## 1 Properties of morphological systems

Stephen Anderson's brief entry in the Encyclopedia of Cognitive Science on morphology is worth reading if you haven't already.

https://cowgill.ling.yale.edu/sra/morphology\_ecs.htm

Many thorny issues:

- 1. Paradigms
- 2. Productivity
- 3. Exceptions
- 4. Semi-productive exceptions
- 5. Phonological inteference
- 6. Phonological interference is exceptionful and semiproductive too (leaf/leaves and dwarf/dwarves but chief/chiefs and reef/reefs etc.)
- 7. item arrangement versus process

8. ...

# 2 Automata Theory

## Acceptors



Is there a path through the machine for these strings?

- 1. bababa
- 2. babaab
- 3. bbabba
- 4. baabaa

### Transducers

### Multiplying along paths

Boolean



Draw paths for the following strings which also show the outputs. Multiply the outputs with *conjunction*.

- 1. bababa
- 2. babaab
- 3. bbabba
- 4. baabaa

#### Counting



Draw paths for the following strings which also show the outputs. Multiply the outputs with addition.

- 1. bababa
- 2. babaab
- 3. bbabba
- 4. baabaa

#### Probability



Draw paths for the following strings which also show the outputs. Multiply the outputs with *multiplication*.

- 1. bababa
- 2. babaab
- 3. bbabba
- 4. baabaa

#### Strings



Draw paths for the following strings which also show the outputs. Multiply the outputs with *concatenation*. Note  $\lambda$  denotes the empty string.

- 1. bababa
- 2. babaab
- 3. bbabba
- 4. baabaa

### Summing between paths

The above acceptors were *deterministic*. That is, at each state upon reading a letter, there was at most one transition arc to take. Consequently, there is at most one path for each string.

The ones below are *non-deterministic*, which means there can be more than one path for each string. You have to take them all and then sum up all the paths.

#### Probability



Draw all the paths for the string *baabaa* which also show the outputs. As before, along a path, multiplication is concatenation. Across paths, summing is *addition*.

So what is the probability of *baabaa* according to this transducer?

#### Strings



Draw all the paths for the string [darv] which also show the outputs. As before, along a path, multiplication is concatenation. Across paths, summing is *union*.

So what is the output of this transducer given the input [darv] 'dive'?