

Phonology

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What is phonology?

- Phonetics: the study of speech sounds
- Phonology: the study of **sound systems**; how the particular sounds used in each language form an integrated system for encoding information and how such systems differ from one language to another; studies the structure and systematic patterning of sounds in human language

How to find phonemes: distinctive sounds

- distinctive and nondistinctive sounds
 - (1) a. sip vs. zip
 - b. fine vs. vine
 - c. chunk vs. junk

- Distinctive: Two sounds are “distinctive” w.r.t. one another if sounds differences cause a distinction in meaning. One way to determine whether two sounds in a language are distinctive is to identify a **minimal pair** which is a pair of words that differ only by a single sound in the same position, and which have different meanings but which are otherwise identical.
 - (2) bill; dill; gill, rib; rid; rig
 - (3) beat; boot, book; beak
 - (4) moon vs. good? duty vs. cook? thin vs. that?

How to find phonemes: minimal pair/set

- Minimal set/pairs are thus pairs of words or a set of words which are identical in form except for one sound segment that occurs in the same place in the string. Check the following. Are they minimal pairs? No!

(5) seed/soup
bar/rod

- Free variation: two sounds are in free variation if they do not cause any meaning difference. For example, when we pronounce the following words the initial sound could be either [i] or [e] with no changes in the meaning.

(6) economics, either/neither

Phonemes and allophones

- Phoneme: What is it?
 - a. Distinctive sounds in English
 - b. A class of speech sounds which are identified by a native speaker as the same sound
 - c. Not physical sounds/but mental sounds
 - d. Phoneme is represented by //.
- Let us consider some examples. In (7), /b/ and /t/ are distinctive sounds that cause meaning differences. Can [p] and [p^h] in (b) be phonemes in English? Can [k] and [kk] in (c) be also English phonemes as in Korean?

- (7) a. bin, tin
b. [pin] vs [p^hin]
c. kam (감) vs. kkam (깁) (Korean)

Phone

- Phone: a phonetic segment represented by []. Phones are phonetic symbols or the realization of phonemes. One phoneme may be realized as more than one phone/phonetic segment (these different phones are 'allophones'). [p] and [i] are English phonemes but may be realized differently in the following examples (as aspirated [p^h] and nasalized [ĩ])

- (8) a. spin vs. pin
b. bean vs. bead

- allophone: Allophones are thus the members of the phone classes, which are actual phonetic segments produced by a speaker. An allophone is a predictable phonetic variant of a phoneme and a rule governed (cf: complementary distribution). We will see what this means in due course.

Broad vs. narrow descriptions

The identical phoneme can be realized into different phones. These phones are not required to be distinguished by speakers, but could be represented by additional transcriptions. Some fine details of the articulation of phones are as follows.

Narrow descriptions 1

- aspirated stops: aspirations sounds on all voiceless oral stops ($[p,t,k]$) occurring as the first sound in a stressed syllable in English.
 - (9) a. pat vs. spat
 - b. kid, vs. skid
 - c. top vs. stop
 - d. append vs. apple
- unreleased stops: When stop occurs before another stop, it is unreleased: $[p^-]$
 - (10) popcorn, kickback, labcoat, madman, rugby

Narrow Descriptions 2

- flaps: In intervocalic (between vowel) position, an alveolar stop is flapped: [ɾ]
(11) catty, caddy, bitter, bidder, latter, ladder
- dental consonants: alveolar sounds followed by an interdental consonant is pronounced with the tip of the tongue on the teeth: [θ]
(12) health, unthinkable, eighth

Narrow descriptions 3

- velarized: the lateral following vowels: [ɫ]

(13) feel, pill, tall, golf, vs. leaf, lip
- voiceless liquids and glides: when they follow a voiceless obstruent: [ɬ]

(14) proof, sleep, quick
- lengthened vowels: followed by a voiced consonants

(15) peas, had, road, vs. peace, hat, rote
- nasalized vowels: followed by a nasal:

(16) green, tan, lamb, tongs

Distinctive features

- distinctive feature: When a feature distinguishes one phoneme from another, it is a distinctive feature. This difference also accounts for the meaning difference. See the following minimal pairs.

(17) seal vs. zeal

In (17), the distinctive feature [voice] tells [s] from [z]. The two are contrasting phonemes. But the two are neither allophones nor in complementary distribution. The only difference is the distinctive feature [voicing].

(18) bat/mat, rack/rock, see/zee

Nondistinctive features

- Nondistinctive features are identical phonemes, no different meanings, but just allophones. The allophones are **predictable, redundant, nondistinctive, and nonphonemic**.

- Example 1: nasality

(19) bean/bead

The nasality feature occur before syllable-word-final nasal consonants. But the nasality doesn't contribute to phonemes in English.

- Example 2: aspiration

- (20) a. possible in the syllable initial position or before a stressed vowel: pill, till, kill, etc
 b. not possible after a syllable initial /s/: spill, still, skill

Conclusion

Phoneme is an abstract unit or mental construct. We do not utter phonemes; we produce phones which are the allophones of the phoneme of the language. For example, /p/ is a phoneme in English. This sound can be realized phonetically as either [p] or [p^h]. These two are allophones of the phoneme /p/.

Overlapping vs. complementary

- Overlapping Distribution: two sounds are overlapping when the sets of phonetic environments in which they can occur are partially or completely identical. For example, [b] and [d] could occur anywhere; syllable initially or finally. Their occurrences are overlapping.

(21) bait/date, lobe/load

Overlapping vs. complementary

- Complementary distribution: if the two phones complement each other, they are in complementary distribution. For example, see the place where the aspirated [p] and unaspirated [p] occurs.

- (22) a. spat, spool
b. pat/pool/peek

The positions are in complementary distribution.

- (23) a. [p] occurs after [s]
b. [p^h] occurs word initially

We could predict where each of these phones occurs. It is *predictable and rule governed*.

Natural classes

- Natural Class: groups of sounds in a language which share some articulatory or auditory features. For a group of sounds to be a natural class it must include all of the sounds that share a particular feature or group of features; a set of phonemes uniquely defined by a small number of distinctive features such that the set plays a significant role in expressing the phonological regularities; a group of sounds that share one or more distinctive features
- One example:
 - (24) a. [p,t,k]: forms the natural class, voiceless stops
 - b. [p,l,w]: does not form a natural class

Natural classes 2

- One more example: what is the natural class of voiced stops in English?
- Why do we need to refer to natural classes? It makes it possible to state generalizations concerning the sound systems of English. For example, there are no words like **pwell*, **bwint*, **fwallow*, **vwoot*, etc. in English. One simple generalization we can state is '[w] cannot follow labial sounds in English.'
- Features: When talking about a groups of sounds, we refer to those features in the bracket we have learned so far for the description of consonants and vowels: [bilabial], [interdental], [high], [front], [tense], etc.

New features

- sibilant: sounds with a high pitched hissing sound quality. This feature is good for stating a generalization about English plural system.
- obstruents: sounds produced with an obstruction of the air flow. The sounds in this category are stops, fricatives, and affricates.
- sonorant: sounds produced with a relatively open passage for the air flow. The sounds in this category are nasals, liquids, and glides, in addition to all vowels. Nonsonorants are obstruents

New features 2

- labials: bilabial and labiodentals
- anterior: sounds produced in the front part of the mouth (bilabials, labiodentals, alveolars, and palatals)
- syllabic: vowels, nasals, liquids (rhythm, listen, little, etc) this feature is assigned to phonemes that can function as the head of a syllable
- continuant: sounds made with a complete blockage of the oral cavity. Stops are [-continuant]

Phonological rules

We have learned that mental 'entities' phonemes are realized into physical entities 'phones'. We capture this mapping relation by phonological rules. The rules state how phonemic forms are changed into phonetic forms according to phonological rules:

(25) /A/ → [B]/C__ D

The rule states that the phoneme /A/ is realized as the phone [B] in the environment such that it occurs between C and D.

Phonemic rules

- nasalization: A vowel is nasalized in the environment before a nasal segment

(26) Vowel \rightarrow [+nasal] / __ (C[+nasal])\$

(27) bab vs. bomb

Rules 2

- alveolar stop assimilation: alveolar stops assimilate in place of articulation to a following consonant

(28) width, in this

(29)
$$\left[\begin{array}{c} +\text{alveolar} \\ +\text{stop} \end{array} \right] \rightarrow \left[\begin{array}{c} \alpha \text{ place} \\ +\text{alveolar} \\ +\text{stop} \end{array} \right] / _ \left[\alpha \text{ place} \right]$$

Rules 3

- liquid and glide devoicing: when they follow a voiceless obstruent in speech, they become voiceless

(30) proof, sleep, quick, etc

(31) $\left[\left\{ \begin{array}{l} +\text{liquid,} \\ +\text{glide} \end{array} \right\} \right] \rightarrow \left[-\text{voice} \right] / \left[\begin{array}{l} -\text{voice} \\ + \text{obstruent} \end{array} \right] _$

Rules 4

- aspiration: pink, top, kick, etc.

$$(32) \left[\left\{ \begin{array}{l} - \text{continuent,} \\ - \text{voice} \end{array} \right\} \right] \rightarrow [+ \text{ aspirated}] / \$ _ [+ \text{ stress}]$$

- flapping: alveolar oral stops are realized as [D] when they occur after a stressed vowel and before an unstressed syllable

(33) write, writer, ride, rider

$$(34) \left[\left\{ \begin{array}{l} + \text{ alveolar,} \\ + \text{ stop} \end{array} \right\} \right] \rightarrow [+ \text{ flap}] / [+ \text{ stress}] _ [- \text{ stress}]$$

Morphophonemic Rules

- the phonetic form of the plural form is determined by both the morphology and the phonology
- plural forms:
 - (35) a. cab, cad, bag, love,
 - b. cap, cat, back, cuff, faith
 - c. bus, bush, buzz, match, ...

Plural Rules

Rules: Add the phonological form /z/ with the meaning "plural"

1. insert [ə] before the plural ending when a regular noun ends in a sibilant sound
2. change the voiced /z/ to voiceless [s] when it is preceded by a voiceless sound

Rules

- past tense:

- (36) a. grab, hug, love, fan, long, kill, tie...
b. reap, peak, kiss, wish, pitch,,,,,
c. state, raid,

- the negative infix 'in'

- (37) a. inexcusable, inattentive, intolerable, indefinable,
b. impossible, imbalance,
c. incomplete, inglorious

:change the place of articulation of a nasal consonant so that it agrees with the place feature value of a following consonant.

Syllable

- intuition
 - (38) example: cat, catfish, catalogue, catatonic
- What a syllabus consists of?
 1. Nucleus: center of the syllable (Vowels and other sonorants can be nuclues as in bottom and apple)
 2. Onset: beginning of the syllable
 3. Coda: end of the syllable
- Aspiration Rule: [-continuent, -voiced] are aspirated in the syllable initial position
- Maximal Onset Principle: Make the onset the maximal sequence available at the beginning of a syllable anywhere in the language
 - (39) con-structs

Quote of this chapter

Don't fear failure so much that you refuse to try new things. The saddest summary of a life contains three descriptions: could have, might have, and should have. Louis E. Boone