

SOFTWARE DESIGN SPECIFICATION





{ GROUP MEMBER }

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——Signals & System 🗡

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I. Introduction

A. Purpose

This book is written for the users of our system. It will describe the system in details and help every user to understand the function of this software application.

B. Background

After learning the course of Signal and System, we learn some typical signals and their properties, such as the convolution, Fourier transform, sample operation, Laplace transform and so on.

In this way, we develop this system as a tool to show the waveform of the signals, so that we can achieve a visualized understanding of the signals.

C. Definition

SJTU: Shanghai Jiao Tong University Raspberry Pi: Our Develop Team Software Design Specification: to guide users how to use our system and understand the function of this software. Usage: the function and purpose of this system Run-time environment: The basic running condition for our software

D. Divition

- ✤ 李健达:UI, AM modulator
- ◆ 钱堃: Convolution and Fourier for DT signal
- ◆ 武治宸: DT signal processing for CT signal
- ✤ 韩建华: Signal waveforms of typical signals
- ◆ 王玫: Laplace transform and LCCDE solution
- ✤ 刘柏辰: Software document, Test

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II. Usage

A. Functions

- a) Display some typical signals with some basic transformation allowed.
- b) Make the convolution sum of the given discrete signals.
- c) Calculate the Fourier Transform for discrete signals.
- d) Give the sample operation for the kind of signals.
- e) Laplace transform and ROC can also be solved and showed.

B. Performance

1. Portability

Our software system is a convenient one. Actually, it can be used on any laptop as long as you have installed the MATLAB with version over 8.

2. Time-Concerned Character

The software system architecture decides its performance. We build this system on a well-designed architecture, we use MATLAB GUI design interface and developed functions on MATLAB 8.3.

3. Diversity

Our system provides all kinds of signals and transformations we have learned on the course of signals and system, including convolution, FT, Sample and LT. Each of them has different input responses as well as other attributes.

4. Practicability

Our software system is very useful for college students in the learning section, since we can see the virtual waveforms directly, so that it makes us a better understanding and memory of it.

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III. Run-time Environment

A. Hardware

The minimize hardware configuration for running this system is as below:

- a. Computer or laptop
- b. Memory: 512M or above (1G recommended)
- c. Hard Disk: 2G or above (4G recommended)

B. Supporting Software

In order to run it, the following software and their versions are required:

- a. Windows 7/8 or IOS
- b. MATLAB version 8 or above
- c. PCs should have JAVA environments

C. Data Content

Our system is all in the range of class content.

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IV. During Using

A. Interface

We offer users an easy-operated interface. You can know how to use the software easily. Following is the interface of our system:



On the top of the software are the basic functions. You can click the button to show the waveform of the signals on the left. If you want to see the waveform of typical signals, you can input the signals and the range of the signals in the boxes below.



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B. Functions on Signals

a) Typical:

1. unit impulse function:







2. unit step function:







3. complex exponential function:



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4. window function



5. sample function:



b) convolution

eg: Rectangle * Rectangle: **BİBĂ #ELYAR #EQUE ZHEX HENK HENK HENK #ELYAR #EXVE ZHEX HENK HENK HENK #ELYAR #EXVE ZHEX HENK HENK HENK HEXH H**

-Signals & System

c) Fourier

periodic CT rectangle FS:







Discrete Fourier of Sa and exponential function:



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d) Sample

eg: Sa[an]:

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e) Laplace

f) overlook:

C. Scale Management

Our system will auto set the proper scale to suit for itself`s result, this makes the virtual graph more feasible.

D. Operations Declaration

a) Input:

We make several approaches to provide friendly user experience when users intend to input functions. Our software are capable of telling mistakes in input expressions and support getting input function with a combination of existing functions users choose. What's more, users can choose to type in the functions directly in the input box.

b) Output:

Once the result is worked out, users are shown graphs from different views such as 2-dimensional graph. What's more, if there exists impulse terms in the result, our software can also plot the diagram and offer users a deep comprehension of it.

c) Graphs:

We display a graph from different views, such as the real and imaginary part of the signal, the modulation. You can get a full understanding of the signal.

d) Graphs:

Our oscilloscope will raise exception warnings when your input is illegal. You need to check your input when the oscilloscope warns.

If you have any other questions, please contact us.