Lecture 25 - Project Lecture

Today's Talk about the project.

1. Bart: Some details about your project.
2. John: Overall view of (audio) stuff.
Your project:

Q: What is it?
A: Tone controller / Treble Bass amplifier (stereo)

Block diagram:

1. Battery
   9V

2. Power Circuit

3. Tone Controller
   +5V
   Left
   Right

4. Audio Input

5. Audio Amp

6. Speakers
(2) Why ????
   1. one of the first projects which EE people build
   2. Easy to build, easy to understand qualitatively.
   3. Good project to understand the limitations of theory.
   4. Cheap!
Component of your project

Solution: "Linear low dropout regulator."
also "Smart voltage divider"

R2 will be adjusted
as long as it can

bad, because a real battery cannot put out steady 9 V.
"as long as it can" means \( \Delta \) between \( V_{\text{in}} \) (9 V) and \( V_{\text{out}} \) (5 V) should be at least 1-2 V

(A.) How do you choose a regulator?

(A.) Look at datasheets from companies (e.g., Motorola, National Semiconductor ...)

e.g. LM2940, LM1086 ...

In reality, regulators look like:

![Diagram of a regulator](image)
Note: You need filter capacitors at the input and output. Caps. help filter out noise.
Potentiometer
\[ x(t) = a_0 + a_1 \cos(t) + b_1 \sin(t) + a_2 \cos(2t) \]

\[ v = c_0 e_0 + c_1 e_1 \]
amplitude

subwoofer

200 8000 frequency

amp low pass filter

freq x

20 Hz 20 kHz freq
amp.

**highpass**

- $f_c$: cutoff frequency
- freq

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**Speakers**

- Standard 8Ω

- $(20 mA)^2 R$
- $(0.02)^2 R$
- $(0.0041) 8$
- 0.0032 W
- 3.2 mW
Audio

Phase difference is not important because as humans, we can't "hear" phase differences.

John's comment: phase difference in audio means time delay.