Outline

- Transistors/FET’s continued

Recap

- Transistors are used by connecting power supplies to the base and collector (relative to the emitter) so that there is \( I_B \) and \( I_C \).
- \( I_B \ll I_C \) under normal circumstances (amplifier configurations, but not switching configurations). Their ratio is called \( \beta = I_C/I_B \).
- So a bare transistor is a current amplifier. But one can build simple circuits around a transistor to make a voltage amplifier, too.
- Emitter follower has a voltage gain of 1. This seems to be completely useless device. It is except when you have a high-output-impedance signal source to a low-input-impedance load. When they are connected directly to each other, the voltage from the source sags, which is often not desirable.
- But when an emitter follower is connected in-between, it will increases the input impedance of the load that the signal source sees by a factor of about \( \beta \). Then it can be connected to a high-output-impedance signal source without sagging the voltage.
- Alternatively, one can interpret the same phenomenon in the following way. This circuit will increase the output impedance of the source by a factor of about \( \beta \). When it is connected to the low-input-impedance load, then, there will not be an output-voltage sagging.

Remarks

- When I calculated input/output impedances in the last class, I use
  \[ Z_{\text{in}} = \frac{\Delta V}{\Delta I} \]
- Instead of
  \[ Z_{\text{in}} = \frac{(V+\Delta V)}{(I_{\text{in}}+\Delta I)} \]
- This is because of the reason we define these impedances.
- Use a velocity example to illustrate the difference between the two expressions.

- From now, **Convention: \( I \) and \( V \) are for quiescent current and voltage, whereas \( i \) and \( v \) are deviation from the quiescent current and voltage.**