Problem with Common-Mode Feedback

- What if \( I_L < \frac{I_{\text{tail}}}{2} \)?
  - Will capacitive feedback solve this?
- Typical solution: Common-mode feedback
  - Sense CM at output
  - Adjust some knob to alter CM
Common-Mode Sensing

- Simplest CM sensor: pair of resistors
- Resistors load the OTA (reduce gain)
  - If make R large, get slow $V_{cm}$ tracking
  - Is this a problem?

Sensing Scheme #2

- Isolated CM sensing
  - Works reasonably well
  - But hard to use with wide swing amplifier output
Capacitive Sensing

- Capacitive sensing avoids DC loading
  - (still creates AC load though)
- Needs to be reset to remove initial offset
  - Just like capacitive feedback

Adjusting Common-Mode

- Really only two knobs:
- Knob A: adjust load current
- Knob B: adjust tail current
Example Common-Mode Feedback

- Secondary amplifier enforces $V_{cm} = V_{cm\_ref}$
- Place dominant pole at $V_{bp}$, or $V_{cm}$?

Capacitive CMFB

- How to choose $C_{cm}$?
  - “Small”: CM loop gain low
  - “Large”: Loading on diff. output high
Initialization

“Continuous” CMFB