Structured Electronic Design

Determination of OpAmp GB-product requirement

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Procedure for finding required GB product OpAmp

1. Make a model of the OpAmp
   model relevant parameters for dynamic behavior symbolically
   a. DC gain and single pole: $A_v = \frac{A_0}{1+s\frac{A_0}{2\pi \mathrm{GB}}}$
   b. Differential-mode and common-mode input capacitances
   c. Output resistance
2. Model the amplifier: use numeric values for parameters that have been designed
3. Derive an expression for the loop gain (mixed symbolic, numeric)
4. Determine the loop gain-poles product (and its order) from this expression
5. Solve GB from: $\mathrm{LP}_n - (2\pi B_f)^n = 0$ B_f = required bandwidth in [Hz]
6. Find show stopper value with input capacitances and output resistance set to zero
7. Example 11.2 (study this example during next instruction)

SLiCAP functions for determination of the bandwidth

```
instruction.setGainType('loopgain')   # defines the gain type
instruction.setDtaType('laplace')     # defines the data type
instruction.setSimType('numeric')     # substitutes parameters before execution
instruction.setLGref('E1')            # defines the loop gain reference

result = instruction.execute()
# Get the coefficients of the numerator and the denominator of the
# loop gain in ascending order
numerCoeffs, denomCoeffs = coeffsTransfer(result.laplace)
# Get the asymptotic values of the servo bandwidth
servoData = findServoBandwidth(loopGainRational);

# display help for a specific function
help(<functionName>)
```