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Simulation Lab

"AM Modulation and Demodulation"

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Abstract

In this experiment LabView software was used to build Amplitude Modulation and demodulation systems. The software is known as one of the best softwares used to build a user interface, or front panel, with controls and indicators due to its wide range tools that simplify the process such as tools used for acquiring, analyzing, displaying, and storing data, as well as tools to help troubleshoot the code we write .

Contents

List of Figures

Chapter 1

Introduction

Amplitude Modulation (AM) is an analog modulation scheme where the amplitude (A) of a fixed-frequency carrier signal is continuously modified to represent data in a message. The carrier signal is generally a high frequency sine wave used to "carry" the information on the envelope of the message. The result is a double-sideband signal, centered on the carrier frequency, with twice the bandwidth of the original signal. The aim of this experiment is to get familiar wit the LabView software to do the procedure of the modulation and demodulation.

Fig. 1.1: LabView Logo

The main advantage of using AM modulation is that it has a very simple circuit implementation (especially for reception), creating widespread adoption quickly. AM modulation however wastes power and bandwidth in a signal. The carrier requires the majority of the signal power, but actually does not hold any information. AM uses twice the required bandwidth by transmitting redundant information in both the upper and lower sidebands.

Chapter 2

Procedure and Results

This chapter describes how to build a VI which implements the modulation and demodulation systems for different modulation indexes.

2.1 AM Modulation and Demodulation

The block diagram of the system consists of a while loop which contains various controls and graphs to display and control the AM signal component information. The basic modulation and demodulation approach was used with full rectification and low pass filter followed by a DC removal. Using the absolute value, Filter, and AC-DC estimator VI functions, as shown in the diagram below after placing all the required compnents.

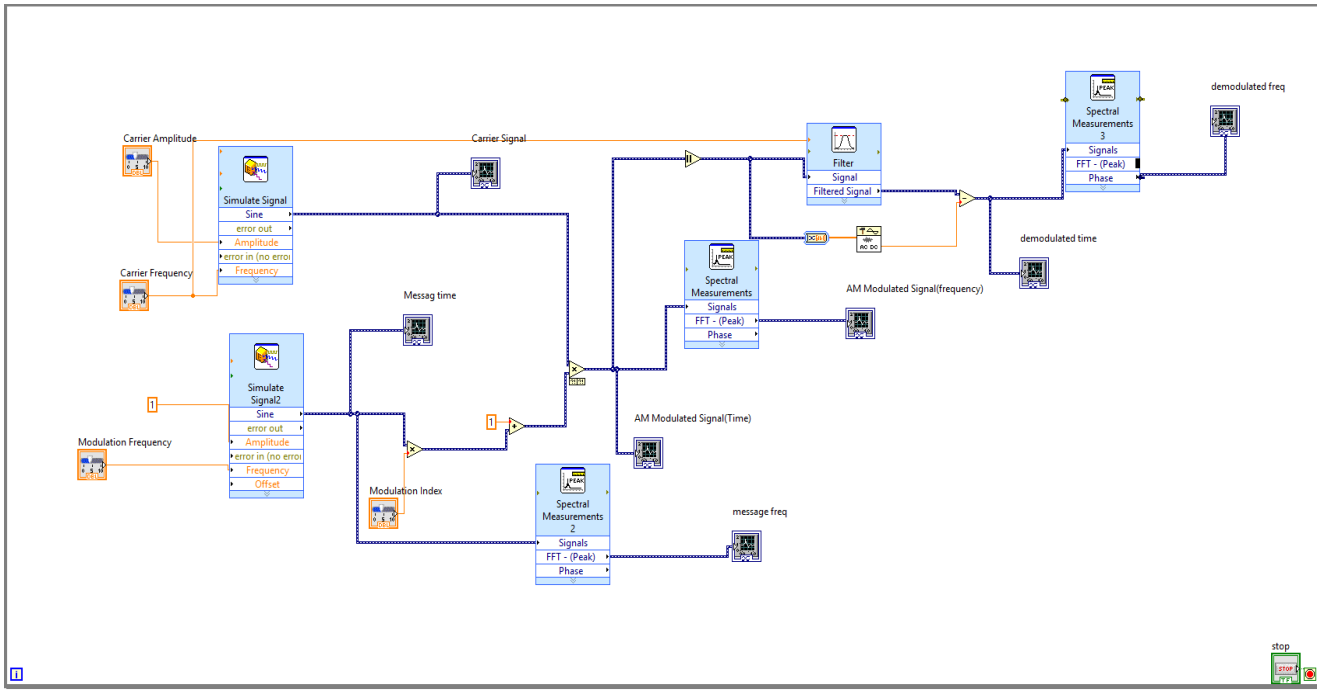


Fig. 2.1: Modulation and Demodulation Block Diagram

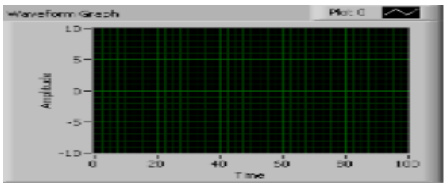
The required components that were used to design the system are as follows :

- *Simulate Sig" VI from Functions>Express>Input. To insert* sinusoidal signal with required frequency and amplitude

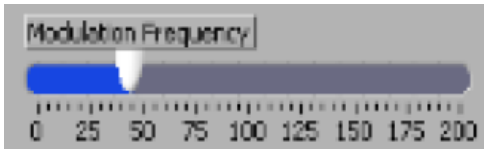
- Add block in order to do the summations

- Multiply block in order to do the multiplication

- Waveform Graph block in order to view the output



- Horizontal Pointer Slide in order to change the input.



After running the system, the following result were obtained for For Fc = 500Hz , Fm =200Hz for different modulation index.

Modulation Index is basically the ratio by which the modulated signal varies from the unmodulated signal and is given as a percentage. The ideal index would be 100% which ensure a high Signal to Noise Ratio in AM. a value higher than this would cause distortion and a special circuit required at the receiver

- At Modulation Index = 1

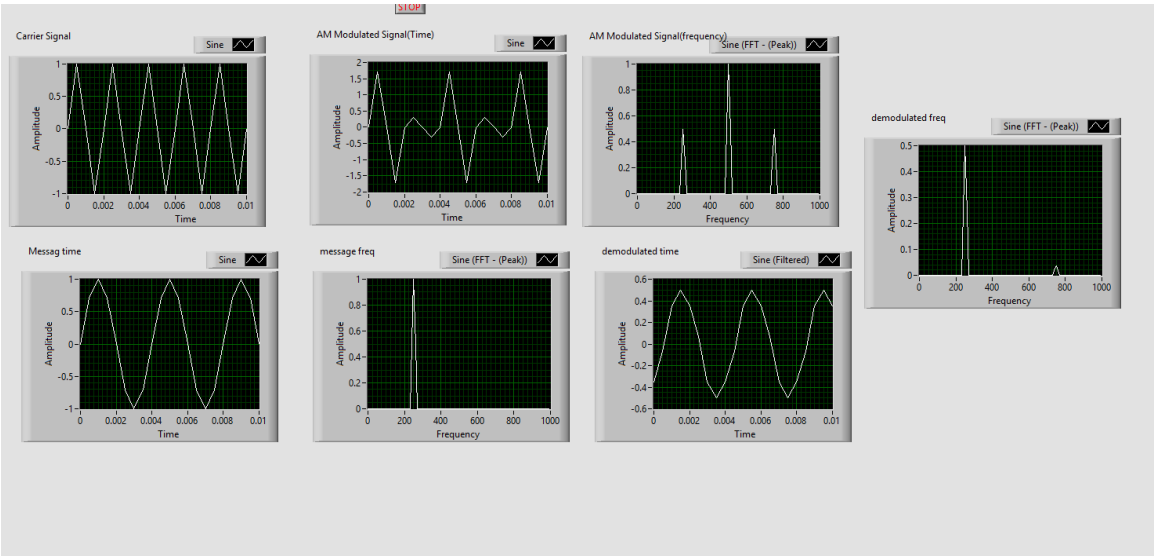


Fig. 2.2: Modulation and Demodulation for K=1

- At Modulation Index = 0.5

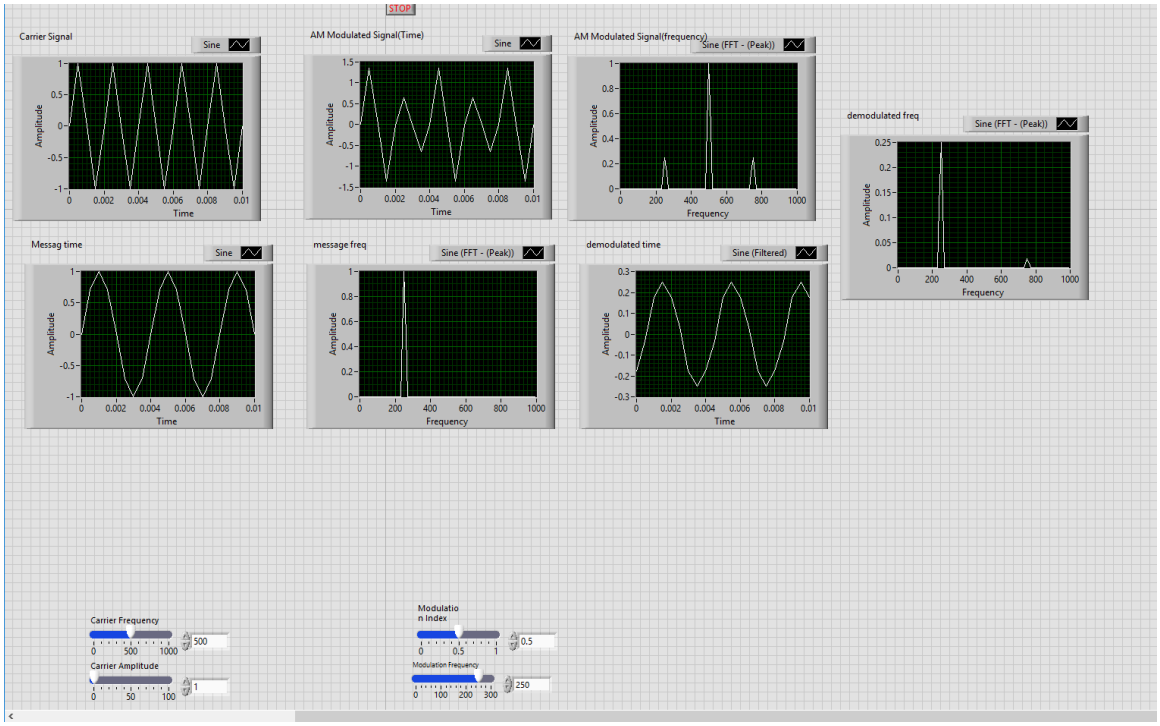


Fig. 2.3: Modulation and Demodulation for K=0.5

2.2 Calculator Exercise

LabVIEW was used to build VI file that functions as a calculator as in the following figures :

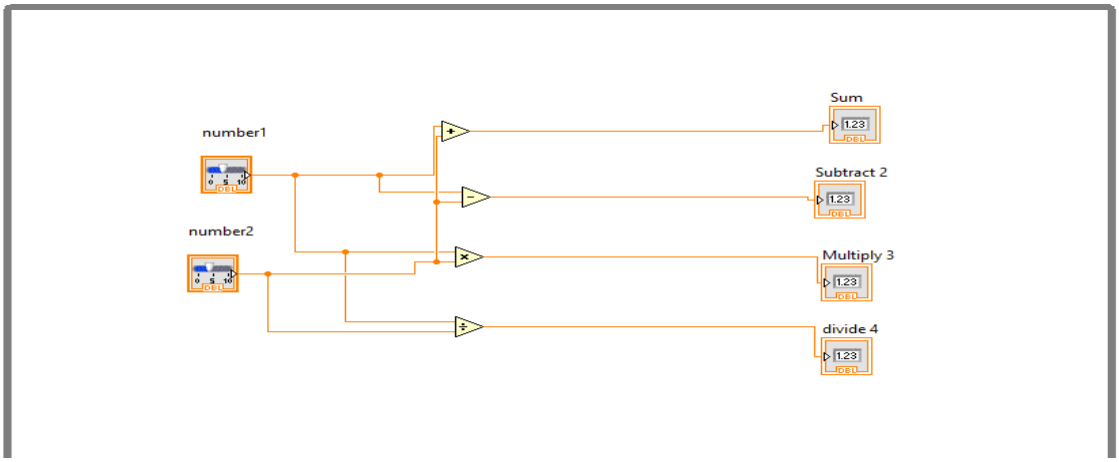


Fig. 2.4: Calculator System

the results for two arbitrary numbers :

Fig. 2.5: Calculator Results

Conclusion

A AM Modulation and Demodulation and a calculator system were simulated in this experiment using LabView Software, the main purpose of this experiment was to get familiar with the software and to see its ability to test the effect of parameter changing on the modulation and demodulation process.

Refernces

[1] http://csivc.csi.cuny.edu/engsci

[2] Lab Manual