Detecting Speech

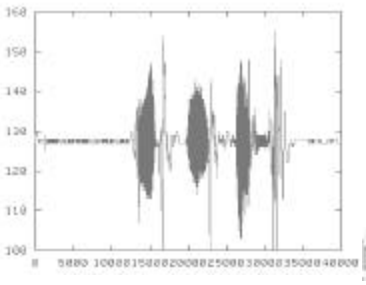
Project 1

Outline

- Motivation
- Problem Statement
- Details
- Hints

Motivation

- Word recognition needs to detect word boundaries in speech



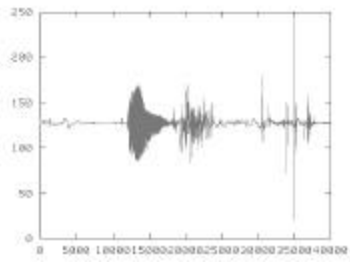
"Silence Is Golden"

Motivation

- Recognizing silence can reduce:
  - Network bandwidth
  - Processing load
- Easy in sound proof room, with digitized tape
  - Measure energy level in digitized voice

Research Problem

- Noisy computer room has loud background noise, making some edges difficult



"Five"

Research Problem

- Computer audio often for interactive applications
  - Voice commands
  - Teleconferencing
- →Needs to be done in 'real-time'

Project Solution

- Implement end-point algorithm by Rabiner and Sambur
  - (Paper for class, next)
- Implementation in Linux
- Basis for audioconference/Internet phone
  - (Projects 2 and 3)

Details

- Voice-quality:
  - 8000 samples/second
  - 8 bits per sample
  - One channel
- Record sound, write files:
  - `sound.all` - audio plus silence
  - `sound.speech` - audio no silence
  - `sound.data` - text-based data: audio data, energy, zero crossings:

```
128 10 3
127 12 4
127 20 3
```

- Other features allowed

Sound in Linux

- Linux audio device just like a file:
  - `/dev/dsp`
  - `open("/dev/dsp", O_RDWR)`
- Recording and Playing by:
  - `read()` to record
  - `write()` to play

Sound Parameters

- Use `ioctl()` to change sound card parameters
- To change sample size to 8 bits:

```
fd = open("/dev/dsp", O_RDWR);
arg = 8;
ioctl(fd, SOUND_PCM_WRITE_BITS, &arg);
```

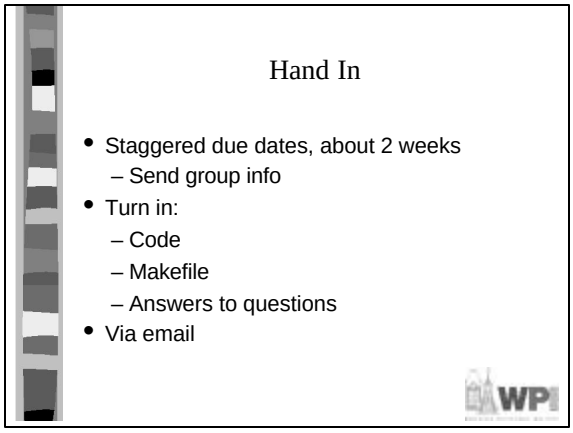
- Remember to error check all system calls!

Sound Parameters

- The parameters you will be interested in are:
  - SOUND_PCM_WRITE_BITS
    - the number of bits per sample
  - SOUND_PCM_WRITE_CHANNELS
    - mono or stereo
  - SOUND_PCM_WRITE_RATE
    - sample/playback rate

Program Template

```
open sound device
set sound device parameters
record silence
set algorithm parameters
while(1)
    record sound
    compute algorithm stuff
    detect speech
    write data to file
    write sound to file
    if speech, write speech to file
```


Hand In
• Staggered due dates, about 2 weeks
– Send group info
• Turn in:
– Code
– Makefile
– Answers to questions
• Via email
WPI