

# Application of the Guided Method to study the Characteristics of the Frequency Modulation Circuits

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**Abstract:** This paper provides to implementation many of the experiences that uses in the communication library by using (Multisim.version 11) program. The electronic component circuit connection easily although the complexity in electronic component also useful from simulation in program to absolved the results in exact and speedy time instructional program was designed and simulated according system so that students have a knowledge base in the field of evaluation of the modulation .The instructional program takes of individualized difference because it does not require the learner to go along the sequence of units .He can by bass many of these units according to this needs speed and ability to learn.

**Keywords:** communication, frequency, information, instruction, modulation.

## I. INTRODUCTION

Communication means the transmission of information from one place to another by including the information signal modulation where the low-frequency information (information) is loaded on a carrier signal and there are different types including amplitude modulation and bandwidth Frequency modulation, pulse modulation and the modulation of any communication system are of great importance, by which the amount of power transmitted and the amount of power consumed in the built-in wavelengths are known, and it is important to know how much distortion is made and how it affects the amount and importance of information [2] .

## II. AMPLITUDE MODULATION

The spatial inclusion is meant to change the amplitude of the carrier signal with the frequency of the information signal remaining unchanged and where the information signal is in the high frequency of the carrier signal [3],

$$VAM = VC \sin WCT + mVC / 2 [COS (WC - Wa) t + mVC / (2 [COS (WC + Wa)t] \dots (1)$$

Where VAM represents the amplitude of the embedded signal

VC signal amplitude

Vm represents the breadth of information signal

To calculate the inclusion coefficient, the equation is applied

$$m = \frac{VMAX - VMIN}{VMAX + VMIN} = \frac{Vm}{VC} \dots \dots \dots (2)$$

A represents the maximum value in the amplitude of the embedded signal

(B) The smallest value in the amplitude of the embedded signal

The value of the modulus of modulation is between 0 and 1, where the best coefficient of inclusion is at the value of (1). Figure (1) illustrates the Amplitude modulation [4].

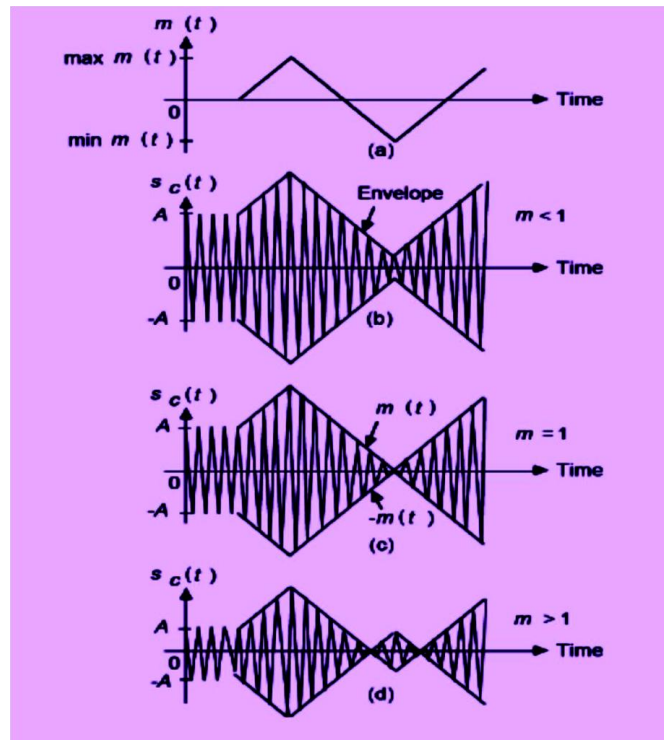


Figure (1). Shows the Amplitude modulation

## III. FREQUENCY MODULATION

Frequency modulation is the process of changing the frequency of the carrier according to the information signal and the inward wave can be expressed in a frequency [5]

$$gfm(t) = A \cos[wct + kfwat \dots \dots \dots (3) .$$

Where kf is the index modulation

gfm (t) The included signal is frequency

Wc represents the angular velocity of the carrier signal [6]

The signal of information contained in the frequency modulation can also be detected by the use of the built-in signal reverberation circuit as shown in figure (2).

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The function of the built-in signal reducer is to convert or change the offset (or change) in frequency to a scalable frequency wave similar to the one that caused this offset (the signal of information). This transformation must be done efficiently and in writing, and the detection circuits must be sensitive to capacitive changes [7]. In general, this type of circuit converts the fixed-frequency inline wave to a wave containing capacitive and refractive inclusion that extends to the detection circuit to detect capacitive changes and ignore frequency changes [8].

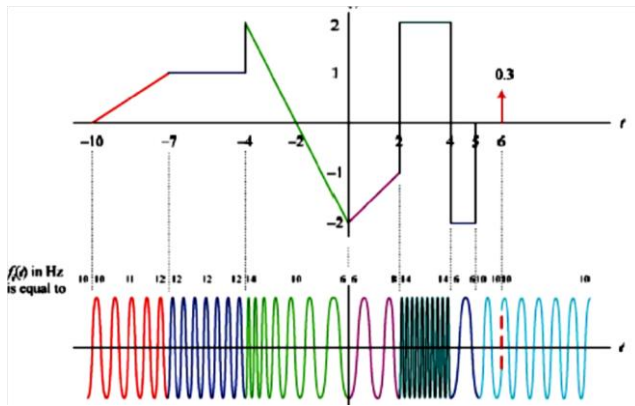


Figure (2) Shows the frequency changes[9]

#### IV. STATISTICAL METHODS

The weighted arithmetic mean was adopted as a statistical method for the purpose of recognizing the importance of each paragraph of the expert opinions and the beneficiary category. The weighted arithmetic mean can be calculated from the following law

$$\text{Mean} = \frac{T*5+2T*4+3T*3+4T*2+5T*1}{N} \dots\dots\dots(4)$$

Where T = the frequency of the answer in the paragraphs of the questionnaire  
 N = number of paragraphs of resolution [10].

#### V. INSTRUCTIONAL PROGRAMS

Is a set of instructions and steps implemented by the calculator for the purpose of providing a unit supported by multimedia and learning can be directly dealing with the scientific material and has many advantages and is the interaction and the possibility of learning and control of education by the learner in the selection of educational units that want to learn as well as the transfer of learning axis To the learner and be on several types of them [11]

- 1- Educational programs directed
- 2-Non-directed educational programs

#### VI. LEARNING BY SIMULATION

In this process represent a set of positions and steps that mimic a realistic process by simulating that model because of the low cost or application of the practical side to obtain the results compared with the theoretical side and allow the simulation of the student to make mistakes and a few losses of the components and allow the student to apply in a real environment [ 12].

### VII. RESEARCH PROCEDURES

In this research, several laboratory experiments were performed using the representation of the practical circuits through the application of the Mutisum. Version program (11). Electronic elements were represented by the circuit shown in Fig(3).

Where the simulation of the program was carried out by changing the voltage values of the wave generator to obtain a modulation coefficient equal to 0.5 and adjusting the signal frequency information to 1 kHz and the frequency of the 465 KHZ carrier signal and to apply Equation (2) and to continue the voltage variations of the wave generator to obtain a coefficient equal to one for detection For the signal information, the wave generator value is set at 1KHZ and the modulation factor parameter was equal to (1)

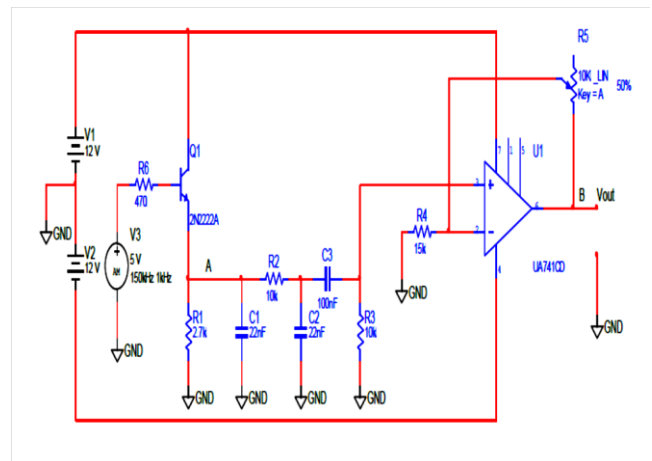


Figure (3) Demonstrates the generation of Amplitude Modulation

In order to obtain the built-in frequency wave, the circuit shown in Figure (4) is designed. The modulation index is calculated in the frequency modulation of the relationship shown

$$k_f = \Delta F / F \dots\dots\dots(4)$$

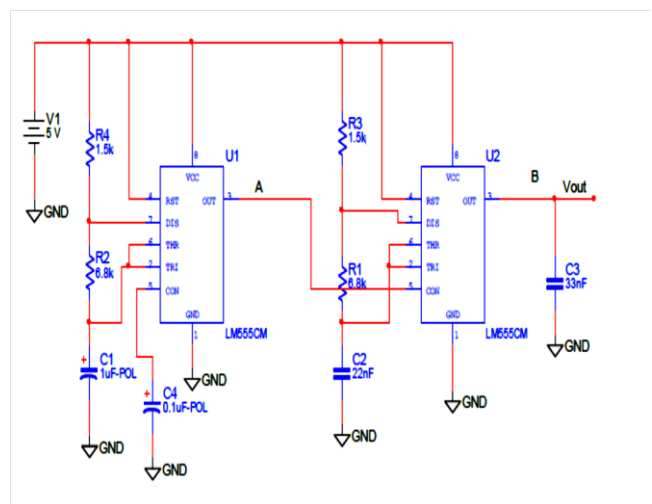


Figure (4) Demonstrates the generation of Frequency Modulation



The program included an analysis stage where the educational goals of the system were then determined and the learner's characteristics were analyzed by conducting tribal tests for students to know the abilities and level of prior knowledge. The material for each student and the selection and identification of educational positions through the use of individualized learning in the presentation and evaluation of scientific materials intended to learn learning through the educational system, determination of the elements of design through staining And the construction of computer programs consisting of three modules and each unit in turn consists of a series of modules. Implementation Stage This stage included the organization of educational activities according to a particular sequence to ensure the achievement of learning through the gradient from simple to complex and gradient known to the new material , Evaluation Stage This stage is one of the basic stages in the educational design as it adjusts the design prepared and correct its tracks, steps and elements, and the aspects that need to be improved as an increase in the amount of information provided by supervisors and a number of trained specialists. For the experts and learners to identify the views on the educational program was also in based on statistical methods calculating the standard deviation and the mean of the calculation of the questionnaire paragraphs, and Figure (5) shows the main steps of the educational program . we can be concluded that this study can help for creating a society of learning, improve the adoption potential and a wide sharing of knowledge.

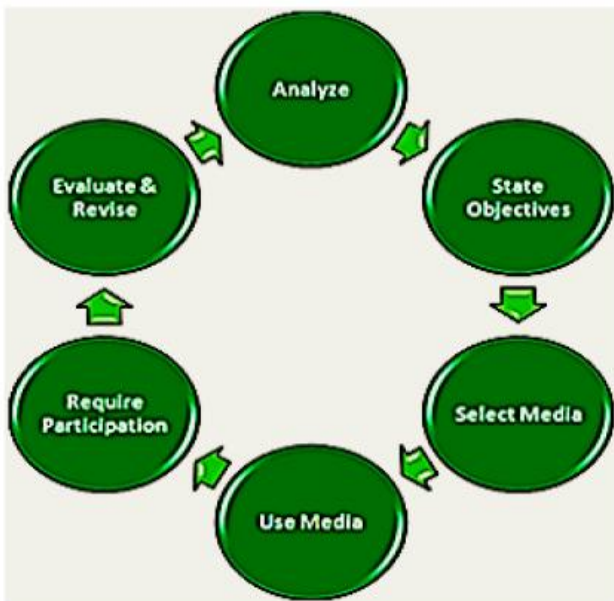
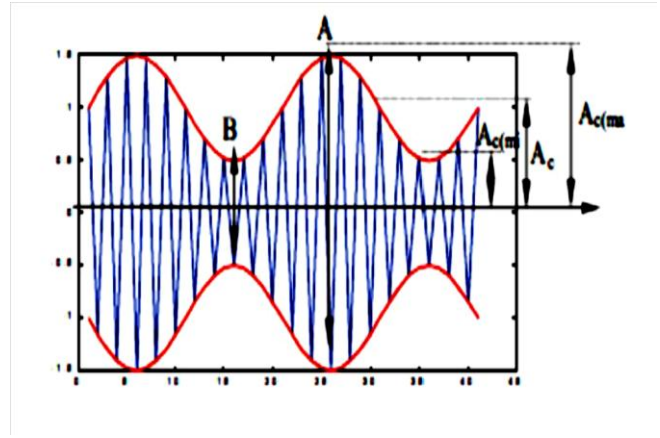


Figure (5) illustrates the stages of the instruction program

### VIII. RESULTS AND DISCUSSION

1) (The Lum simulates program was activated and the bode plotter was connected to the input and output of the circuit to observe the practical results and to draw the outside signal when  $m = 0.5$ ,  $m = 1$  and as shown in Fig. 6



The signal of 1kHz information was obtained after the detection circuit of the audible frequencies was used as shown in Fig ( 7).

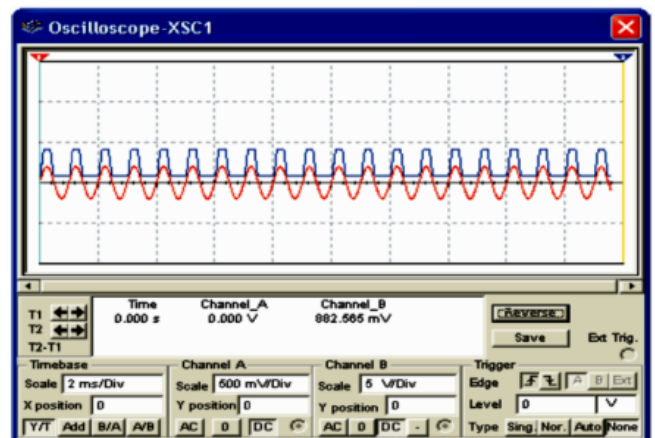


Figure (7) shows the information signal

Table (1) shows the most important results obtained from the application of the frequency modulation process

Table (1). Demonstrates the results in FM modulation

$(V_{in})$	2	4	6	8	10	12
<b>KHZ (frequency)</b>	10	10	10	10	10	10
$(\Delta F)$	20	40	80	100	120	140
$(\beta)$	2	4	8	10	12	14
$V_O$ (volt )	2	4	6	8	10	12

The effectiveness of the educational program was measured by achieving the objectives of understanding the material indicated by the target group, namely, students of the second stage of the electronics department where the program showed the clarity of the material presented in the educational units and the ease of using the program. Figure (8) shows some of the programming interfaces .

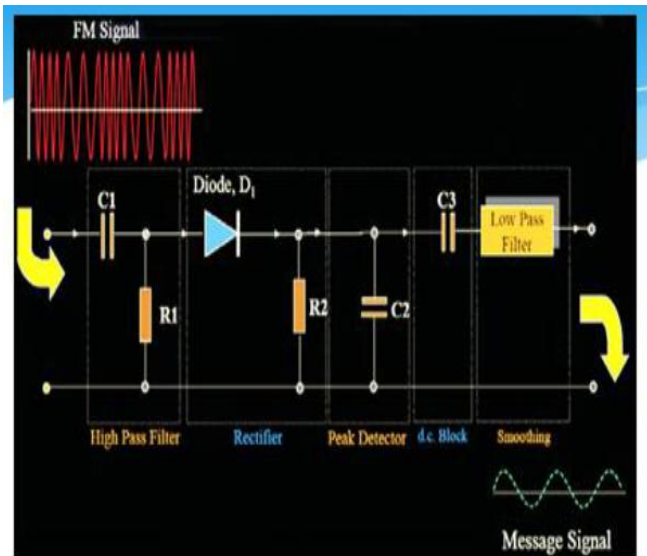


Figure (8) shows the sample of the instruction program

By analyzing the responses of the sample members and presenting the questionnaire form to a group of experts, the weighted mean and the standard deviation were calculated. Based on these results, each of the paragraphs was analyzed as follows,

- ❖ 1-The introduction of the computer program or system contributed to the definition of the students at the scientific level of the material to a large degree. This is indicated by the estimate given in this paragraph (4.9). The amount of dispersion of this paragraph (0.5)
- ❖ 2- taking into account individual differences in the design of the educational program by controlling the target group itself to move from one screen to another.

- ❖ 3-The quantity and size of the information provided in the program modules for any technique of image-processing techniques.
- ❖ 4-Include program information from simple to remarkably complex.
- ❖ 5 -The introduction of some tests in the form of short questions helped to determine the requirements of student learning significantly
- ❖ 6- The use of colors in clarifying the scientific concepts presented.
- ❖ 7 -Each module represents the basis for learning the subsequent unit and rely heavily on the previous units.

The results of the students' questionnaire were analyzed as follows

- ❖ 1-Instructions for the use of modular system modules are clear to students.
- ❖ 2- notes provided to students during the units of the system helped to reduce the effort made by them.
- ❖ 3 -Determine the general and specific objectives of each unit share
- ❖ Significantly in the turnout to learn the unit.
- ❖ 4-The distribution of shapes in the system in a symmetrical manner contributed greatly to the interpretation of the scientific material presented.
- ❖ 5 -Contribute to the immediate reinforcement of the answer in increasing the student's desire to follow up the program.
- ❖ 6 -The clarity of the formulation of the test questions, where both supervisor and student helped to follow the program.
- ❖ 7 -The student's study of the system was, according to his level and abilities and his speed in learning.

Table (2) shows the value of the weighted arithmetic mean of the questionnaire

No.	Paragraphs	Mean
1	Introduction The computer program or system is characterized by the definition of students at the scientific level	4.9
2	Take into consideration individual differences in the design of the educational program	4.7
3	The quantity and size of the information provided in the program modules	4.8
4	Distribution of shapes in the system in a symmetrical manner	4.8
5	The introduction of some tests in the form of short questions helped identify learning requirements	4.9
6	The use of color luminaries in clarifying scientific concepts	4.8
7	Each module represents the basis for subsequent module learning and is based on previous modules	4.9

Table (3). The value of the mean of the questionnaire form shows the students' opinions

No.	Paragraphs	Mean
1	Instructions for using standard system modules are obvious	4.9
2	Take into consideration individual differences in the design of the educational program	4.7
3	Determining the general and specific objectives of each unit shares significantly in the turnout to learn the unit.	4.8
4	The distribution of shapes in the system in a symmetrical manner contributed greatly to the interpretation of the scientific material presented	4.6
5	Contribute to the immediate reinforcement of the answer in increasing the student's desire to follow the program	4.6

6	Clear wording of test questions	4.9
7	The student's study of the system was according to its level, ability and speed in learning	4.9

## IX. CONCLUSIONS

Results showed the importance of applying the program in the implementation of the practical experiments of the communication laboratory Mutisum.version 11. Where the calculator was developed to carry out the experiments accurately and reach the students to the results in the event that the implementation of the experiments in practice, which helps all students and users of the program the possibility of self-learning. The design of the tutorial and the modules help students to know the results of their responses by means of the typical answer to the test paragraphs. The program also considers the individual differences where the learner's progress is not according to the serial order of the units, but he can The units of these units exceeded the units according to their needs. Therefore, this program can be included in the laboratory material for the second stages in the technical institutes for the purpose of benefiting from the program through its application to other subjects such as electronic circuits, electronic devices).

## REFERENCES

1. Lathi, B., "Modern Digital & Analog Communication Systems", 3rd Ed., 1998.
2. Roy Blake, "Electronic Communication Systems", 2nd Ed, 2014.
3. Martins, R., "Analog and digital communication system ", 2nd Ed, 2002.
4. Leow, "Digital and Analog communication Systems", 5th ED., 2013.
5. Bayez, K , "The Basics of Communication", Dar Al-Hikma, University of Technology, 2000.
6. Noor Ali Hussain Al-Sudani "Audio Denoising Using Wavelet Transform", M.Sc. Thesis , Computer Department , College of Science , Al-Nahrain University , 2011.
7. Simon Hykin, "Communication Systems", 4th ED., 2009.
8. Dr. Saad Abdel-Wahab Al-Shaabab, "Effective in the treatment of analogue and digital signal", Scientific Affairs Committee, University of Technology, 1999.
9. Dr. Basem Nazhat al-Samarrai and D. Muthanna Jabr, "Principles of Engineering Statistics", Dar al-Hikma, University of Technology, 2001.
10. Mabarz, Manal Abdel-Aal, Ismail, Sameh Said, "Self-Learning and Distinction", Amman, Dar Al-Fikr, 2010.
11. Salama, Abdel Hafez and Abu Raya, Muhammad. "Computer in Education". Al Ahlia Publishing, Jordan, 2002, [11].
12. Pansak, T, "The Innovation Adoption Perspective in M-learning for Engineering Education", Journal of Engineering and Applied Sciences, Volume 7, Issue 1, 2012, Page No. 23-30.