)
 - 構詞 (基本表意單位) 法則與相關問題
- Syntax (句法學)
 - 構句 (完整表意單位) 的法則與相關問題
- Semantics (語意學)
 - 對語意與相關問題的探討
- Pragmatics (語用學)
 - 語境對語意解釋的影響、語言和語言行為的關係

語音學和音韻學

- 語音學 (Phonetics)
 - 發音語音學 (articulatory phonetics)
 - 聲學語音學 (acoustic phonetics)
 - 聽覺語音學 (auditory phonetics or perceptual phonetics)
- 音韻學 (phonology)
 - 音素 (Phoneme)
 - 記 (標) 音方法 (sound representation)
 - 語音組合法 (Phonotactics)
 - 音韻規律 (Phonological Rules)

音素 (Phoneme)

- 音素（音位）：具有辨義功能的抽象語音單位
 - 辨義功能：在相同語音環境（**phonetic context**）中會引起語意對立（**meaning contrast**）的單音（**phone**）
 - ◆ 例如，最小差異對偶詞（**minimal pair**）：[pa] ‘八’ 和 [p^ha] ‘趴’
 - ◆ 不同的音素間，不一定會造成語意對立
 - ☞ 音素間的自由變體（**free variant**）：例如，with唸成 [wiθ] 或 [wið]
 - 抽象單位：代表一組同位音（**allophones**）的語音單位
 - ◆ 例如，英語中的音素 / p / 有三個同位音：[p^h], [p], [p^ɹ]
 - ◆ 同位音之間的關係
 - ☞ 互補分佈（**complementary distribution**）：例，[p] 只能出現在 [s] 後面
 - ☞ 自由變體（**free variant**）：例，[p^h], [p^ɹ] 都可出現在字尾，但語意不變
 - ◆ 符號習慣：雙斜線 / / 中指音素，方括號 [] 中指同位音（單音）

記音方法 (Sound Representation)

- 語音錄音
- 語音波形圖或聲譜圖
- 語音符號
 - 精細 (語音) 注音 (narrow or phonetic transcription)
 - 概要 (音素) 注音 (broad or phonemic transcription)
 - IPA: International Phonetic Alphabet
 - 各種音標、注音符號
- 辨音成分 (Distinctive Features)
 - SPE辨音成分系統
 - ◆ Chomsky, Halle: “The Sound Pattern of English”, 1968.



國語標音系統

(Transcription Systems for Mandarin)

- 威妥瑪式：Wade(-Giles) System
 - 清朝，英外交官Thomas Wade著作「語言自邇集」
 - 民國之後大部份之人名、地名譯音多採用此系統
- 國語注音符號第一式 (MPS I：Mandarin Phonetic Symbols I)
 - 民國7年11月制訂，即ㄅ、ㄆ、ㄇ、ㄉ、....
- 國語羅馬字 (Kwoyeu Romatzyh, Romanization Alphabet)
 - 民國17年9月由蔡元培等人制訂，不同的聲調有不同的拼法。
 - 民國29年10月改名「譯音符號」(Transliteration Symbols)
- 國語注音符號第二式 (MPS II：Mandarin Phonetic Symbols II)
 - 75年1月制訂，根據譯音符號並參考威妥瑪式、耶魯式、林語堂式
- 大陸漢語拼音
- 台灣通用拼音



國語聲母符號

MPS	IPA	Wade	K.R.	MPS2	大陸	MPS	IPA	Wade	K.R.	MPS2	大陸
ㄅ	p	p	b	b	b	ㄅ	tɕ	ch(i)	j(i)	j(i)	j
ㄆ	p ^h	p'	p	p	p	ㄆ	tɕ ^h	ch'(i)	ch(i)	ch(i)	q
ㄇ	m	m	m	m	m	ㄇ	ɕ	hs	sh(i)	sh(i)	x
ㄉ	f	f	f	f	f	ㄉ	tʂ	ch	j	j	zh
ㄊ	t	t	d	d	d	ㄊ	tʂ ^h	ch'	ch	ch	ch
ㄋ	t ^h	t'	t	t	t	ㄋ	ʂ	sh	sh	sh	sh
ㄌ	n	n	n	n	n	ㄌ	ʐ	j	r	r	r
ㄌ	l	l	l	l	l	ㄌ	ts	tz, ts-	tz	tz	z
ㄍ	k	k	g	g	g	ㄍ	ts ^h	tz', ts'-	ts	ts	c
ㄎ	k ^h	k'	k	k	k	ㄎ	ʃ	sz, ss, s-	s	s	s
ㄏ	x	h	h	h	h	ㄏ	ŋ	ng	ng	ng	ng

K.R. = Kwoyeu Romatzyh



國語韻母符號

(一、非結合韻母部份)

單韻					複韻				
MPS	IPA	Wade	MPS II	大陸	MPS	IPA	Wade	MPS II	大陸
ㄚ	a	a	a	a	ㄞ	ai	ai	ai	ai
ㄛ	o	o	o	o	ㄟ	ei	ei	ei	ei
ㄜ	y	o(ê), -ê	e	e	ㄠ	au	ao	au	ao
ㄝ	ɛ	eh	ê	e	ㄡ	ou	ou	ou	ou
ㄝˊ	ɝ	êrh	er	er	聲隨韻				
ㄝˊ	i	i	-i, yi	-i, yi	ㄤ	an	an	an	an
ㄝˊ	u	-u, wu	-u, wu	-u, wu	ㄤ	yɛn	ên	en	en
ㄝˊ	y	-ü, yü	-iu, yu	-ü, yu	ㄤ	aŋ	ang	ang	ang
ㄝˊ	u	-ih, -u	r, z	i	ㄤ	yŋ	êng	eng	eng



國語韻母符號

(二、結合韻母部份)

		單韻				複韻				聲隨韻			
		ㄚ	ㄛ	ㄜ	ㄝ	ㄟ	ㄨ	ㄩ	ㄨ	ㄩ	ㄨ	ㄩ	ㄨ
一		一ㄚ	一ㄛ		一ㄝ	一ㄟ		一ㄩ	一ㄨ	一ㄨ	一ㄩ	一ㄨ	一ㄩ
	威式	-ia			-ieh			-iao	-iu	-ien	-in	-iang	-ing
		ya	yo		yeh	yai		yao	yu	yen	yin	yang	ying
	二式	-ia			-ie			-iau	-iou	-ian	-in	-iang	-ing
	ya	yo		ye	yai		yau	you	yan	yin	yang	ying	
	大陸	-ia			-ie			-iao	-iu	-ian	-in	-iang	-ing
		ya	yo		ye	yai		yao	you	yan	yin	yang	ying
ㄨ		ㄨㄚ	ㄨㄛ			ㄨㄟ	ㄨㄨ			ㄨㄨ	ㄨㄩ	ㄨㄨ	ㄨㄩ
	威式	-ua	-uo			-uai	-u(e)i			-uan	-un	-uang	-ung
		wa	wo			wai	wei			wan	wên	wang	wêng
	二式	-ua	-uo			-uai	-uei			-uan	-uen	-uang	-ung
	wa	wo			wai	wei			wan	wen	wang	weng	
	大陸	-ua	-uo			-uai	-ui			-uan	-un	-uang	-ong
		wa	wo			wai	wei			wan	wen	wang	weng
ㄩ					ㄩㄝ					ㄩㄨ	ㄩㄩ		ㄩㄩ
	威式				-üeh					-üan	-ün		-iüng
					yueh					yüan	yün		yüng
	二式				-iue					-iuan	-iun		-iung
				yue					yuan	yun		yung	
	大陸				-üe					-üan	-ün		-iong
					yüe					yüan	yün		yong



SPE辨音成分

- 濁音性 (vd: voiced) : 母音、有聲子音
- 響音性 (son: sonorant) : 母音、接近音、鼻音
- 鼻音性 (nas : nasal) : 鼻音
- 子音性 (con: consonantal) : 非母音、非介音
- 緊音性 (tns: tense) : 送氣音
- 粗擦性 (str: strident) : 擦音、塞擦音
- 延續性 (cont: continuant) : 非擦音、非塞擦音、非鼻音
- 顎齦前性 (ant: anterior) : 發音部位在顎齦之前者
- 舌葉提升性 (cor: coronal) : 發音時舌葉提起者
- 緩放性 (d.r. or del rel: delayed release)



SPE辨音成分（續）

- 高（high）
- 低（low）
- 後（back）
- 圓唇性（round）
- 捲舌性（retroflex）
- 音節性（syl: syllabic）



國語音素表

大類	小類	發音方式		音素	
子音 (廣義) 25	子音 (狹義) 22	塞音 6	不送氣	ㄅ、ㄆ、ㄇ	無聲
			送氣	ㄆ、ㄑ、ㄒ	
		塞擦音 6	不送氣	ㄆ、ㄑ、ㄒ	
			送氣	ㄑ、ㄒ、ㄓ	
		擦音 6	不上提	ㄇ、ㄈ	
			舌葉上提	ㄌ、ㄎ、ㄎ	
	半母音 4	鼻音 3		ㄇ、ㄎ、ㄎ	有聲
		接近音 4	流音 1	ㄌ	
			介音 3	ㄟ、ㄨ、ㄨ	
		母音 (廣義) 13	母音 (狹義) 9	單母音 9	
高母音	ㄟ、ㄨ、ㄨ、ㄨ				
雙母音 4	雙母音 4		ㄟ、ㄨ、ㄨ、ㄨ		

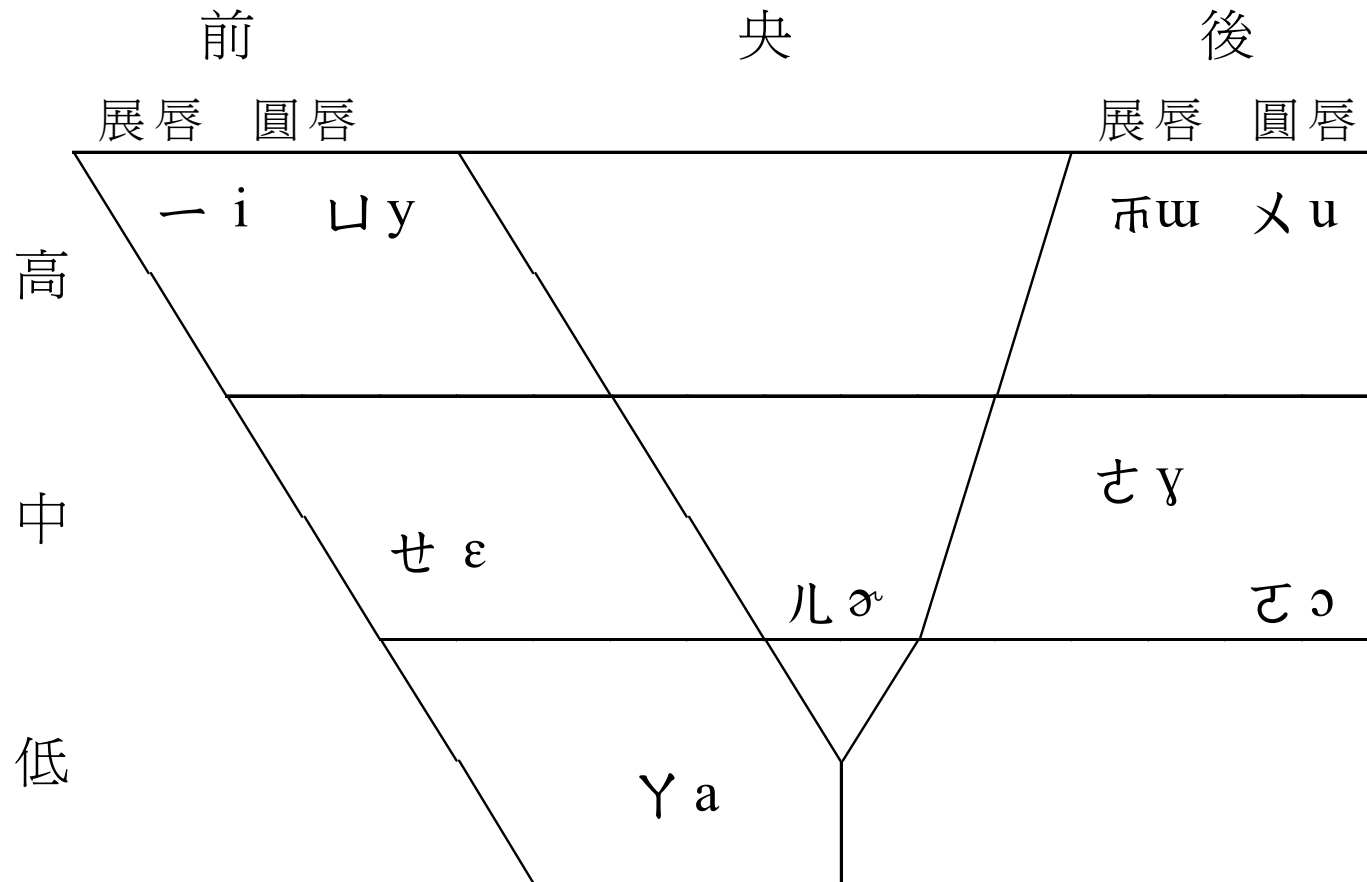


國語子音（聲母）表

方式		部位		雙唇	唇齒	舌尖前 (上齒背)	舌尖 (齒齦)	舌尖後 (顎齦前)	舌面前 (齦顎)	舌根 (軟顎)
		不送	送氣							
塞	清	不送	ㄅ p				ㄊ t			ㄎ k
		送氣	ㄆ p ^h				ㄊ ^h t ^h			ㄎ ^h k ^h
塞擦	清	不送			ㄊ ts			ㄊ tʂ	ㄌ tɕ	
		送氣			ㄊ ^h ts ^h			ㄊ ^h tʂ ^h	ㄌ ^h tɕ ^h	
擦	清			ㄈ f	ㄌ s			ㄆ ʃ	ㄊ ɕ	ㄍ x
	濁							ㄆ z		
鼻	濁		ㄇ m				ㄋ n			ㄋ ɳ
流	濁						ㄌ l			



國語母音表



語音組合法 (Phonotactics)

- 語音組合法：語音的組合規律（針對某個語言）
- 系統空缺（system gap）
 - 不容許存在的語音組合
 - ◆ 例：英語中[bɪk]為系統空缺
 - ◆ 例：國語中[ɕam¹]為系統空缺
- 偶然空缺（accidental gap）
 - 容許的語音組合，但組合的字不存在語言的詞彙（lexicon）。
 - ◆ 例：英語中[bɪk]為偶然空缺
 - ◆ 例：國語中[ɕan¹]為偶然空缺

音韻規律 (Phonological Rules)

- 定義
 - 從腦中儲存的「音位形象」(phonemic representation) 自然變化成口中說出的「語音形象」(phonetic representation) 之規律
- 種類
 - 同化律 (assimilation rules)
 - 辨音成分增加律 (feature addition rules)
 - 音段省略律 (segment deletion rules)
 - 音段增加律 (segment insertion rules)
 - 音段移位律 (metathesis or movement rules)
- 形式：變化 / 語境 (X→Y / A—B)：X在A和B中間時念為Y
- 可用律 (Optional) vs. 必用律 (Obligatory)

同化律 (Assimilation)

- 鼻音化：V → V [+nasal] / — C [+nasal]
 - ‘攀’ / p^han / → [p^hãŋ]
 - ‘央’ / iaŋ / → [iãŋ]
- 唇音化：[n] → [m] / — C [+anterior, -coronal]
 - ‘山派’ / ʂan p^hai / → [ʂam p^hai]
 - ‘心病’ / ɕin piŋ / → [ɕim piŋ]
- 母音清化：V [+voiced] → V [-voiced] / C [-voiced (,+tense)] —
 - ‘他’們 / t^ha / → [t^hɑ]
 - 七‘十’五 / ʂu / → [ʂu]
 - ◆ 註：通常是在念得很快（連得很緊）時發生



Feature Systems in Phonetics & Phonology

Feature Systems in Phonetics

- Acoustic Features
 - Measurable parameters: e.g. intensity, frequency
 - Binary choices: e.g. presence or absence of F0
 - Overall pattern: e.g. distribution of formants
- Articulatory Features
 - Physical sense: e.g. Ladefoged's "traditional features" (1982)
 - ◆ Exception: sonorant, grave
 - Abstract features with articulatory correlates: e.g. Chomsky and Halle's "phonetic features" (1968)
 - ◆ Exception: syllabicity
- Auditory (Perceptual) Features
 - E.g. hiss, buzz, dull, heavy, sharp, ...

Feature Systems in Phonology

● Distinctive Features

- Phonological contrasts or oppositions
- Jakobson (1939, 1949) claim (from de Saussure and Hjelmslev): the *signal* of each language contains a limited number of variables, so as the *perceptual* response to it.
- Jakobson, Fant and Halle (1952), Jakobson and Halle (1956)
 - ◆ 12 features
 - ◆ Defined in both *acoustic* and *articulatory* terms
 - ◆ Polar oppositions between two relative values
 - ◆ “unmarked value”: redundant or irrelevant

Cover Features & Abstract Features

- One advantage of distinctive features: sounds may be classified by criteria that transcend acoustic or articulatory properties.
 - /l r w j/: non-obstruent non-nasal consonants
- Cover features
 - Narrow sense: features providing convenient labels for combinations of other features
 - ◆ E.g. many traditional categories: consonant, vowel
 - Wide sense: any feature required in the description of a language
 - ◆ Abstract (*ad hoc*) features: have little or no phonetic basis at all
 - ◆ For convenience of phonological description in specific language

Argument: Accurate and Natural

- Fudge (1967/73): different kinds of features (acoustic, articulatory, and perceptual) represent different perspectives on speech.
- Chomsky and Halle: features should not be of different kinds at different levels; different aspect of speech are integrated
 - as a universal descriptive inventory and
 - as the elements of a language-specific classification
- Natural Class: it is expected that the classes of sounds that are relevant in particular language will be natural, in the sense of having a clear phonetic foundation.
 - Truth: not so natural as expected



Argument: Universal

- Chomsky and Halle (1968): The total set of *features* is identical with the set of *phonetic properties* that can in principle be controlled in speech; they represent the *phonetic capabilities* of man and, we could assume, are therefore the same for all languages.
- Whether a linguistic feature value is necessarily realized by a single articulatory or acoustic scale?

Features and Discreteness

- Universal nature: sound waves & articulatory organs
- Continua: sound waves & articulatory movement
- Human perception and conversion: discreteness

	p	æ	n
voice	-	+	+
labial	+	-	-
stop	+	-	-
nasal	-	-	+
high	-	-	-
back	-	-	-



Features and Discreteness

- Reality: *articulatory* gestures and *acoustic* cues could not be constraint within segmental boundaries
 - E.g. VOT: delay of voicing after [p]
 - E.g. nasality extending over the vowel before [n]
- Prosodic phonology: prosodies included features that extended over more than one segment
- Autosegmental phonology
 - Vowel harmony: all vowels within a word may have to agree in respect of features such as 'back' and 'round'.
- CV phonology
 - Linear organization of speech: a structured representation of speech such that features are not contained only within segmental units.



Hierarchical Organization of Features— Dependency Phonology

- Anderson and Ewen (1987)
- Hierarchy of features
 - Articulation is resolved into Gesture—Subgesture—Components
 - ◆ Components: scales or continua, or may be simply present/absent
- Organization of features
 - Grouping of features by preponderant component(s)
 - In the characterization of particular sounds, component may ‘preponderate’ to a greater or lesser extent.
 - ◆ $\{ |i \rightarrow a| \} = /e/$: frontness preponderant over lowness
 - ◆ $\{ |i \leftarrow a| \} = /æ/$: lowness preponderant over frontness



Overview of Feature Systems

- Jakobson and Halle's 12 distinctive features (1956)
 - Defined in both acoustic and articulatory terms (but in perceptual sense)
 - Opposition between two relative values
- Chomsky and Halle's 24 universal set of phonetic features (1968)
 - Described principally in articulatory terms
 - Binary for linguistic description; may have several values when taken as physical or phonetic scales
- Ladefoged's 20 "Traditional Features" (1982)
 - Relates to physical scale, either articulatory or acoustic
 - Either binary (one value listed only) or more values (all listed)
- Anderson and Ewen's components (1987)
 - Relates to natural class in articulatory sense
 - Scales or continua, or may be simply present/absent



Discussion

- Learn linguistics to establish accurate common language for collaboration
- How to define or find out a universal feature system based on real corpus and measurable by signal processing techniques?

Reference

- 以上簡報內容大多從以下來源整理所得
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