

INTERFACING ELECTRONIC FOR MEASUREMENT,
SIGNAL PROCESSING AND WIRELESS
COMMUNICATION



Edited by

Sheroz Khan, International Islamic University Malaysia

AHM Zahirul Alam, International Islamic University Malaysia

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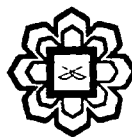
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Chapter 20

A STUDY OF LINEARIZATION TECHNIQUE USING A NONLINEAR THERMISTOR

NURUL ARFAH BINTI CHE MUSTAPHA, AHM ZAHIRUL ALAM, SHEROZ KHAN

20.1. INTRODUCTION

There are several linearization techniques of strongly nonlinear characteristic of thermistor has found its way in several applications. Some are using the different segments in passive method of linearization, conversion method of temperature into frequency or time intervals and some only used the computer methods for linearization. This work is using two methods of simulation; using Excel Simulation and PSpice Block Diagram simulation techniques to study the linearization technique of a measurement technique for astable system.

20.2. METHODOLOGY

Based on the derivation work on a thermistor's study that has been done in (Zvezditz & Toshko, 2009), the first and second derivatives of Eq. (1), Eq. (2) and Eq. (3) has been plotted in Fig. 20.1, Fig. 20.2 and Fig. 20.3. Then, guided by Fig. 12 in (Zvezditz & Toshko, 2009) and using the parameters given, a circuit was generated using PSpice simulation. An analysis was conducted using the PSpice simulation.

20.3. THEORETICAL BACKGROUND

At temperature, $T = 25^\circ$, $T = 273K + 25^\circ = 298K$ where

$$f = \frac{1.44}{(R_\tau + 2R_T)C_\tau} = \frac{1.44}{\left(R_\tau + 2R_x e^{\frac{B}{T}}\right)C_\tau} = \frac{1.44}{\left(R_\tau + 2R_{T2S} e^{B\left(\frac{1}{T} - \frac{1}{298}\right)}\right)C_\tau} \quad (1)$$

Where value of $B = q/k$,

$$f' = \frac{2.88R_{T2S} B e^{B\left(\frac{1}{T} - \frac{1}{298}\right)}}{C_\tau \left(T \left(R_\tau + 2R_{T2S} e^{B\left(\frac{1}{T} - \frac{1}{298}\right)} \right) \right)^2} \quad (2)$$