Introduction to Sounds

SWS3012: Structure and Interpretation of Computer Programs

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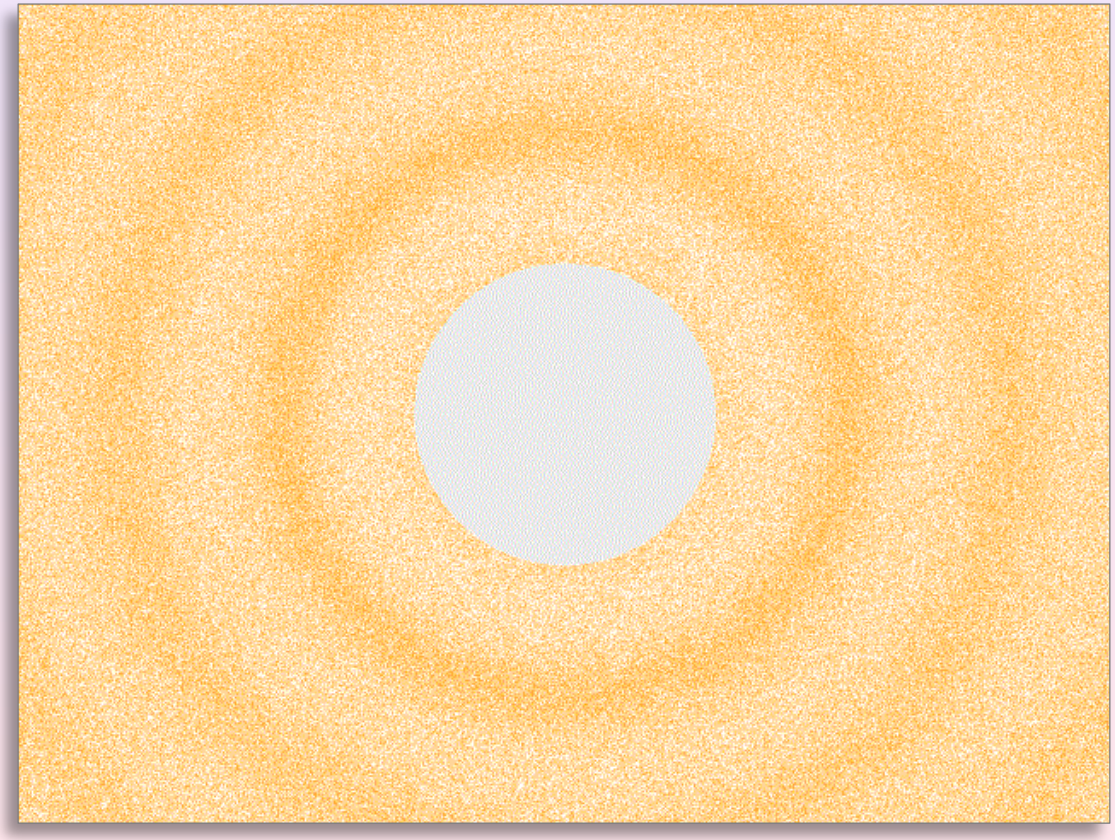
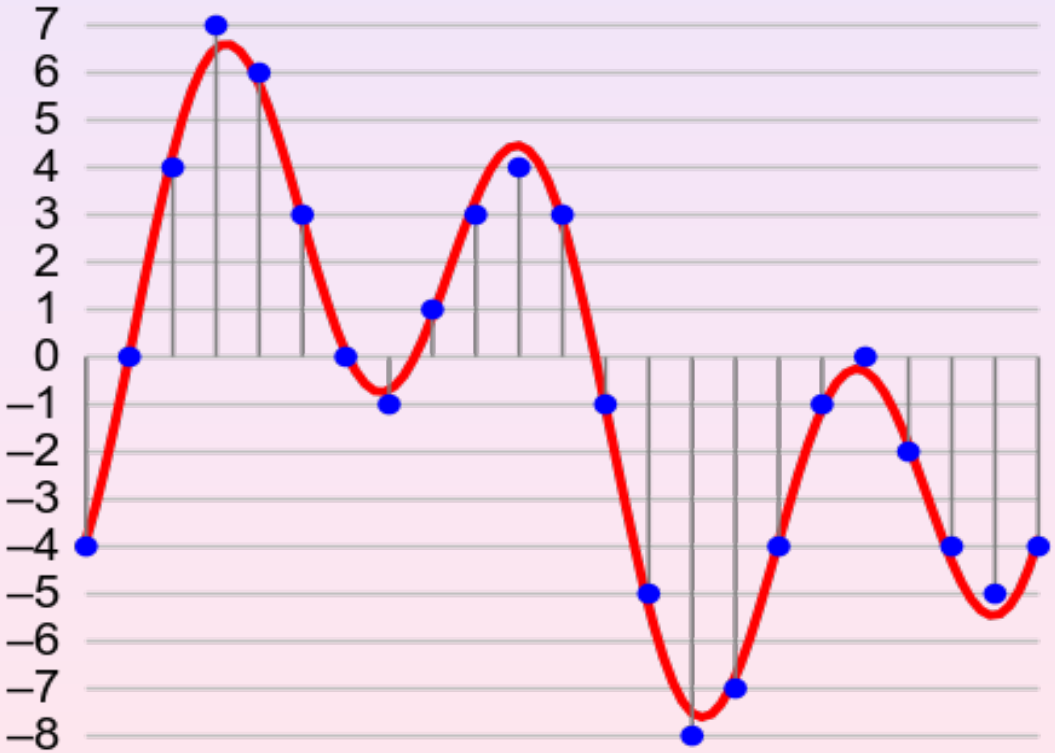
What is Sound?



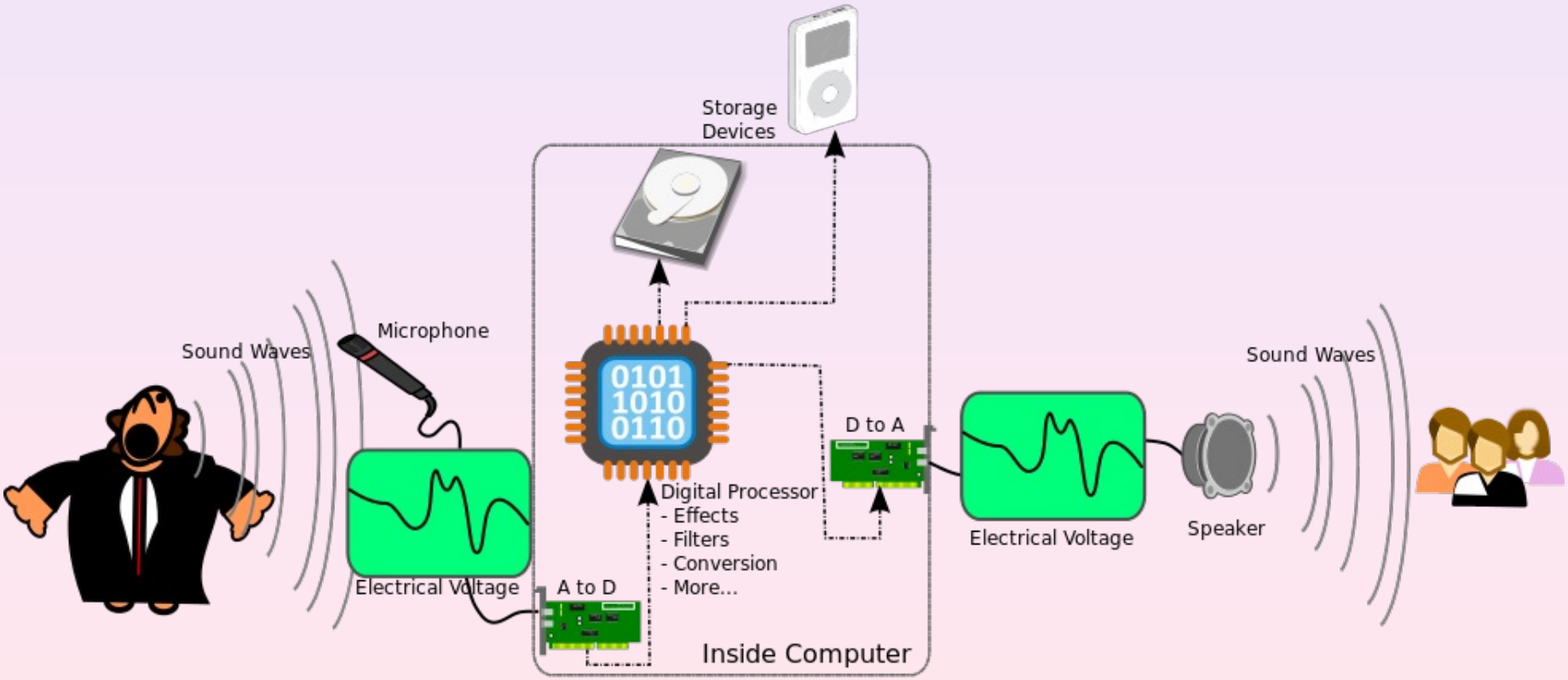
spherical pressure waves

Digital Sound

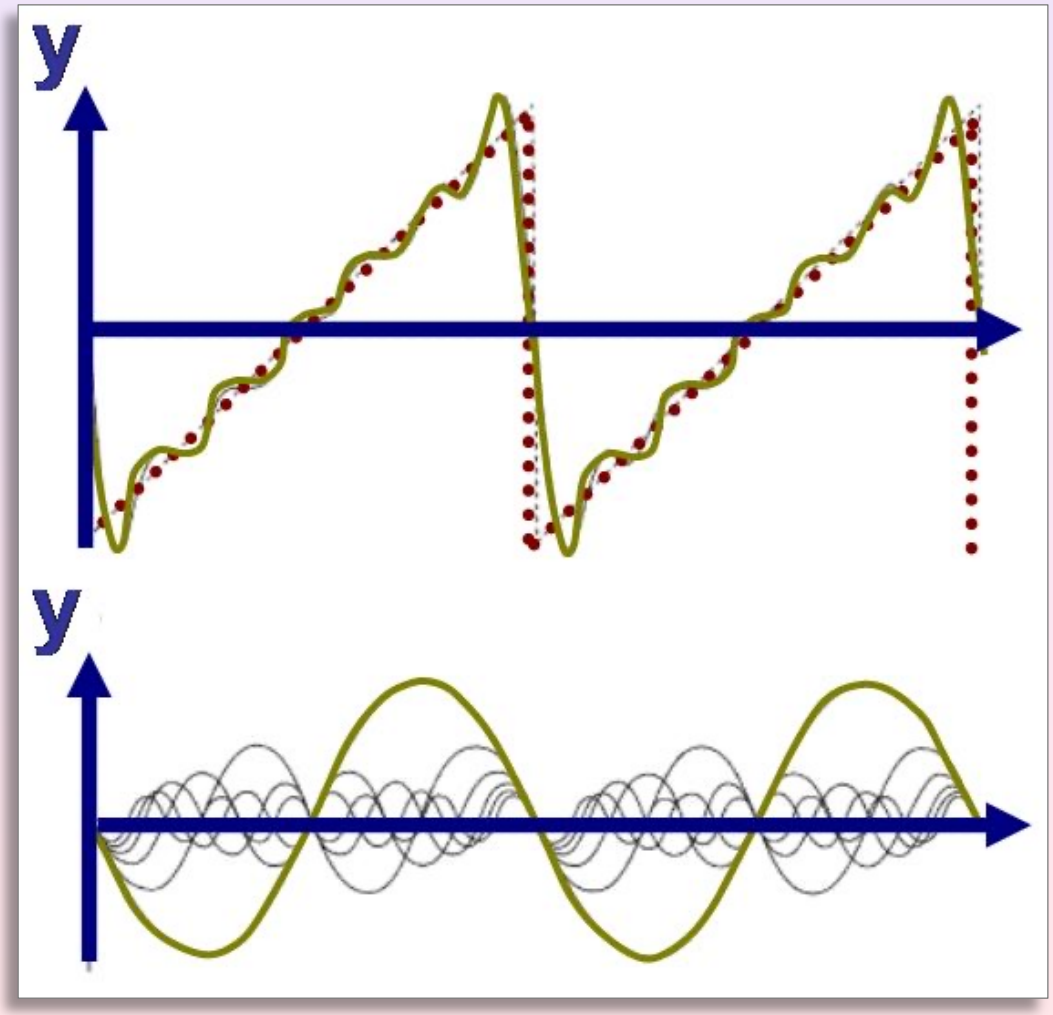


Digitizing / sampling an analog sound signal

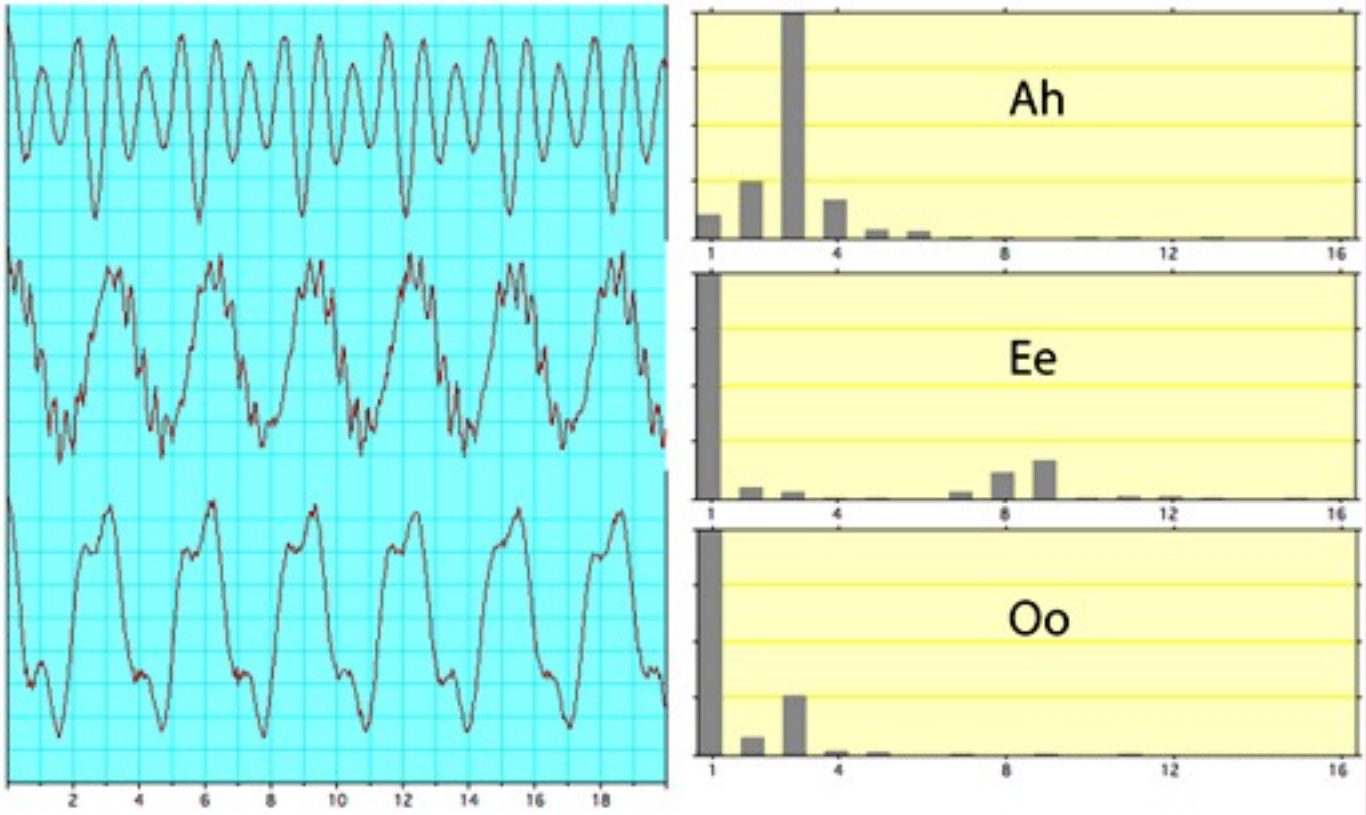
Digital Sound Processing



Fourier Analysis



Analysing Sound in the Frequency Domain



Functional Sound Synthesis

- **Simple example:**

Show in Playground

```
const pitch_A_wave =
    t => math_sin(2 * math_PI * 440 * t); // A4

const pitch_A = make_sound(pitch_A_wave, 1.5);

play(pitch_A);
```

Functional Sound Synthesis

- **Second example:**

Show in Playground

```
const C_maj_chord_wave =
    t => 0.33 * math_sin(2 * math_PI * 261.63 * t) + // C4
         0.33 * math_sin(2 * math_PI * 329.63 * t) + // E4
         0.33 * math_sin(2 * math_PI * 392.00 * t);  // G4

const C_maj_chord = make_sound(C_maj_chord_wave, 1.5);

play(C_maj_chord);
```

Functional Sound Synthesis

- **Third example:**

Show in Playground

```
const doremi_wave =
    t => t < 0.5
         ? math_sin(2 * math_PI * 261.63 * t)  // C4
         : t < 1.0
         ? math_sin(2 * math_PI * 293.66 * t)  // D4
         : math_sin(2 * math_PI * 329.63 * t); // E4

const doremi = make_sound(doremi_wave, 1.5);

play(doremi);
```

Sound in Source

- Supported by the **sound module**
- Uses **functional sound**

Summary

- Sound is a physical phenomenon
- We digitize sound to process it in the computer
- To hear digitized sound, we need to “undigitize“ it
- In CS1101S, we do it differently: we work with functional sound