

Phonology

[These slides are missing most examples and discussion from class ...]

What is Phonology?

| | Pronunciation | Spelling |
|-----------|---------------|----------|
| cat + -s | "kats" | cats |
| dog + -s | "dawgz" | dogs |
| rose + -s | "roziz" | roses |
| kiss + -s | "kisiz" why? | kisses |

How do you pronounce a sequence of morphemes? Especially, how & why do you fix up the pronunciation at the seams between morphemes?

phonology doesn't care about the spelling (that's just applied morphology)

What is Phonology?

| | Pronunciation | Spelling |
|-----------|---------------|----------|
| nap + -t | "næpt" | napped |
| nab + -t | "næbd" | nabbed |
| nod + -t | "nadid" | noddled |
| knot + -t | "natid" | knotted |

Actually, these are pronounced identically:
 naðɪd
 thanks to the English "flapping" rule
 (similarly: ladder/latter, bedding/betting)

What is Phonology?

"Trisyllabic Shortening" in English

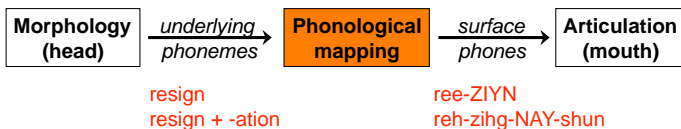
divine → divinity
 futile → futility
 senile → senility
 satire → satirical
 decide → decision
 wild → wilderness

serene → serenity
 supreme → supremacy
 obscene → obscenity
 obese → *obesity

(and similarly for other vowels)

What is Phonology?

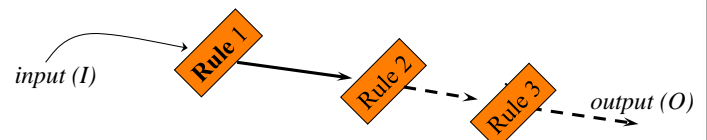
- A function twixt head and lip



- What class of functions is allowed?
 - Differs from one language to next
 - Often complicated, but not arbitrary
- Comp Sci: How to compute, invert, learn?

Successive Fixups for Phonology

- Chomsky & Halle (1968)
- Stepwise refinement of a single form
- How to handle "resignation" example?



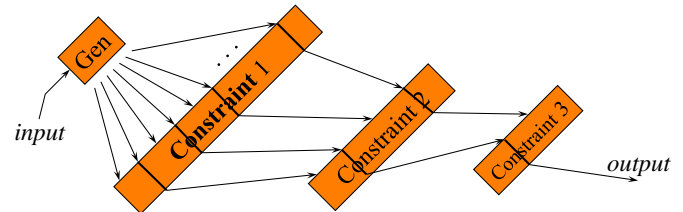
- That is, $O = f(I) = g_3(g_2(g_1(I)))$
 - Function composition (e.g., transducer composition)

How to Give Orders

- Directions version: **successive fixup (derivation)**
 - Break two eggs into a medium mixing bowl.
 - Remove this tab first.
 - On the last day of each month, come to this office and pay your rent.
- Rules version: **successive winnowing (optimization)**
 - No running in the house is allowed.
 - All dogs must be on a leash.
 - Rent must be paid by the first day of each month.
- In rules version, describe what a good solution would look like, plus a search procedure for finding the best solution). Where else have we seen this?

Optimality Theory for Phonology

- Prince & Smolensky (1993)
- Alternative to successive fixups
- Successive winnowing of candidate set



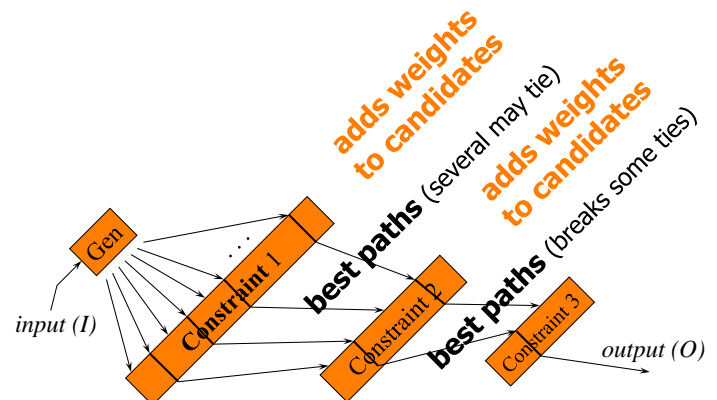
Optimality Theory "Tableau"

★ ★ = candidate violates constraint twice (weight 2)

| | Constraint 1 | Constraint 2 | Constraint 3 | Constraint 4 |
|--------------------|--------------|--------------|--------------|--------------|
| Candidate A | ↔ | | ↔ | ↔↔↔↔ |
| Candidate B | | ↔↔↔ | ↔ | |
| Candidate C | ↔ | ↔ | | |
| Candidate D | | ↔↔↔↔ | | |
| Candidate E | | ↔↔↔ | ↔ | ↔ |
| Candidate F | ↔↔↔ | ↔↔↔↔ | | ↔ |

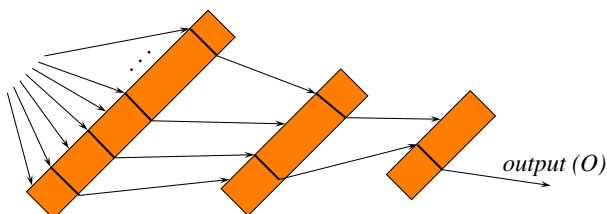
constraint would prefer A, but only allowed to break tie among B,D,E

Optimality Theory for Phonology



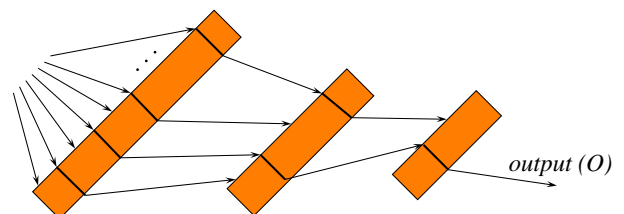
When do we prune back to best paths?

- Optimality Theory: At each intermediate stage
- Noisy channel: After adding up all weights



Why does order matter?

- Optimality Theory: Each machine (FSA) can choose only among outputs that previous machines liked best
- Noisy channel: Each machine (FST) alters the output produced by previous machines



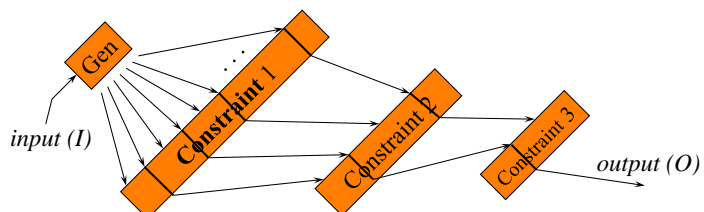
Final Remark on OT

Repeated best-paths only works for a single input

Better to build full FST for $I \rightarrow O$ (invertible)

Can do this e.g. if every constraint is binary:

Assigns each candidate either 1 star ("bad") or 0 stars ("good")



Optimality Theory "Tableau"

| | Constraint 1 | Constraint 2 | Constraint 3 | Constraint 4 |
|--------------------|--------------|--------------|--------------|--------------|
| Candidate A | ↔ | | ↔ | ↔ |
| Candidate B | | | ↔ | |
| Candidate C | ↔ | ↔ | | |
| Candidate D | ↔ | | | |
| Candidate E | | | ↔ | ↔ |
| Candidate F | ↔ | ↔ | | ↔ |

all surviving candidates violate constraint 3,
so we can't eliminate any