METHOD FOR DETERMINING DISTORTION CONTRIBUTION OF INDIVIDUAL ELEMENTS IN AN ANALOG CIRCUIT

IITM Technology Available for Licensing

Problem Statement

- Traditional methods for diagnosing distortion in analog circuits are **inefficient, particularly with nonlinear elements, lacking applicability in complex configurations.**
- There is a **need for a systematic approach** to **identify distortion contributions** of individual elements without requiring detailed models, accommodating variations, and **extending applicability beyond sinusoidal inputs.**

Technology Category/ Market

Category – Electrical Engineering, Circuit Diagnostics
Applications -Distortion Analysis and Optimization in Analog Circuits
Industry - Electronics Manufacturing, Semiconductor, Circuit Design and Testing
Market - Electronic Design Automation Market was valued at USD 12.9 billion in 2022 and is estimated to register **a CAGR of over 10%** between 2023 and 2032.

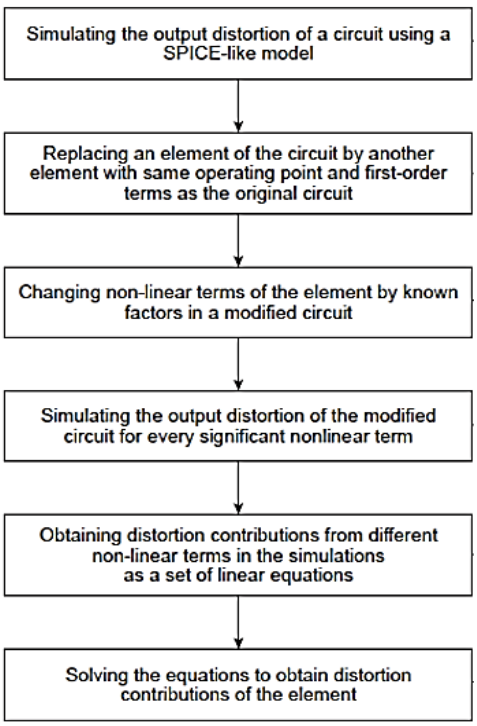

FIG. 1 shows an example of an electronic circuit with one input and one output and K nonlinear elements

Technology

Simulation with SPICE-like Model:
Utilizes **SPICE-like simulation** to analyze **output distortion of analog circuits.**

Replacement of Elements:
Substitutes circuit elements with identical operating points but different **nonlinearities to identify distortion contributions.**

Iterative Nonlinear Term Identification:
Iteratively varies scaling factors of **nonlinear terms** to identify distortion contributions.

Set of Linear Equations:
Derives a set of linear equations from **simulation results to represent distortion contributions**.

Efficient Distortion Analysis:
Provides a **systematic and efficient method** to determine **distortion contributions** without requiring detailed **device models or closed-form descriptions.**

Intellectual Property

- **IITM IDF Ref. 1104**
- **IN 375099 (Patent Granted)**

Research Lab

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Key Features / Value Proposition

- **Systematically identifies** distortion contributions of individual circuit elements or blocks.
- Offers **efficient simulation-based analysis** without the need for **detailed device models**, enabling **optimization and robustness evaluation of distortion cancellation schemes**.
- **Streamlines circuit diagnostics** by pinpointing distortion sources in **complex analog circuits.**
- **Saves time and resources** by offering an **automated, simulation-driven** approach to distortion analysis, **enhancing design efficiency and performance optimization.**

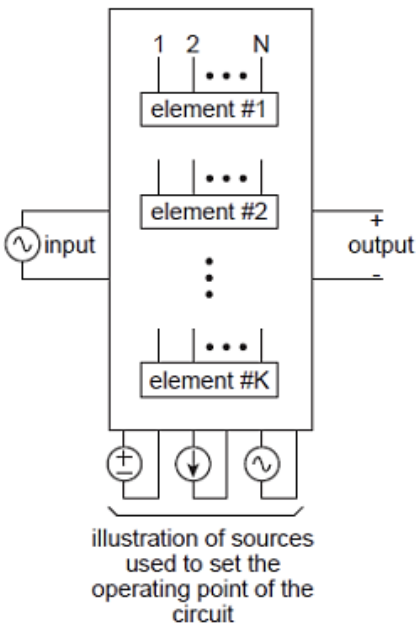


FIG. 2 The device computes the solution to this circuit

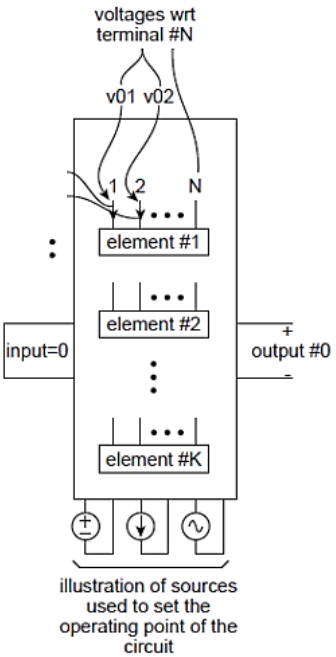


FIG. 3 of the invention involves creating a composite element comprising three copies of element #1, controlled voltage sources for terminal voltages, and controlled current sources for terminal currents.

Image

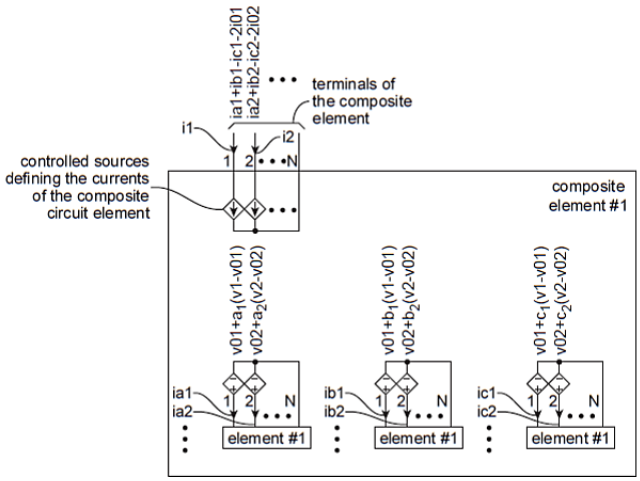
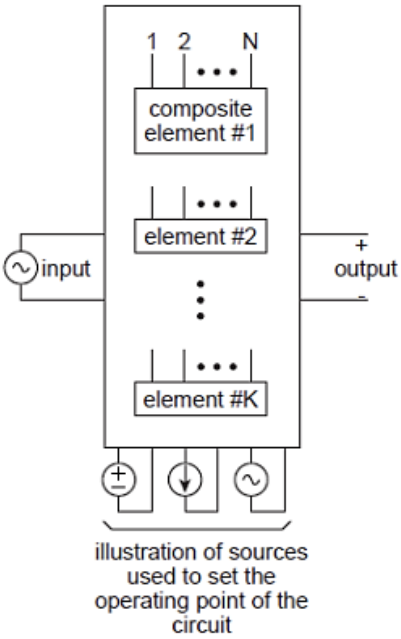


FIG. 4 Copy of the circuit in Fig. 1 with element #1 substituted by the composite element

FIG. 5 Equation setup for computing the distortion contribution x



TRL (Technology Readiness Level)

TRL- 4, Technology Validated in lab

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