Root locus Method

$V_{ref}$

$V_{fb}$

$KG_cG_p$

$1 + KG_cG_pH$

Closed loop poles.
\( 1 + KG_cG_pH = 0 \Rightarrow \text{characteristic eqn.} \)

Roots \( \Rightarrow \) closed loop pole location.

\( \omega \) s-plane
\[ 1 + KG_c G_p H = 0 \]

\[ KG_c G_p H = -1 \]

or

\[ |KG_c G_p H| = 1 \]

\[ \angle KG_c G_p H = \pi \]

\[ (2n+1)\pi \]
\[ \frac{KG}{1 + KG} \]

\[ 1 + KG = 0 \]

\[ KG = -1 \]

\[ K \cdot n_g(s) = -1 \]

\[ d_g(s) \]

\[ G \rightarrow \infty \]

\[ \text{zeros of } G \]

\[ G_c = 1 \]

\[ H = 1 \]

\[ \text{poles of } G \]
\[ KG = \begin{pmatrix} -1 \end{pmatrix} \]

- at open loop pole points of \( G \) \( K=0 \)

\[ KG = \begin{pmatrix} -1 \end{pmatrix} \]

- at open loop zero points of \( G \) \( K=\infty \)

As \( K \) is VARIED from 0 to \( \infty \) the root locus starts from open loop POLE \((K=0)\) and ends on open loop zero \((K=\infty)\).
DC - DC CONVERTER.

Gain structure

PWM

Plant

Gain

V_{\text{ref}}

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$$G_C = \frac{S + a}{S}$$
OCTAVE

1. MODEL \(G_p\) = \(\frac{ng}{dg}\)

2. Control Structure \(G_c\) = \(\frac{ngc}{dq_c} = \frac{1}{S} = \frac{S+q}{S} = \frac{1+q}{S}\)

3. Define feedback transfer fn. \(\Rightarrow H = \frac{nh}{dh}\)
set Gc structure

A. $K \cdot G_c \cdot G_p \cdot H$ 

loop transfer fn.

\[
\begin{bmatrix}
K \\
dgc \\
ngc \\
ng \\
\frac{nh}{dh}
\end{bmatrix}
\]

5. plot root loci

6. Choose a closed loop pole point set

7. STEP RESPONSE TEST