



Instituto Politécnico Nacional
ESCOM “Escuela Superior de Cómputo”
INGENIERÍA EN SISTEMAS COMPUTACIONALES

Análisis Fundamental de Circuitos

Práctica : AMPLIFICADORES OPERACIONALES

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Objective

Check the analog circuits, know the amplifier Inverter. As the amplifier does not Inverter. Voltage Follower, Summer Amplifier, Subtracting Amplifier, Integrating Amplifier, Derivative Amplifier and that the student interprets the results obtained for the circuits presented in practice, as well as the visualization of each of the channels as the input channel as the of output, and observing the changes that each one of the configurations that are presented to us have for the knowledge of the operation of the amplifiers.

Material

- Breadboard
- 3 Coaxial cables BNC
- 4 Points CAIMAN – CAIMAN. 3 Points BANANA – CAIMAN.
- 2 LM741 (Operational Amplificator)
- 6 Resistors $1\text{K}\Omega$ $\frac{1}{4}$ W.
- 3 Resistors $10\text{K}\Omega$ $\frac{1}{4}$ W
- 5 Resistors $100\text{K}\Omega$ $\frac{1}{4}$ W.
- 1 Resistor $560\text{K}\Omega$ $\frac{1}{4}$ W
- 1 Resistor 560Ω $\frac{1}{4}$ W.
- 2 Resistor $15\text{K}\Omega$ $\frac{1}{4}$ W
- 1 Resistor $150\text{K}\Omega$ $\frac{1}{4}$ W
- 2 Resistor $2.2\text{K}\Omega$ $\frac{1}{4}$ W
- 1 Resistor $3.3\text{K}\Omega$ $\frac{1}{4}$ W
- 1 Resistors $2.2\text{K}\Omega$ $\frac{1}{4}$ W
- 1 Resistor $220\text{K}\Omega$ $\frac{1}{4}$ W
- 1 Resistor $4.7\text{M}\Omega$ $\frac{1}{4}$ W
- 1 Resistor $15\text{K}\Omega$ $\frac{1}{4}$ W
- 1 Resistor $82\text{K}\Omega$ $\frac{1}{4}$ W
- 1 Capacitor $0.01\text{ }\mu\text{F}$
- 1 Capacitor $0.0022\text{ }\mu\text{F}$
- 1 Capacitor 100 pF

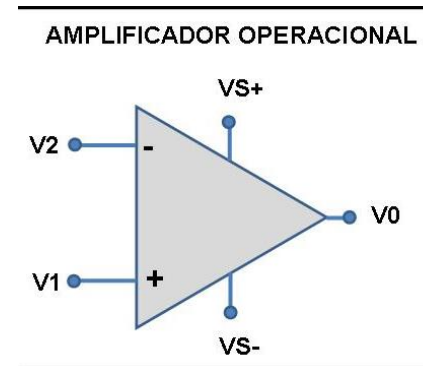
Equipment

- 1 Variable voltage source
- 1 Multimeter.
- 1 Functions generator 10Hz - 1MHz .
- 1 Oscilloscope.

Theoric introduction

What is an operational amplifier?

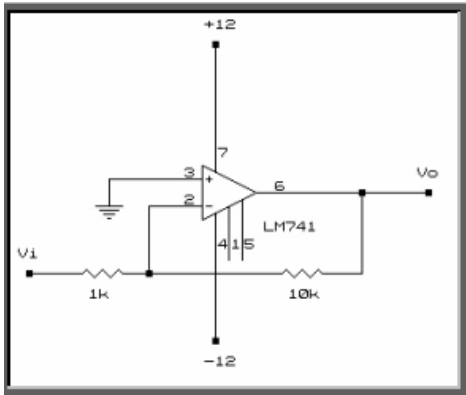
They are electronic devices capable of performing a large number of functions within an electronic circuit, depending on how it is placed inside it.



Terminal	Descripción
- input	Entrada Inversora
+ input	Entrada no inversora
Output	Salida
$+V_{ss}$	Alimentación Positiva
$-V_{ss}$	Alimentación Negativa

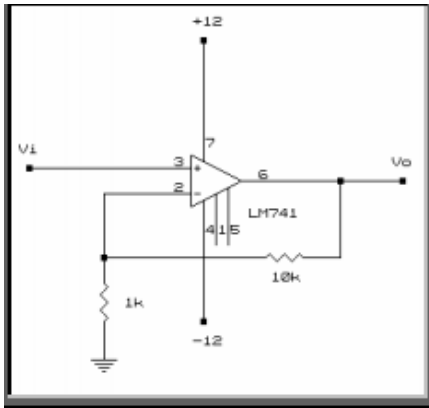
Uses of the operational amplifier

Inverter amplifier



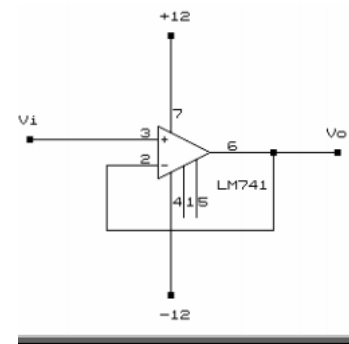
The operational inverter amplifier manages to invert an input voltage while amplifying it. No current enters or flows between the inverter and non-inverter terminals. This means that the current that enters will be equal to the one that comes out.

Non-inverting amplifier



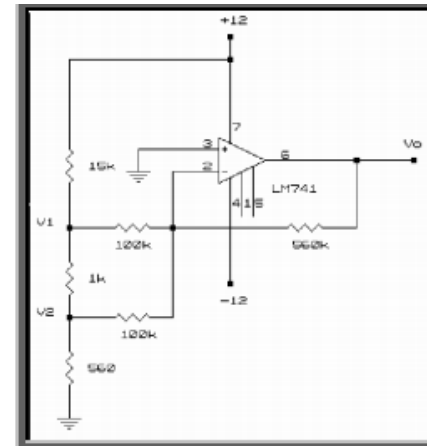
This configuration allows the level of the voltage in an input signal to be increased in such a way that the signal entering the non-inverting leg is amplified from the device.

Voltage follower



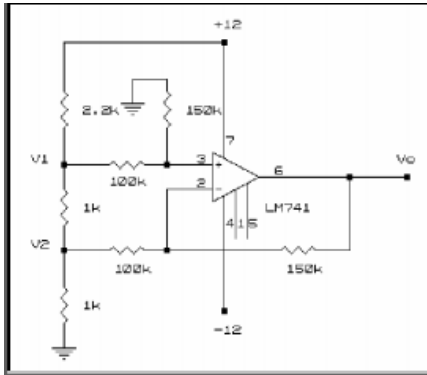
An operational amplifier voltage follower or voltage follower opamp, causes the output to follow the input, ie the output voltage is the same input voltage.

Summer amplifier



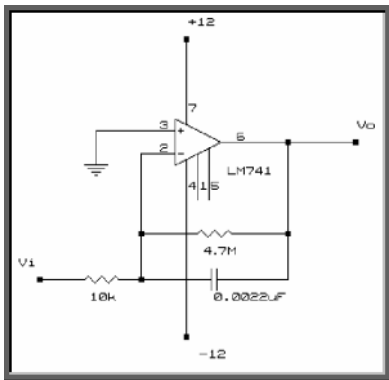
The summing operational amplifier allows the user to add several voltage levels at the same time that the voltage sign is inverted.

Subtracting amplifier



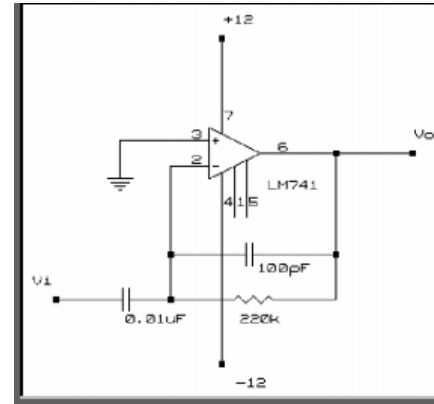
This amplifier uses both inputs inverted and not inverted with a gain of one, to produce an output equal to the difference between the inputs.

Integrating amplifier



The output voltage of the integrating circuit is proportional to the area under the input curve (input wave), for any instant.

Derivative amplifier

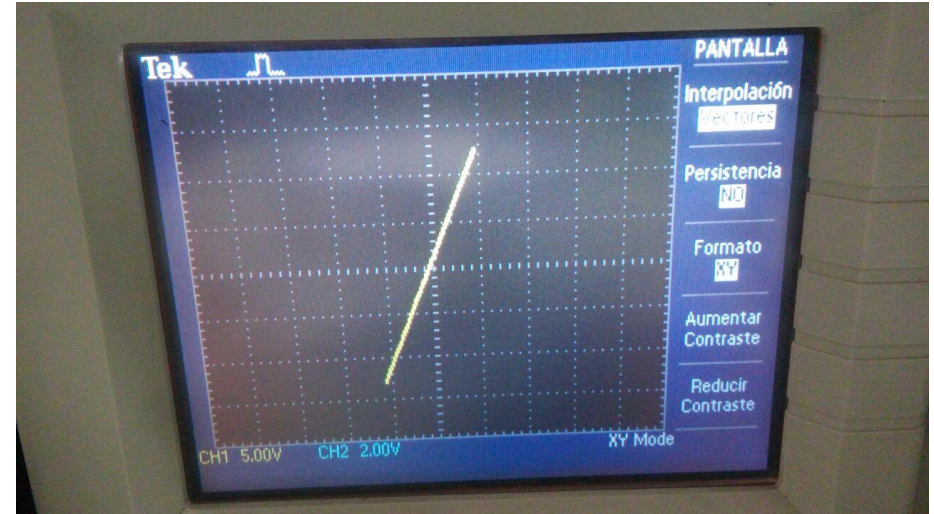
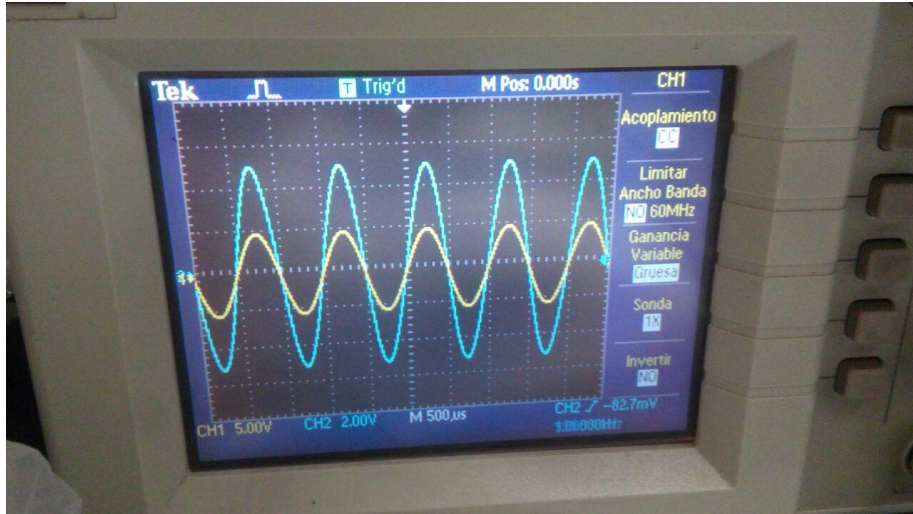
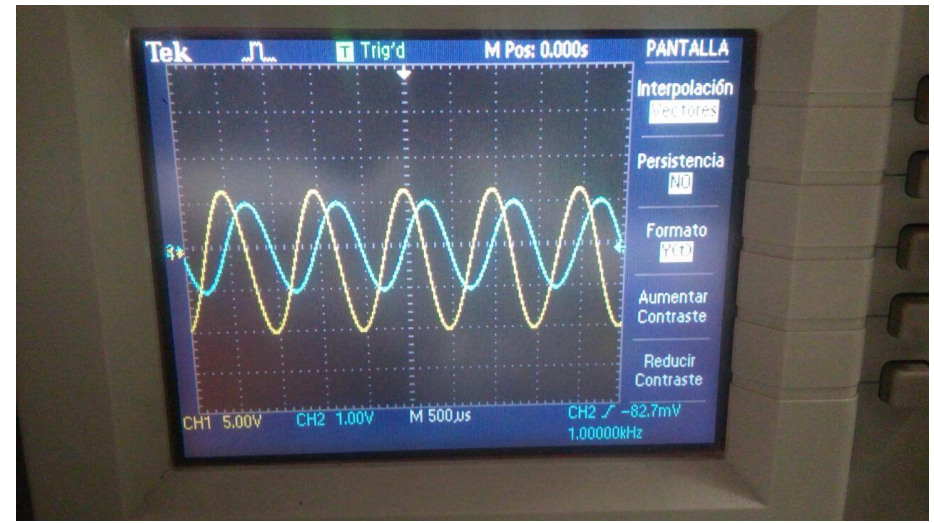
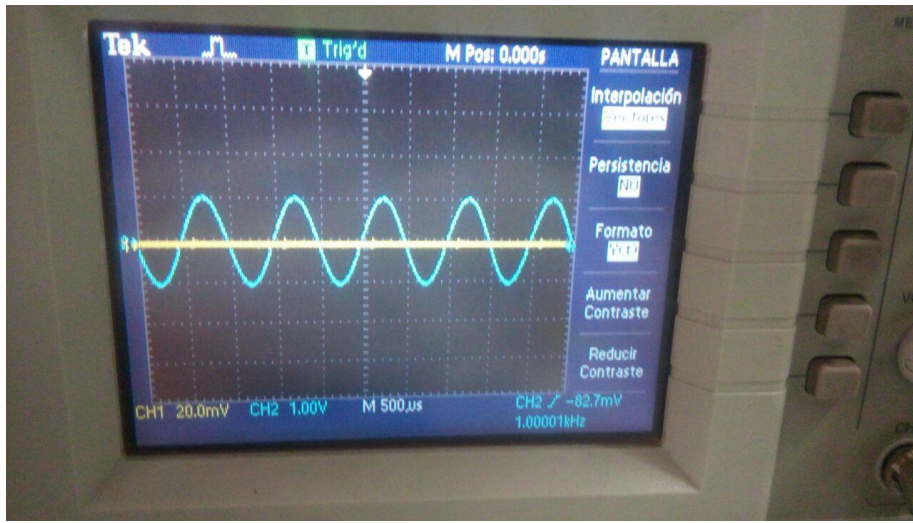


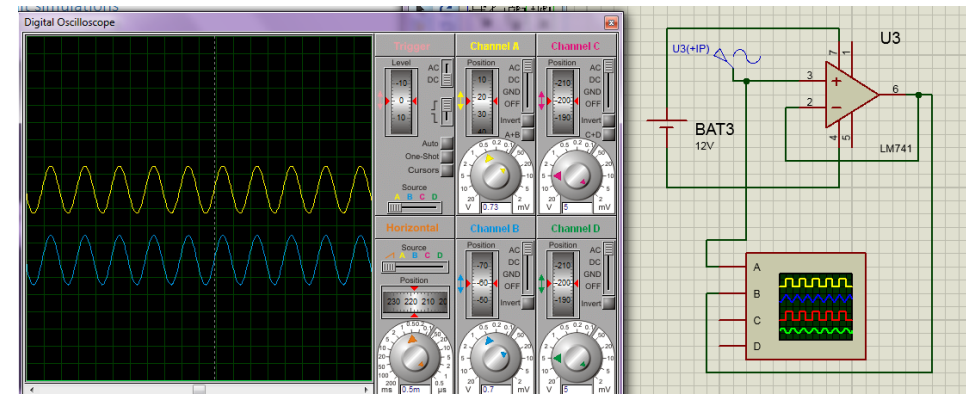
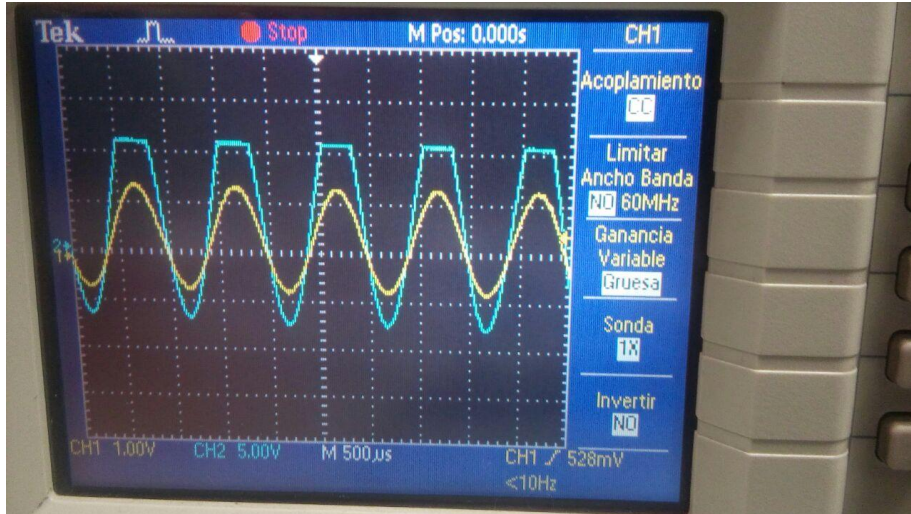
A derivator is a circuit in which the output signal is proportional to the time derivative of the input signal. In other words: The output is proportional to the speed of variation of the input signal.

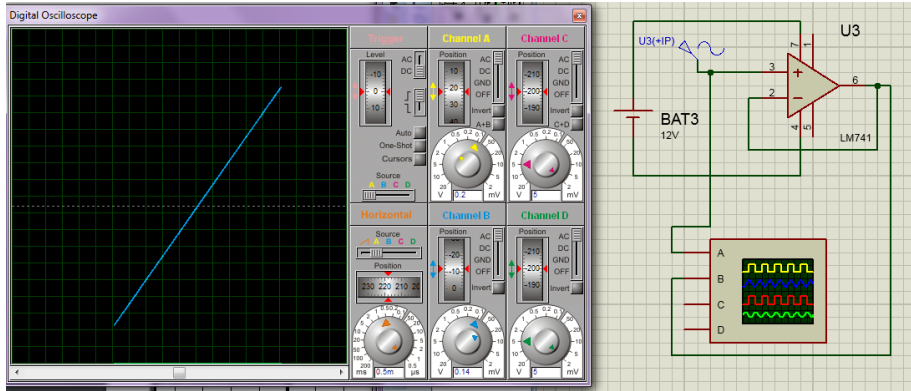
Experimental progress

The practice is to occupy an operational amplifier (which is responsible for amplifying or decreasing a signal) to see the difference between an input signal and that passes through the circuit either adder or subtractor, this is achieved from a small circuit consisting of resistors and a capacitor in addition to a voltage source in series.

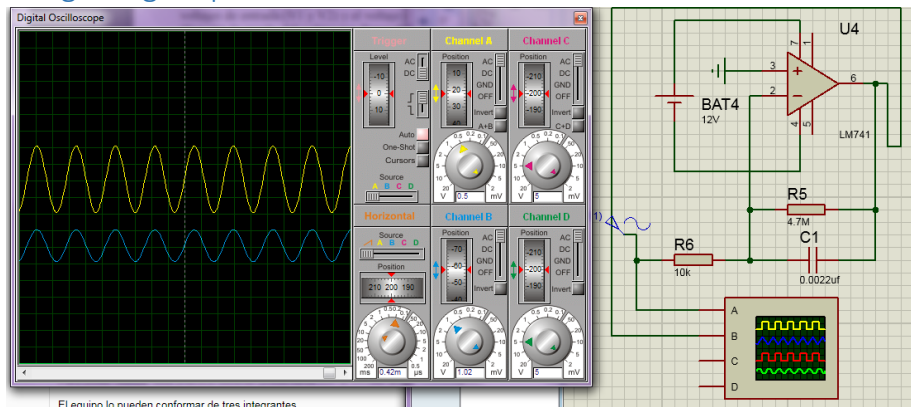
Having armed the circuit we connect the signal generator on an input pin to the circuit with the amplifier, and the output pin to channel 2 of the oscilloscope, channel 1 will be connected together with the signal generator since we will proceed to visualize the difference of graphics between an input signal and an output signal, thus seeing if I amplify or decrease the signal through the circuit.



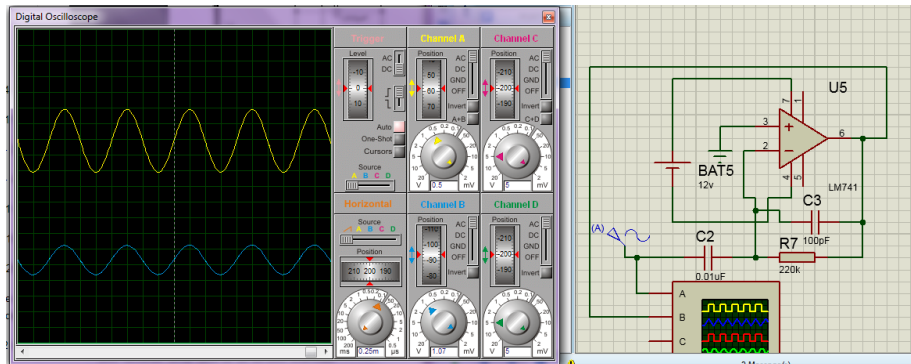




Integrating amplifier



Derivative amplifier



Inferences

- Quintana Camacho Ruben Abiasaf:

- This practice helps us to understand how a signal is modified and how much an input signal can vary to an output, in the case of this practice the change was notorious, although it did not vary much you could see a difference between the 2 signs
- Rojas Alvarado Luis Enrique:
 - In this practice we could know the amplifiers and their operation, and seeing them in the oscilloscope gave us an idea of what was happening inside the device, even without knowing the purpose of the amplifiers, I could give an idea of what they can do in the world of communications
- Rodriguez Hernandez Aldo Hassan:
 - The practice is useful to learn how to handle an operational amplifier and with the oscilloscope observe the signals it generates together with the function generator

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