IVBRANCH

a code to explore halo current distributions
in arbitrary conducting structures

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$$\begin{bmatrix} [L] & [0] \\ [N]^t & [0] \end{bmatrix} \begin{Bmatrix} \{\dot{I}(t)\} \\ \{\dot{\phi}(t)\} \end{Bmatrix} + \begin{bmatrix} [R] & [N] \\ [0] & [0] \end{bmatrix} \begin{Bmatrix} \{I(t)\} \\ \{\phi(t)\} \end{Bmatrix} = \begin{Bmatrix} \{b(t)\} \\ \{\dot{f}(t)\} \end{Bmatrix}$$

where:

$\{I(t)\}_{Bx1}$ = branch currents (tbd)

$\{\phi(t)\}_{Nx1}$ = node voltages (tbd)

$[L]_{BxB}$ = branch by branch inductance matrix

$[R]_{BxB}$ = branch by branch resistance matrix

$[N]_{BxN}$ = edge node incidence matrix

$\{b(t)\}_{Bx1}$ = branch voltage (exterior sources)

$\{f(t)\}_{Nx1}$ = nodal flows (exterior sources)

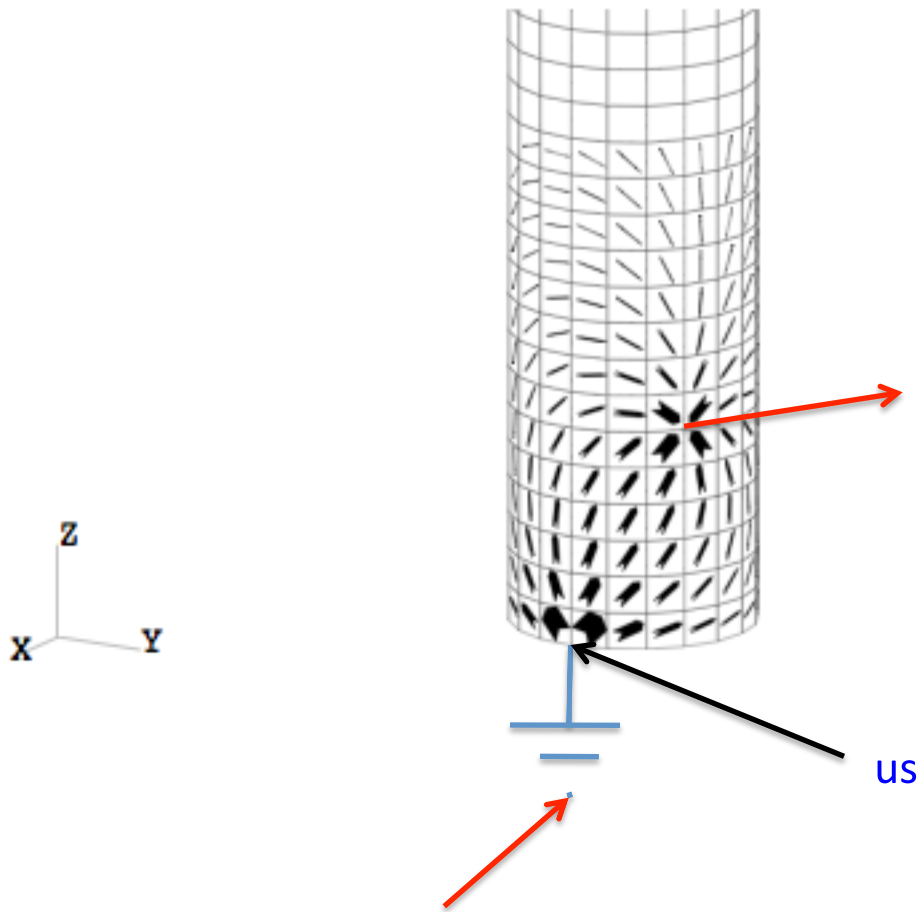
model conducting structures with 1-D, 2-D, & 3-D elements, end up with N 'nodes' & B 'branches' in model

user defines:
1) exterior magnetic d(B)/dt
2) surface normal current density
3) reference nodal voltage(s) in model

code solves for:
current and voltage in model

IVBRANCH results: may program node voltages, node current sources and sinks, current time history in user described coils

resistive solution shown below



10 amp out
user imposed
voltage at node
= -0.0012 V (solution)

user imposed zero voltage

10 amp in (solution)