Pseudo Code:

1. Run LTSPICE simulation, export waveforms for required states, in this case 13 states.

2. Get steady state from waveforms

3. Choosing points at which the system is to be linearized

   (a) $\delta = \|x_0\text{-}x_{steady}\|$
   (b) $\kappa = \left(\frac{||x-x_j||}{||x_j||}\right)$ where, x_j is the previous linearization point and x is the current state
   (c) If $\kappa > \frac{\delta}{5}$ then $x_{j+1} = x$
   (d) Run this through the entire waveform data

4. Read the netlist, record the nodes to which transistors are connected

5. At every x_j record which region the transistor is in

6. Find current equations at every x_j and there by develop the state-space equations

7. Linearizing the non linear equations at each x_j

   (a) Check the equations for non-linear input terms (orders 1,2,3). These terms are removed from the non-linear equations.
   (b) The coefficients of these are introduced in B_j in this order

$$B_j = \begin{pmatrix} .. & .. & .. & .. & .. & .. \\ (inpos) & (inpos)^2 & (inpos)^3 & (inneg) & (inneg)^2 & (inneg)^3 \\ . & . & . & . & . & . \end{pmatrix}_{13\times 6}$$

$$U = \begin{pmatrix} in-pos \\ in-pos^2 \\ in-pos^3 \\ in-neg \\ in-neg^2 \\ in-neg^3 \end{pmatrix}_{6\times 1}$$

(c) Non-linear terms coupled with other state variables are retained, terms such as $k\left(input\right)^{n}\left(state_{i}\right)$ etc are retained in the equation

(d) These filtered equations are part of f matrix. We need this form

$$\dot{x}=f\left(x_{j}\right)+A_{Jac}\left(x-x_{j}\right)+B_{j}U$$

(e) Calculate $\left(A_{Jac}\right)_{j}$the Jacobianof f w.r.t the 13 states. This is a 13×13 matrix

(f) Calculate $f\left(x_{j}\right)$ value of non-linear equations at x_{j}

(g) Re-arrange them to give this form

$$\begin{aligned}\dot{x} &= A_{Jac}\left(x\right)+B_{j}\left(U+K\right)\\ K &= \left(B\right)^{psuedo-inv}\times\left(f\left(x_{j}\right)-A_{jac}x_{j}\right)\end{aligned}$$

8. Feed these matrices to the numerical integrator.

9. Calcuation of weights

   (a) Given current state, calcuate

$$\begin{aligned}norm &= \left(\left|\left|y-x_{j}\right|\right|\right)_{\forall j}\\ weights &= 10^{-10\times norm^{2}}\\ normalization &= weights/weights.sum\left(\right)\end{aligned}$$

   (b) Use normalized weights to scale previously calculated matrices.

   (c) This provides $\dot{x}$ at each time step

$$\dot{x}=\sum_{0}^{j}w_{j}\times\left(A_{Jac}\left(x\right)+B_{j}\left(U+K\right)\right)$$

10. If the system is stable then the waveform obtained should match SPICE waveform