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SIGNALS AND SYSTEMS WITH SCILAB (DISCRETE SIGNAL, CONTINUOUS)

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ABSTRACT

Presence of the signal can be seen depending on the phenomenon formed is influenced by the time range. In the arithmetic process, the signal can be amplified, weakened, added and multiplied by two signals. In learning digital signal engineering, microprocessors and microcontrollers on signal material and signal formation, it is necessary to have a display in the form of a simulation, this is because it makes it easier for Budi Darma University students to understand and analyze the basic concepts of signals and some discrete and continuous signal formation by using the Scilab application. The purpose of this study is to make it easier to provide an explanation for learning about signal concepts in the form of simulations. Research Stages The basic concept of signal, signal explanation, Program Code Input and Simulation with Program Applications.

1. Introduction

In the "signal and system book", there are several divisions of continuous signals which are divided into cosine, triangular and square wave signals. Then the discrete signal consists of Impulse, Step, Ramp, and exponential, [1]. The physical quantity that carries a message or information can be said to be a signal. The difference between a signal and a wave is related to the issue of information, signal carries information whereas the wave does not,[2]. A signal that has only one variable is called a one-dimensional signal, for example, a voice signal whose amplitude depends on one variable, namely time. Signals with two or more variables are called multidimensional signals, [3].

In learning digital techniques, microprocessors and microcontrollers, it can be seen that the number of material loads associated with the signal display is the final result of the success of the measurement where the data is used for analysis of calculations from the existing theoretical basis. Understanding of basic concepts and signal formation to students at Budi Darma University still uses manual analysis in theoretical calculations and formulations without any real form of simulation using software to support the continuity of the teaching and learning process. This makes students respond to confusion and saturation of students in participating in learning.

The misunderstanding about discrete and continuous signal forms is actually because students do not have the basics and it is rather difficult to distinguish in terms of the formation of these signals. For example, a discrete signal has discrete independent and dependent variables, in contrast to a continuous signal with a complex exponential sequence, [4].

Related research to support this research is Discrete signal processing simulation for learning mode using matlab, [4] , discrete time signal processing using compressive sensing based on L1 recovery algorithm, [5], Design and implementation of high speed arithmetic processor,[6], The use of scilab-cloud for teaching

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digital signal processing concepts in electrical engineering curricula,[2], Guitar Sound Signals Filtering Using Band Pass Filters, [7], Signal-to-noise ratio analysis on audio signals using convolution techniques, [8].

Then the basis for research is the use of Scilab simulations for signals and systems, Textbook companion for principles of linear systems and signals, [9], Signals and systems, [10], and digital signal processing, [10], Evolutionary divergence in acoustic signals: causes and consequences, [10], Specevh Analysis and Fature Extraction using, [11], Scilab Manual for Signals and Systems, [12], Scilab tutorial oriented toward the Practice of Discrete-Time Signal Processing, [13].

The purpose of this study refers to the problem of how to display signal simulations, discrete and continuous signals using Scilab software to provide understanding and independent learning for students at Budi Darma University.

2. Research Methods

Signals arise naturally through certain physical processes or are man-made. Signals also abound in biology, e.g., the signals produced by the brain or heart, the acoustic signals used by dolphins or whales to communicate with one another, or those generated by bats to enable them to navigate or catch prey, [7]. Man-made signals, on the other hand, occur in technological systems, as might be expected, like computers, telephone and radar systems, or the Internet, [14]. Man-made signals can be continuous or discrete-time and typically the type of the signal depends on whether the system that produced it is analog or digital, [1].

In the analysis of discrete signal processing systems, the series can be manipulated in several ways, The arithmetic process on the signal includes : Signal Gain (Entry Signal, Operational Amplifier, Signal Exit), Signal Attenuation (Entry Signal, ransmission Media, Signal Exit), Sum of two signals (The signal summation process often occurs in the event of signal transmission through the medium. The signal sent by the transmitter after passing through a certain medium), [15].

Signals based on the variables can be 1-dimensional (1D), 2-dimensional (3D) signals or even n dimensions. Especially for a 1-dimensional signal with an independent variable called time, two types are known Signals are continuous and discrete signals. A continuous signal is a signal that exists at any time the value or with continuous timing (always exists) and is written in the form x(t) which means the variable x is a function of continuous-time, [9].

While discrete signals are signals that do not exist at all times. the value exists only at times of sampling time which is written as x[kT] or x[nT] or x[n]. Variable k or n is an integer value while variable T is sampling time which is sometimes rarely written down. In the figure below, a continuous and discrete signal is shown, [1].

The research was carried out in a computer laboratory on lecture material The research was carried out in a computer laboratory on lecture material on digital signal engineering, Microprocessors, Microcontrollers. in the 2021-2022 school year. This research was conducted on learning Scilab applications for signal simulation, and discrete and continuous signals. Provides an understanding of the basics of signaling, the application of signals to computers, and everyday life.

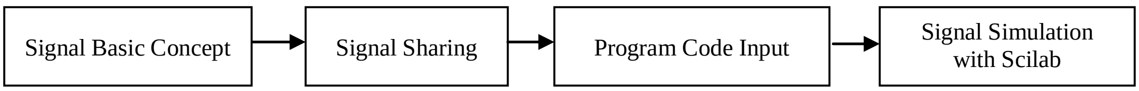

Figure 1. Research Block Diagram

To answer the problem of how to explain to students about signal simulation in learning in the teaching process and make students independent in using the Scilab application.

3. Result and Discussion

Learning basic concepts and signal formation to be applied in the form of simulations using the Scilab application. Determination of Variables from the formulation and input of program code. The concept of a signal can be seen from the notion of a measurable electrical quantity that changes in time and space. provide information related to physical phenomena,[6].

One way of classifying signals is to define their values on the independent variable t (time). If the signal has a value over the entire time t then defined as a continuous-time signal (CT) signal. On the other hand, if the signal only has a value at certain times (discrete), then it can be defined as a discrete-time (DT) signal,[10].

To display the program, the basic concept of comparing the signal system to time, input program code and simulation on Scilab :

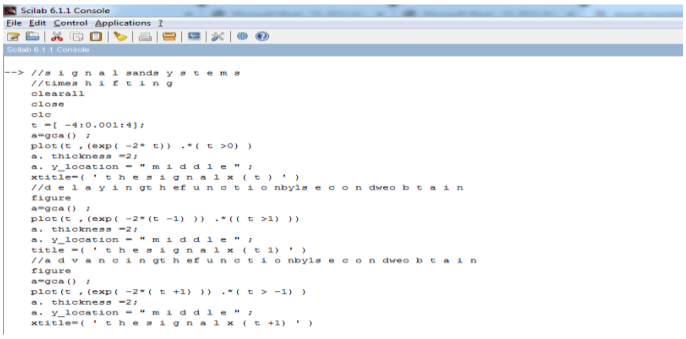

Figure 2. Input Program Code Basic Concepts Signal

Then the display of the code input results, we can see the comparison of the equation, [3] :

t =[-4:0.001:4];
(t ,(exp(-2* t)) .*(t >0)),
(t ,(exp(-2*(t -1))) .*((t >1)));
(t ,(exp(-2*(t +1))) .*(t > -1)) and (' t h e s i g n a l x (t +1) ')

The following is the display of the input equation above:

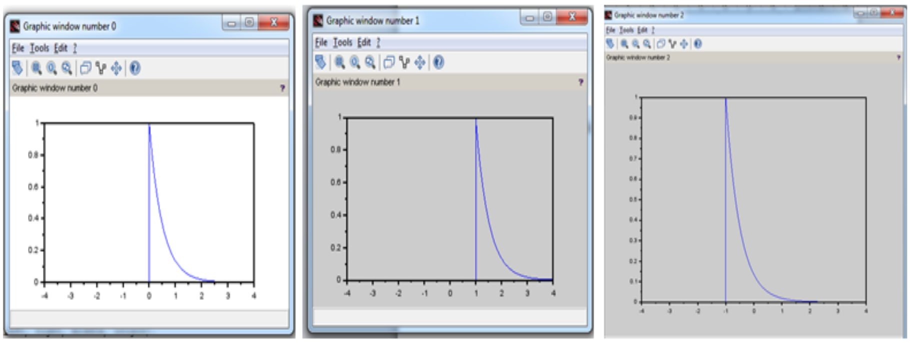

Figure 3. Display of Signal Equation Input against Time

For the next equation, [5]:
t =[0:0.1:5];
(t ,t .*((t >=0) &(t <=2)) - 2*(t -3) .*((t >2) &(t <=3)))

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("x (t)=x1 (t)+x2 (t)= tu (t)-3(t-2)u (t 2)+2(t-3)u (t-3) ");
Enter the Program Code :

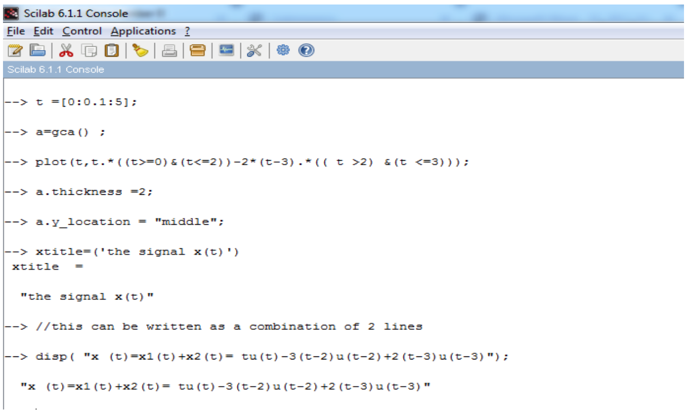

Figure 4. Input Signal Equation Program Code

The display of the equation input code above :

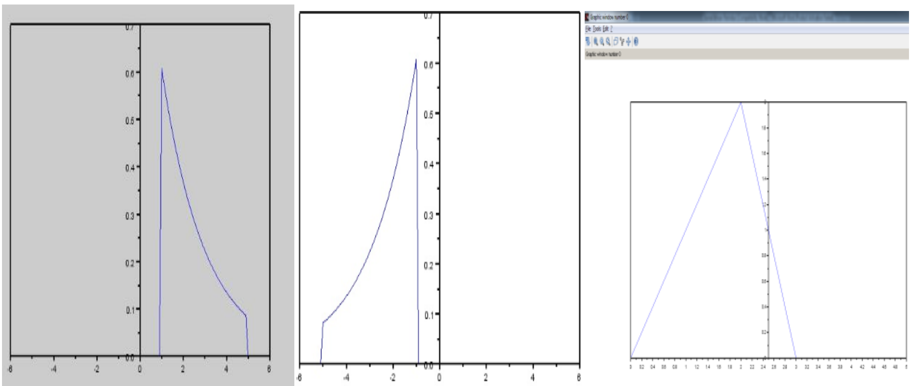

Figure 5. The Display of The Equation Input Code Above

3.1 Discrete Signals

Comparison of values in the period according to the side period used, where the value of u[k] has a different function of time, [4].

Can be seen with the input equation :
Wo = %pi /4;
a = (0.33) ^n;
x1 = %e ^(sqrt(-1) * Wo *n);
X1 = symsum (a* x1 *(z ^(- n)) ,n ,0 , %inf)
x2 = %e ^(-sqrt(-1) * Wo *n)
X2 = symsum (a* x2 *(z ^(- n)) ,n ,0 , %inf)
X =(1/(2*sqrt(-1))) *(X1 + X2).

Input Program code and Display Results:

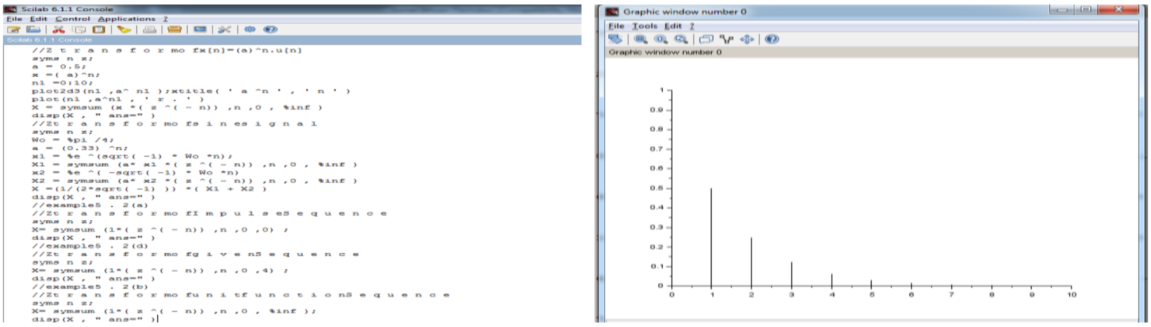

Figure 6. Program Input and Discrete Signal Display Results

3.2 Continuous Signal

Equation of program input and Display

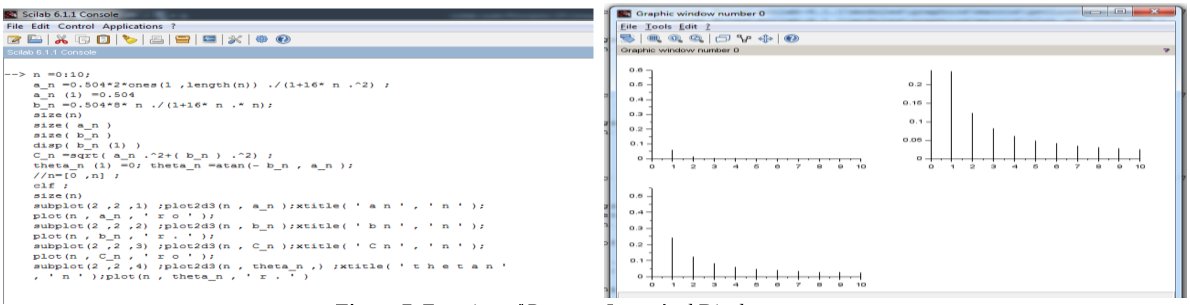

Figure 7. Equation of Program Input And Display

4. Conclusion

From the results of the input and program display that is displayed, it can make it easier for Budi Darma students to learn the basic concepts of signaling and signal formation. The analysis of the equation display is very easy to understand and can be applied as needed. The input variable is adjusted according to the time range in the formation of the signal, discrete and continuous signals. If the signal has a value over the entire time t then defined as a continuous-time signal (CT) signal.

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