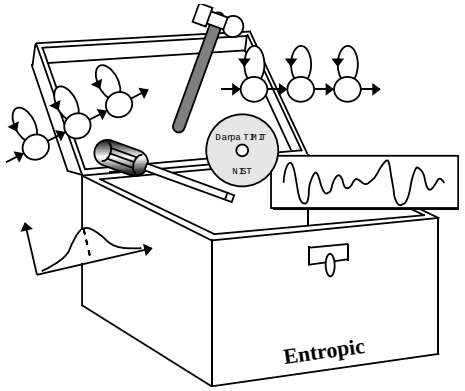
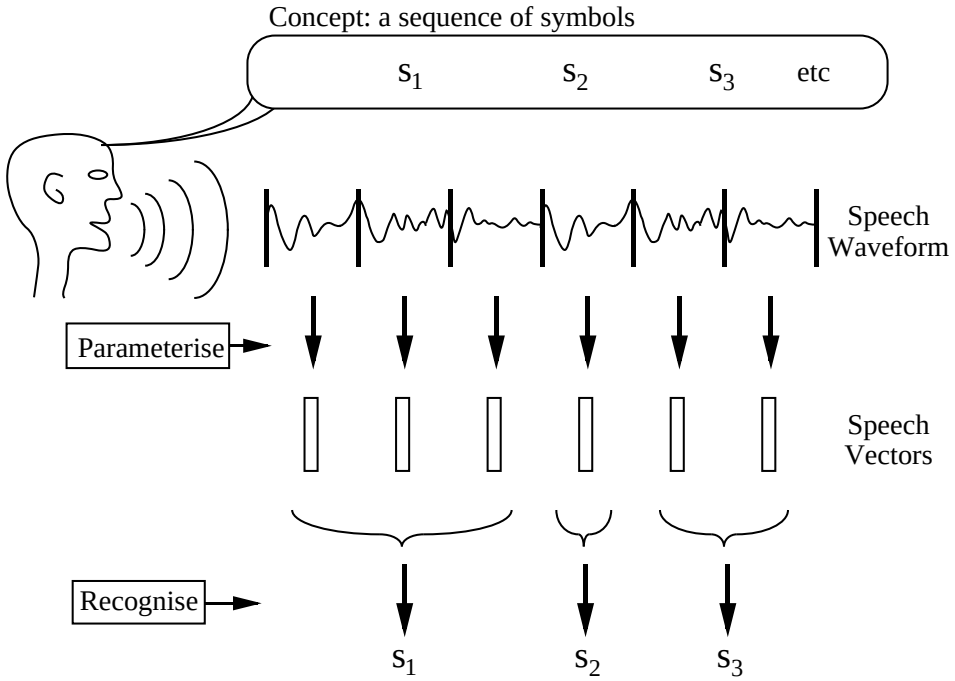
Isolated Word Recognition application

- Data preparation
- Training
- Testing
- Analysis





Message encoding and decoding.*

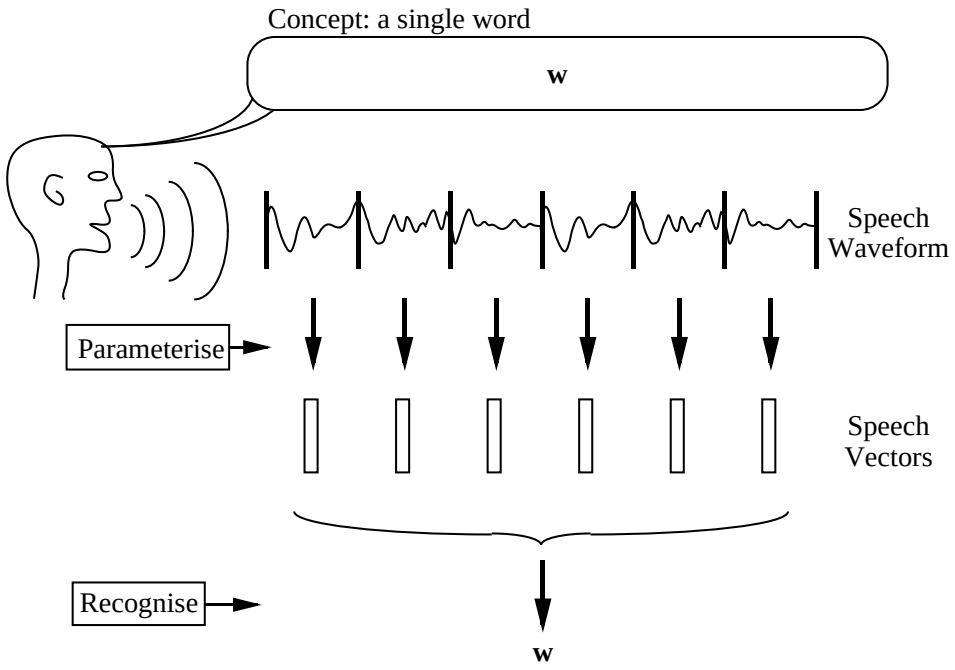
Isolated Word Recognition task

The problem is to find

$$\arg\max_i \{P(w_i|\mathcal{O})\}, \tag{1}$$

where, according to Bayes,

$$P(w_i|\mathcal{O}) = \frac{P(\mathcal{O}|w_i)P(w_i)}{P(\mathcal{O})}. \tag{2}$$

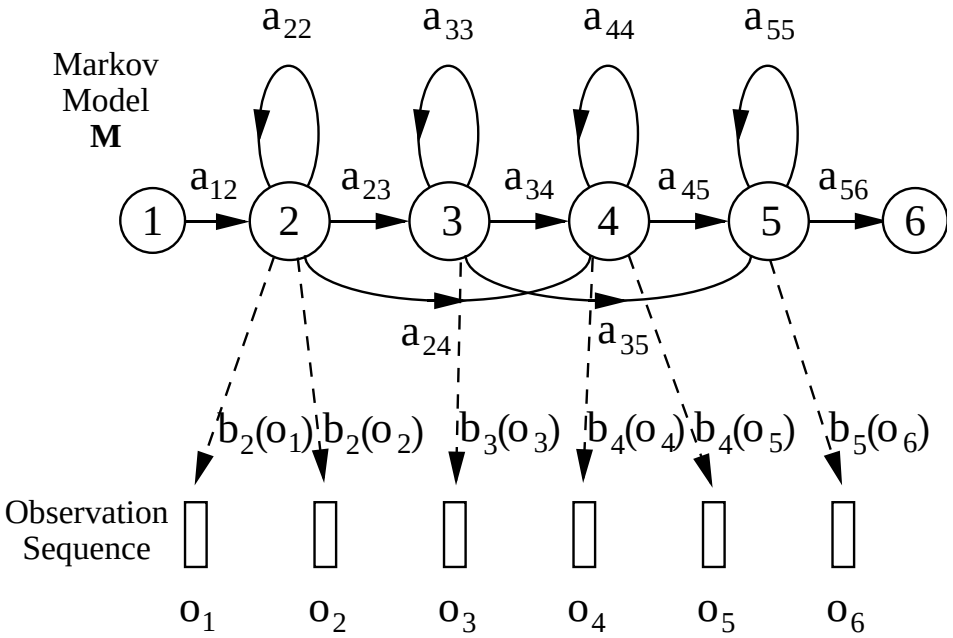


Isolated word problem.*

The hidden Markov model

In this case, we assume

$$P(\mathcal{O}|w_i) \approx P(\mathcal{O}|\lambda_i) \approx \max_X \pi_{x_1} b_{x_1}(o_1). \prod_{t=2}^{T} a_{x_{t-1}x_t} b_{x_t}(o_t). \quad (3)$$



The Markov generation model.*

IWR: Building the grammar

Example utterances:

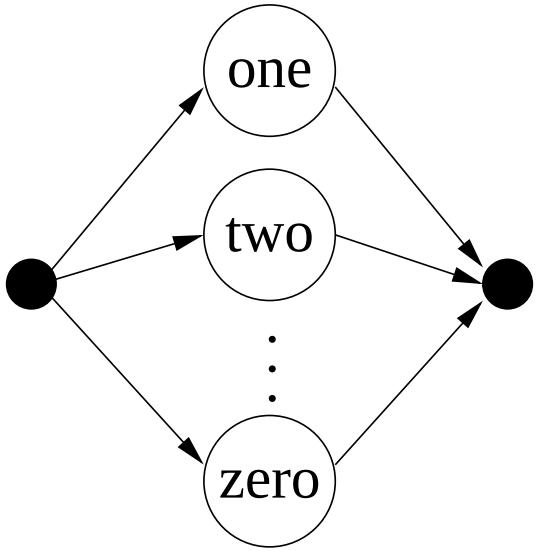
- eight
- oh
- six

Task grammar:

```
$digit = ONE | TWO | THREE |
         FOUR | FIVE | SIX |
         SEVEN | EIGHT | NINE |
         OH | ZERO;
( SENT-START $digit SENT-END )
```

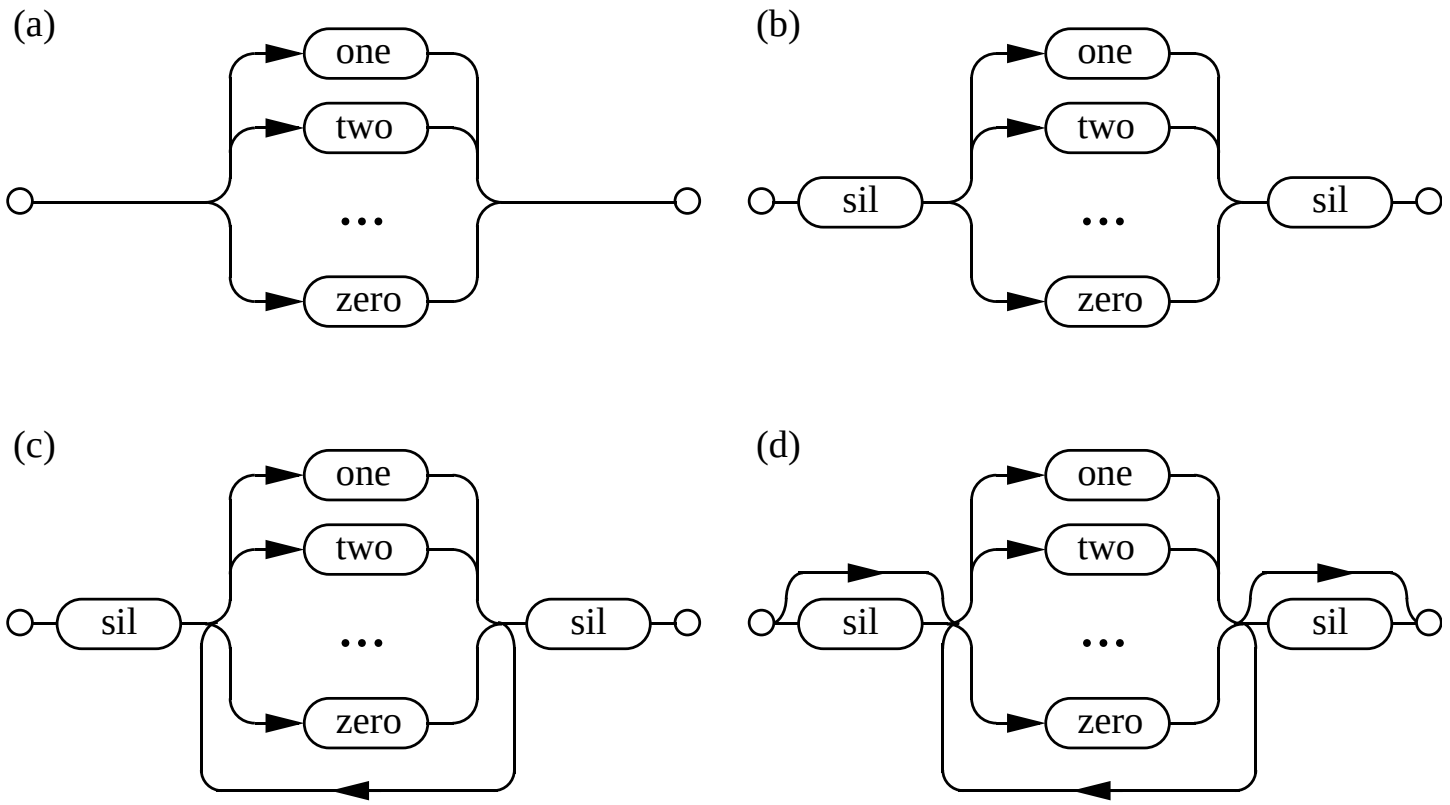
Key:

| alternatives.



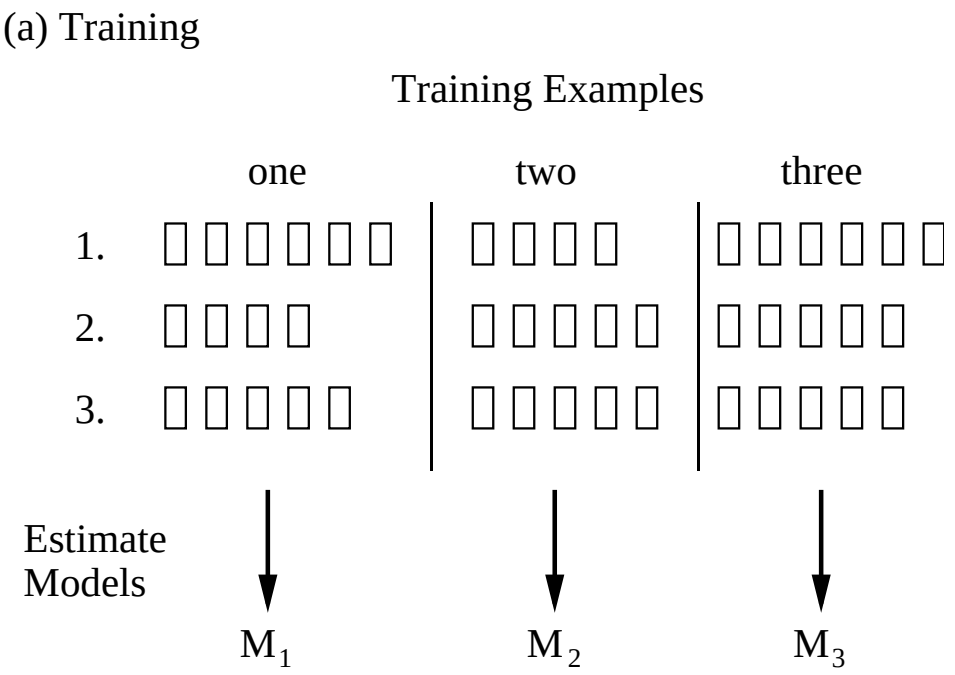
Grammar for isolated digit recognition.

Isolated & Connected Digit grammars



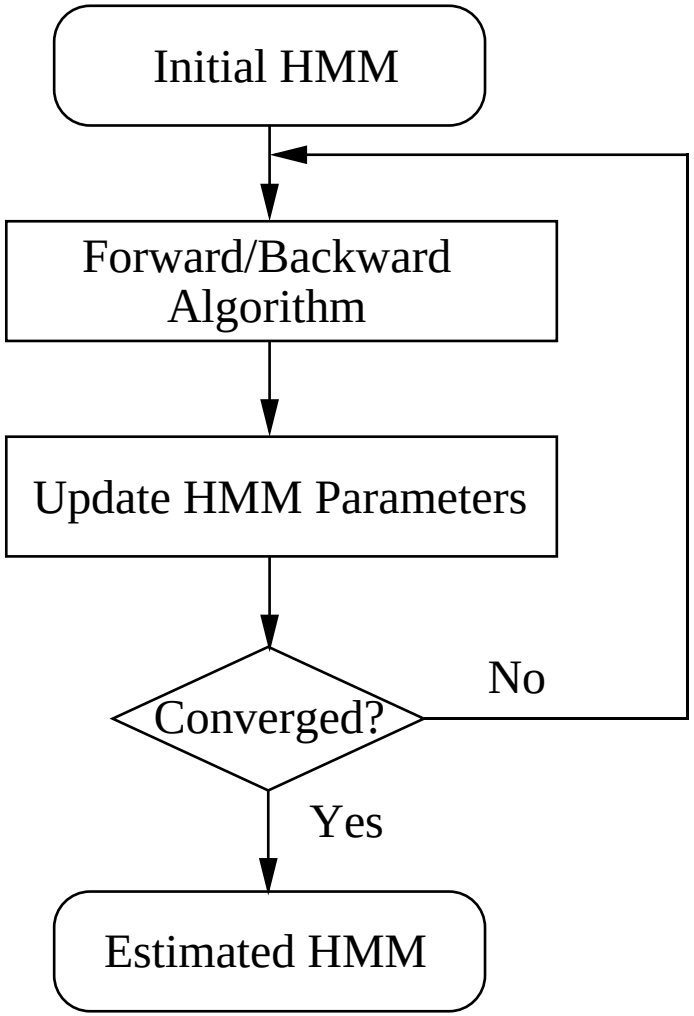
Networks for isolated and connected digit recognition tasks:*
(a) IWR, (b) IWR with end-point adjustment from silence,
(c) CWR with silence model, (d) with optional silence.

Training and test data



Using HMMs for isolated word recognition.*

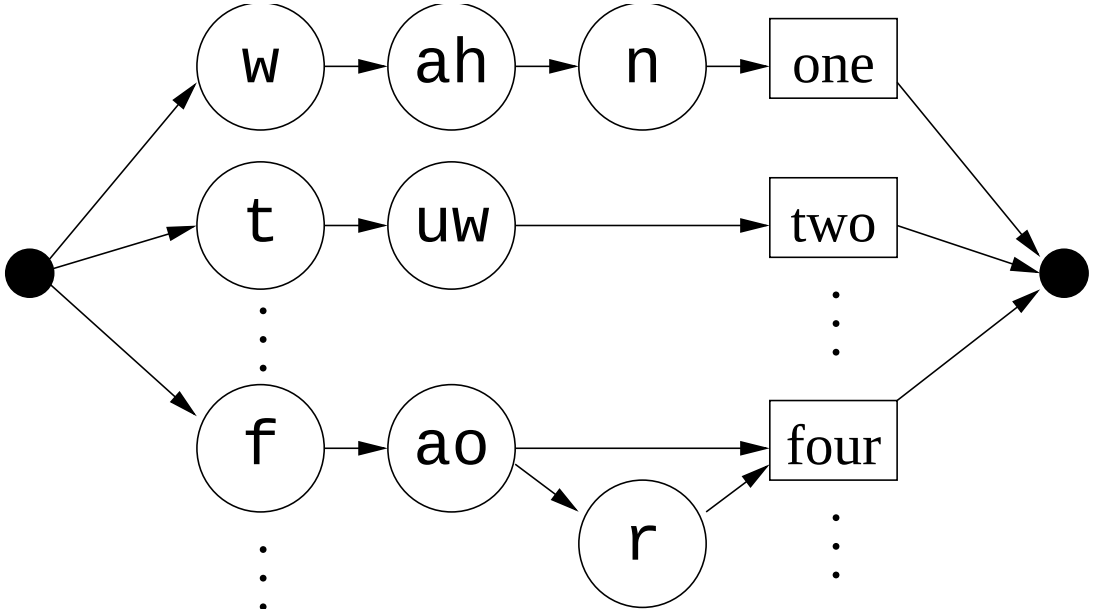
Re-estimation process



Isolated unit re-estimation.*

IWR: Phone-based digit dictionary

ONE	w ah n	SIX	s ih k s
TWO	t uw	SEVEN	s eh v n
THREE	th r iy	EIGHT	ey t
FOUR	f ao	NINE	n ay n
FOUR	f ao r	OH	ow
FIVE	f ay v	ZERO	z ia r ow



Grammar for phone-based isolated digit recognition.

IWR summary

- Isolated word recognition task
- HMMs for IWR
- Building the grammar
  - Preparing the data
  - Training the models

Next

- How to set the model parameters:
  - Baum-Welch re-estimation
  - Forward-backward algorithm