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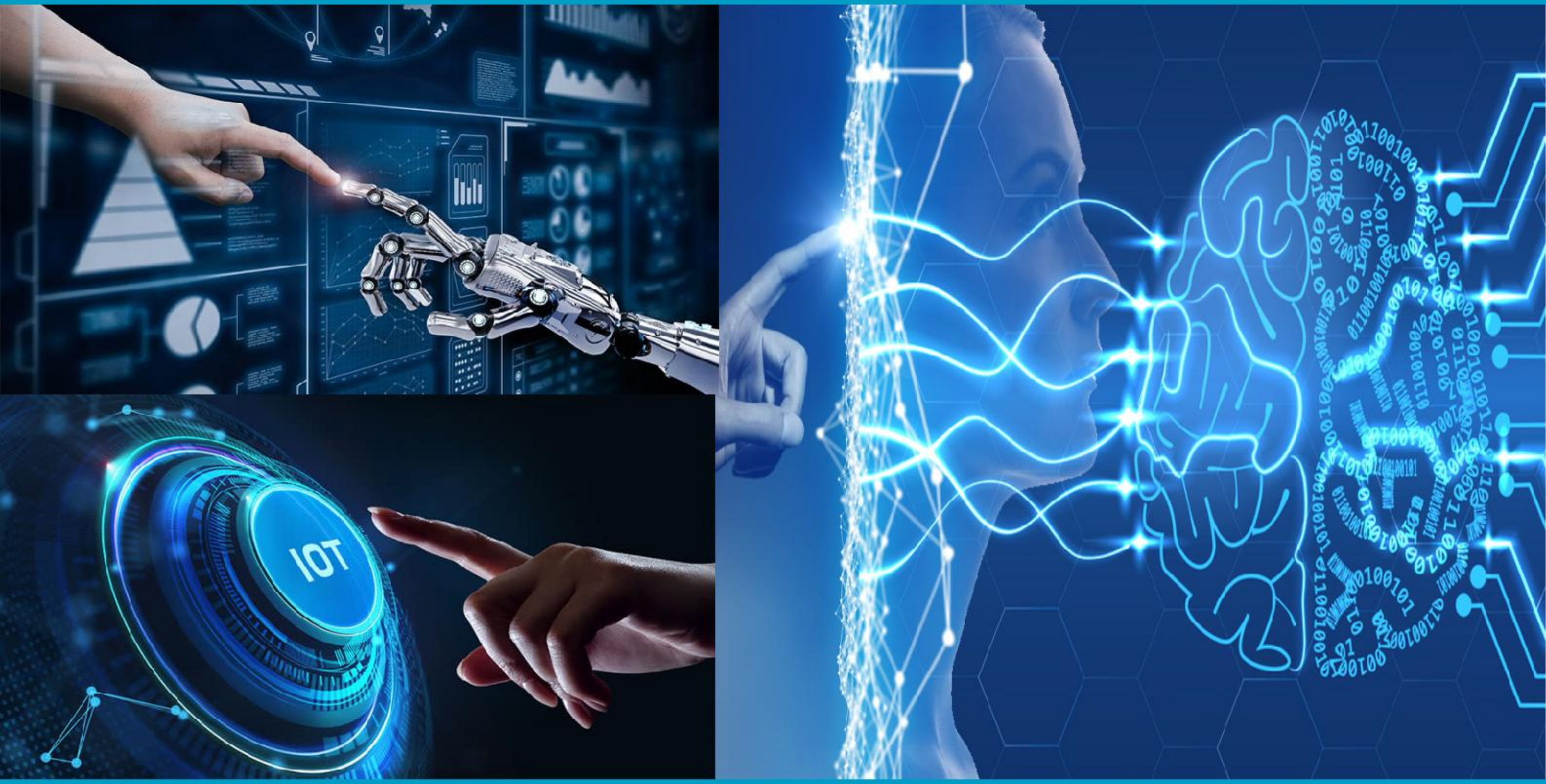

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Analysis & Modelling of Non-Uniform Transmission Line in Matlab Simulink

RAMAN, ANKIT

Electronics & Communication Engineering, CBS Group of Institutions, Haryana, India

ABSTRACT: The rapid expansion of technology over the course of the last several years has completely transformed the nature of communication. Hands-free communication is becoming more popular in today's society. When this occurs, the user replaces the telephone receiver with a standard loudspeaker and a microphone in order to continue the call. Because of this, it would be possible for several individuals to take part in a discussion at the same time. Another benefit is that the individual would be able to walk about freely in the space without having to worry about their hands getting in the way. The Linear Predictive Auto-regression approach and the LMS Adaptive method form the foundation of this strategy for cancelling out echoes. An imitation of the echo is generated by the adaptive filter, and then this replica is subtracted from the sum of the real echo, the near-end signal, and the noise. By doing this step, you can be certain that the last stage will simply include the elimination of noise and echo. The introduction chapter covers topics such as the concept of echo, the many forms of echo and the origins of such echoes, the requirement of echo cancellers in telecommunications networks, the fundamentals of echo cancellation, and the difficulties associated with echo cancellation. Also provides a comprehensive description of the adaptive techniques used in echo cancellers, including the Wiener, LMS, NLMS, and RLS adaptive algorithms. These approaches are designed to lower the amount of energy produced by an erroneous signal. The literature survey will be broken down into its component parts in the next chapter. The Problem Formulation Chapter provides an explanation of the simulation of a standard acoustic echo canceller model that does not use a linear prediction filter, along with specifics of the simulation environment and the findings that were produced. The next chapter provides information about the simulation of a suggested model for an acoustic echo canceller that uses a linear prediction filter. Additionally, the following chapter provides information regarding the simulation environment and the findings that were produced. On the basis of the data that were acquired, the last chapter draws a conclusion, and it also provides a summary as well as some proposals for ongoing study in this sector.

KEYWORDS: Non-Uniform Transmission Line, LMS, NLMS, RLS

I. INTRODUCTION

A cable or other structure is intended to transmit radio frequency waves, which means that the waves are high enough to accommodate the natural considerations of their waves. Radio and receivers, cable TVs, cables between telephone exchanges, computer network connections and high-speed computer data buses are all examples of transmission cables. The parallel lines (stairs), the strings, the strip lines, and the micro strips are all examples of transmission lines with two conductors covered in this article. Even if certain sources refer to transmission lines such as wavelengths, dielectric waveguides, and even optical fibers, this page does not include analysis of these lines; see Waveguide for more information (electromagnetism).

Sound transmission with low-frequency alternating current (AC) can be taken using standard power cords, which rotate 100 to 120 times per second. Radio frequency [1] over 30 kHz cannot be carried by these cables due to the energy transmitted as radio waves and resulting in power loss. Non-continuous cable, such as connecting to joints, can also signal radio waves and restore where they started. [1] [2] The signal strength is not able to reach its target because of this display, which acts as a barrier. Transmission lines are designed with some form of simulation and special construction to reduce the reflection and loss of electrical signal. Feature distortion of multiple transmission lines is manifested by the constant side of the cross section across the entire line length. [2] [3] [4] This impedance uniform prevents thinking. The coaxial cord, strip line, thin strip, and ladder line (a type of twisted pair) are all examples of transmission lines in a plan. The shorter wavelength can be achieved by increasing the frequency of the electric waves carried through the wire or device. If the cable length exceeds the maximum length of the frequency wave, transmission lines are required.

The energy loss in the transmission lines is very high in microwave waves and therefore using waveguides [1], which act as "pipes" to contain and direct the electromagnetic waves, which are used instead. [6] Waveguides are often referred to as transmission lines, [6] although not so in this article. Directing electric waves to very high waves (terahertz, infrared and light), using optical technology (such as lenses and mirrors). [6] The theory of sound wave

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propagation is very similar in mathematics to that of electric waves, so techniques from transmission line theory are also used to construct structures to drive acoustic waves; and these are called acoustic transmission lines.

II. PROPOSED METHODS

There are two approaches for analyzing a non-uniform transmission line.
Non-Uniform Transmission Line Discretization.
Non-uniform Transmission Line Perturbation Theory.

DISCRETIZATION OF NON-UNIFORM TRANSMISSION LINE

On the diagram shown in Figure 1, the fundamental differential equations governing the voltage and current down a transmission line are shown. In equations (3.1) and (3.2), non-uniform transmissions line differential equations are provided

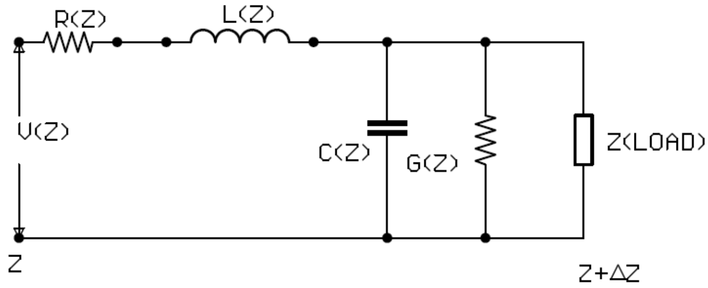

Figure 1: Discretization model of non-uniform transmission line

$$-\frac{dV(z)}{dz}=(R(z)+j\omega L(z)I(z) \quad 1.$$

$$-\frac{dI(z)}{dz}=(G(z)+j\omega C(z)V(z) \quad 2.$$

From equation (1.)

$$I(Z)= -\frac{V'(z)}{R(Z)+J\omega L(Z)}3$$

Substituting (3.3) into equation (3.2)

$$\frac{d}{dz}\left(\frac{V'(z)}{R(Z)+J\omega L(Z)}\right)=\left(G(Z)+J\omega C(Z)\right)V(Z) \quad 4$$

$$\left(\frac{V'(z)}{R(Z)+J\omega L(Z)}\right)-\left(\frac{R'(Z)+j\omega L'(Z)}{(R(Z)+J\omega L(Z))}V'(z)-\left(G(z)+j\omega L(z)\right)=0 \quad 5$$

Now we will calculate v'(z)

Where

$$\lambda^{2=}((G(z)+J\omega C(z)(R(z)+J\omega L(z))6$$

Where

λ^2= Function of z

Let

$$A(z)= \left(\frac{R'(Z)+j\omega L'(Z)}{(R(Z)+J\omega L(Z))}\right.$$

$$B(z)= \quad \lambda^2$$

Where

$$R(z)=R_0+R_1\sin(\beta z) \quad 7$$

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$$L(z)=L_0+L_1\sin(\beta z+\frac{\pi}{6}) \quad 8$$

$$C(z)=C_0+C_1\sin(\beta z-\frac{\pi}{6}) \quad 9$$

$$G(z)=G_0+G_1\sin(\beta z) \quad 10$$

Where

$$\beta=\frac{2\pi}{\lambda}, R_1=\frac{R_0}{2}, L_1=\frac{L_0}{2},\ G_1=\frac{G_0}{2},\ C_1=\frac{C_0}{2}$$

$$1\leq n\leq 100$$

$\boldsymbol{\lambda}=1/10$

Discretize Equation (3.12) with step size Δ

Where z=nΔ

n=0,1,2……………………………N-1

NΔ=d

$$\Delta=\frac{1}{100}$$

This second-order differential is now a second-order difference equation as a result of this Discretization.

Initially condition $V_o=1$

Final condition (load) $V_n=Z< load >.I(d)$

Thereafter we can calculate I_d and V_n values for values of $\boldsymbol{\lambda}$.

III. SIMULATED RESULTS

SIMULATED RESULTS OF DISCRETIZATION METHOD

A transmission line with non-uniformly distributed characteristics has been used to mimic voltage propagation. Using KVL and KCL to write out the fundamental transmission line equations, we began our investigation. Our single second order linear ordinary differential equation with non-constant coefficient for the voltage phase at a given frequency was obtained by removing the current as a variable. We used MATLAB to solve this differential problem by transforming it into a difference equation. According to our simulation findings, the voltage down the line changes as a function of both the distance from the source and the frequency. Using constant distribution parameters and constant frequency, we can see in Fig. 2 the voltage versus distance (z) plot in action. Thus, the voltage decreases exponentially as the distance increases (z). Using non-constant distributed parameters, but a constant frequency, we can see in Figure 3 how voltage varies with distance (z). In other words, when distance (z) decreases, so does the voltage variation. We can see from this graph that both frequency and distance from source end are important factors in plotting voltage pharos in three dimensions. Voltage fluctuation may be seen in the normalized distance range of 0 to 50, whereas there is no variation in the normalized frequency range of 0 to100. When the input voltage is a stationary random process, this three-dimensional graphic may be used to calculate the spectral density of the voltage waveform along the line. Correlation of the voltage waveform along the line may be utilized to determine the scattered parameters. Using both fixed and variable values of main constants, we've looked at six distinct instances.

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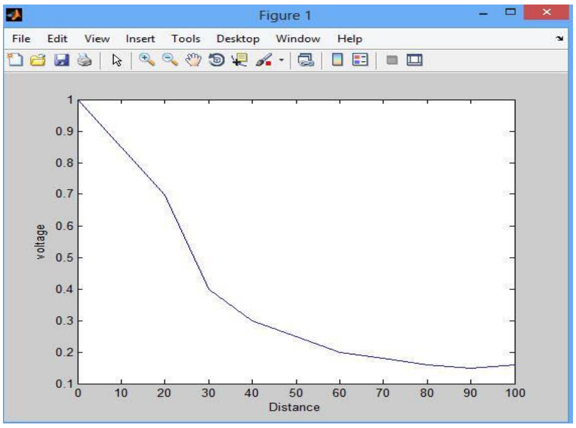

Figure2: Variation in voltage with respect to normalized distance (z) when the fundamental constants are constant but fluctuate.

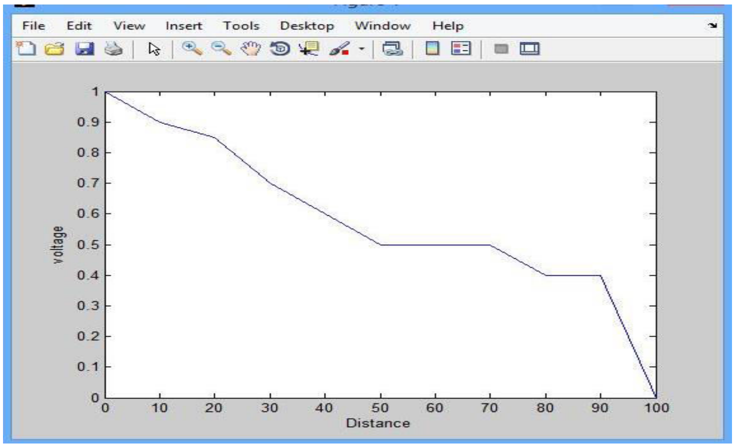

Figure 3: For a given frequency and main constants, voltage variation with normalized distance (z).

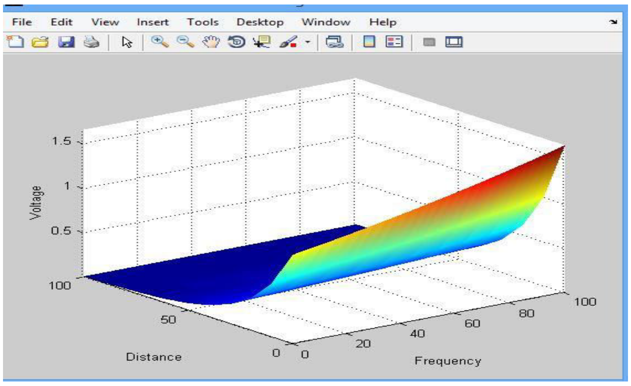

Figure4: Voltage variations with normalized frequency and distance for the variable primary constants(1/RC≫ 1/LC).

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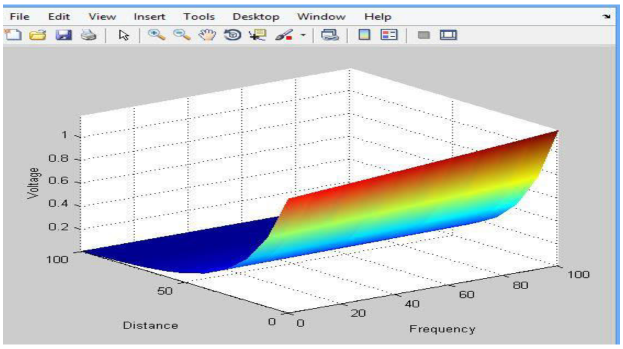

Figure 5: Voltage variations with normalized frequency and distance for the variable primary constants (1/R=1/LC).

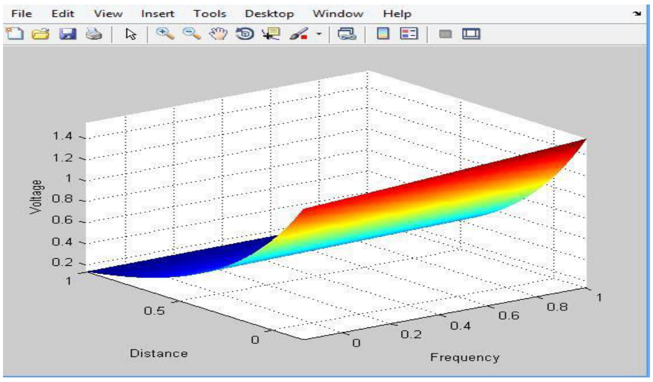

Figure6: Voltage variations with normalized frequency and distance for the variable primary constants (1/RC ≪ 1/LC).

Comparison on the bases of two as well as three dimensional simulated results

Unlike the two-dimensional plot, the three-dimensional plot shows voltage change with normalized frequency and distance (z) at the same time. Figure 4.1 indicates that the voltage strength decreases as the distance increases, but Figure 4.2 shows that the voltage strength decreases and then increases as the distance decreases (z). So, if a decrease in voltage strength is needed, the Discretization approach is more suited, and if voltage variation is needed with respect to distance, the Perturbation method is better suited. Low-frequency voltage strength may be shown in Figure 4.1. When =1 the blue line shows that voltage strength is gradually diminishing. When =3, the green line shows that the voltage strength is falling rapidly compared to the green line (=1). Compared to the other colors—blue, green, red, and light blue—the violet line exhibits a rapidly declining voltage intensity at =12. As seen in Figure 4.5, the voltage strength increases with frequency. When =1 the red line implies that the voltage intensity at the whole normalized distance is insignificant. When reaches 10,

There is more voltage strength in the blue line compared to the red line. As long as =100 with their respective color lines like green, light blue, violet and yellow lines demonstrates that the voltage strength is at the =100 (yellow line). We came to the conclusion that for high frequency NTLs systems we utilize Perturbation theory, whereas for low frequency NTLs systems we use Discretization theory.

IV. MODELING OF SHORT TRANSMISSION LINE

As a two-port circuit, ABCD parameters establish the relationship between voltage and current in the sending and receiving ends. A genuine transmission line can only be accurately represented using evenly distributed factors like as series resistance, series inductance, and series capacitance (shunt capacitance). Power flow or load flow in an ac power system deals with the computation of bus voltages and their phase angles as well as the flow of active and reactive power via different network parts under steady-state circumstances for short (less than 80 km) and medium lines. Mathematical analysis is a vital source of technical information for planning and design, and is also an important tool

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for a variety of other power system analysis areas, including stability, symmetric and asymmetrical faults, harmonic studies, and system stability.

It is customary to regard generators as part of the power system. We've only evaluated the power system under typical working circumstances thus far. A fault occurs when a portion of a power system fails, resulting in a short circuit. Through the low-impedance route that is created by this short circuit, high-fault currents are able to pass. It is possible that power system equipment might be damaged by these abnormally high fault current magnitudes. Electrical and mechanical damage are two possible subcategories of these losses. Solid insulation may be damaged by high current flow, resulting in thermal damage or metallurgical damage to conductors. One or two phases of a three-phase system may be affected by an asymmetrical fault, which differs from balanced or symmetrical faults in which all three phases are affected equally.

More than 95% of all transmission line problems are caused by asymmetrical defects. The amount of the fault current in this kind of failure is less than in symmetrical faults, yet its study is critical for system stability, relay configuration, and single-phase switching. Additionally, the passage of electricity into the earth from unsymmetrical faults may have an effect on the surrounding environment. Keeping an eye on voltage and power flow is a crucial element of power system management, especially in today's complex systems with many components and linkages.

Simulation parameter

Three-Phase Source
Rmsvoltage - 250e3
Frequency – 50Hz

Three-Phase Series RLC Branch
Resistance 6
Inductance – 0.053H

Three phase Load
Active power -304.8e6
Inductive power - 228.6e6

Simulation Layout

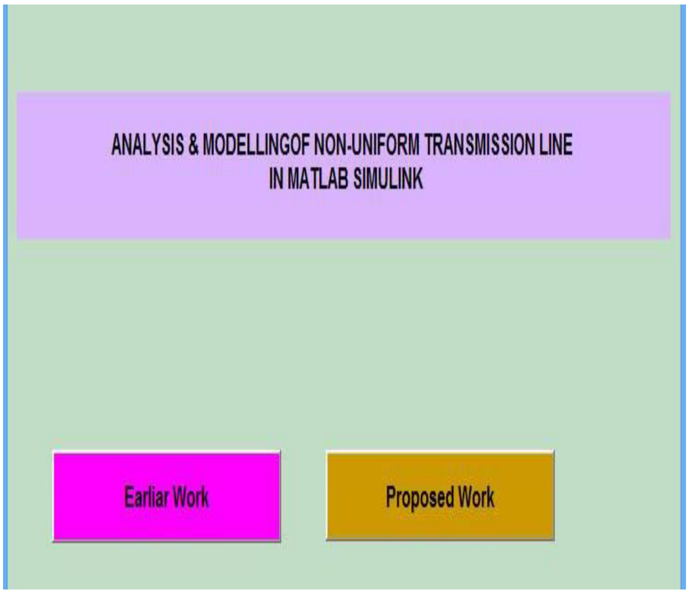

Figure 7: This is a simple MATLAB 2010b layout with just two buttons. For perturbation theory, see earlier; for transmission lines, see suggested.

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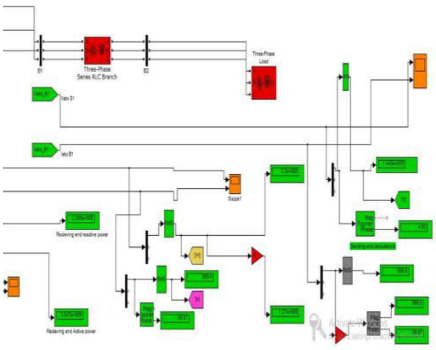

Figure 8: Simulation of Transmission line using MATLAB

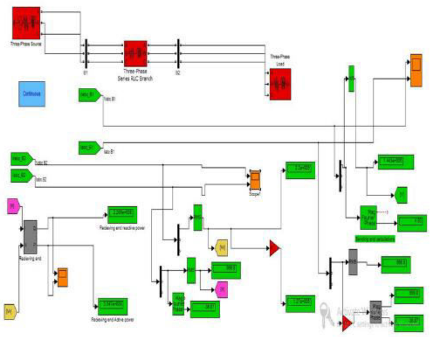

Figure 9: Simulation in running time (Green Box shows the timer) for transmission behavior

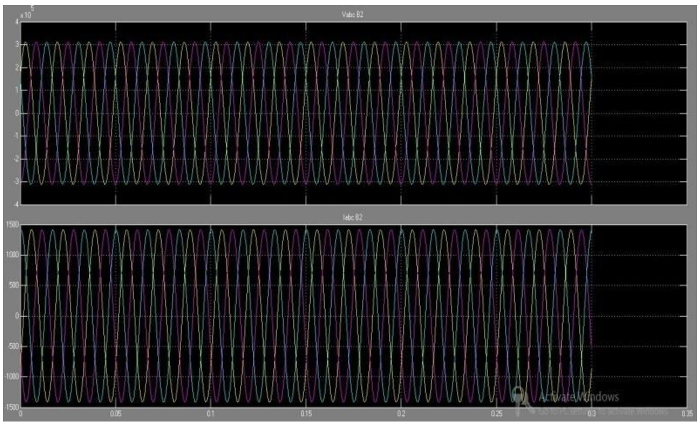

Figure 10: Output of scope 1(Sending End of transmission Line)

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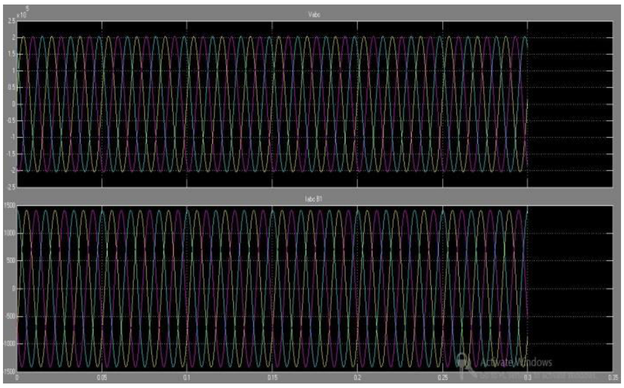

Figure 11: Output of scope 2(Sending End of transmission Line onsends the Different parameter of voltage and current)

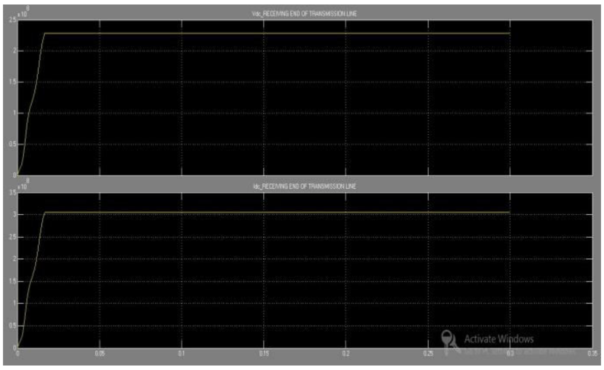

Figure 12: Scope 3's output (Receiving End of transmission Line)

Three alternative scopes of simulated output may be found in the MDL file of Simulink. On one end, you're supplying data, while others are getting it; on the other end, you're receiving it with varying parameters of input.

V. CONCLUSION AND FUTURE SCOPE

Analysis of transmission lines with fixed parameters for the length of each unit was created in this thesis using the new method described here. In this thesis, we focus on transmission lines that have features that do not distribute in the same way. It is a microscopic transmission line, too. The distraction method can be used to analyze unequal transmission lines. KCL and KVL unlimited line lengths are the starting point of the process. The first order orders of the combined first order of electrical and current power in the line are forced to form a system. Due to the inhomogeneity of the line, these different figures have a fixed coefficient. Starting with the first system of the various calculated voltages, the voltage and current variables in the line are expanded by a variable variable and a 2x2 matrix is formed by the dispersed parameters to make the distortion theory process. In each order, this matrix is reduced to a fixed 2x2 matrix total and 2x2 variable parameters; so we have a series of different line numbers. Perturbation theory can be applied if the matrix should have a modest process. The power chain is used to increase the minimum parameter relative to the variable vector of the circuit. We find the dividing number of the line in each order by measuring the power coefficients of each of the parameters. The Dyson series is used to solve the circuit vector and the coupling occurs faster when the amplitudes of small variations in the distributed parameters are considered. This thesis examines a number of real-world examples to test the usefulness of the analysis presented here. The three-dimensional structure of voltage pharos as your function of both the variable frequency and the distance from the end of the source is shown in the second article, which has $R0 = 1$, $L0 = 1$, $C0 = 1$, $G0 = 1$. As a result, with more than 20 frequencies, this type of transmission line is always selected. The voltage structure of pharos 'three-dimensional as your function of both frequency and distance from the end of the source by the constant values $R0 = 1$, $L0 = 0.01$, $C0 = 1$, $G0 = 1$ recognized in another event no.4. As a whole, the electric current in the normal range is shown here. 5 on various frequencies set (= 10, 25, 1, 50, 75 and 100) as a distance function from the end of the source. There is no change in the dynamic part of the dynamics of a single object in the original case. This type of transmission line should be used in high frequency

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programs. In summary, if the amplitudes of distributed parameters are maintained within reasonable limits, the interference method may provide a good measurement.

The following is the most comprehensive generalization made in this thesis. Variations in voltage and current up to time t do not linearly affect the parameters dispersed throughout the line. It is possible to construct models of these interdependencies via

(a) The inductance is a function of the previous current levels, as seen by the B-H hysteresis curve.

(b) In this case, the temperature changes in the resistances impact the resistance values because of osmic heating of the resistances. Because the osmic temperature increase is dependent on previous i2(t) values, it follows that the resistance is likewise functional or previous current values. It is necessary to create perturbation techniques in order to solve the transmission line equations, which then turn into a set of nonlinear integral differential equations.

(c) Randomly varying parameters on non-uniform transmission lines.

A small transmission line with the parameters stated above has been established in the Modeling file. On both the sending and receiving ends, there are three output graphs showing the voltage against time relationship as well as the current vs. time relationship. It clearly demonstrates that the output frequency graph linearizes as soon as the simulation begins. Stable and low-distortion output is evident from the transmission line's output.

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