Signals and Systems

Lab 12

# Topic: Implementation and Analysis of Amplitude Modulation Transmitter and Receiver System

**Objectives:**

* Understand the operations carried out in the Amplitude modulation and understand their applications
* Apply the concepts on real world signals and systems

**Amplitude Modulation (AM)** is one of the methods of long distance radio transmission. Although this is not frequently used now a days due to certain disadvantages but it is still an excellent example for us understand the concepts that we have seen in class until now.

The implementation of the AM transmitter and receiver system is fairly simple as seen in the diagram shown below:

Message Signal

Output Signal

Multiplier

Multiplier

Carrier Signal

Carrier Signal

Transmitter

Receiver

*Figure 1: The block diagram of the AM Transmitter-Receiver.*

In this lab we will try to take peak into this fabulous system and perhaps try to understand its working by using the fundamental concepts we have covered in class.

Our task for today’s lab is quite simple and straight forward.

**Task 1:**

**Hints:** Please for your own understanding think as if we are using a single pure tone as the message signal. Also try to implement the whole system as a single m file.

**(a)**: Generate a signal defined by the following equation,

, and let it be your message signal. Plot and analyze both the time domain and frequency domain plots.

**(b):** Generate a cosine of 1000Hz and call it you carrier signal. Plot and analyze both the time domain and the frequency domain plots.

**(c):**  Now generate the signal that we will receive at the end of the transmitter system. Plot and analyze both the time and the frequency plots. This signal is the Amplitude modulated signal, carefully examine these plots. Try identifying the how the amplitude of the amplitude modulated signal varies with time.

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**(d):** Assuming we have a noise less channel we receive the signal generated in the previous part as the input to the receiver circuit. Generate the output signal by implementing the system given in the block diagram. Plot and analyze the output signal. A detailed answer is required focusing on what has actually happened here.

**(e):** If you would have noticed that the output signal in the previous part was supposed to be the message signal, but it is quite different. Can you identify what operation (in terms of filtering) we need to perform to retrieve our original message signal? Explain how you arrived at your answer.