PH3204: Electronics Laboratory

Experiment 03: Study of Operational Amplifier (OpAmp) as inverting and non-inverting amplifier and its applications as adder and subtractor

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1 Theory

1.1 Operational Amplifier (OpAmp)

An Operational Amplifier or OpAmp is a differential amplifier that has a very high voltage gain, high input impedance and low output impedance. The OpAmp ha two inputs namely a non-inverting input(V_+) and an inverting input(V_-). The OpAmp amplifies the difference between the two inputs. The output voltage (V_{out}) is given by

$$V_{out} = A(V_+ - V_-)$$

where A is the open loop gain of the amplifier. The OpAmp is usually operated with a negative feedback. The OpAmp used in this experiment is the LM741 OpAmp. The pin configuration of the LM741 OpAmp and its circuit diagram is shown in the figure below.

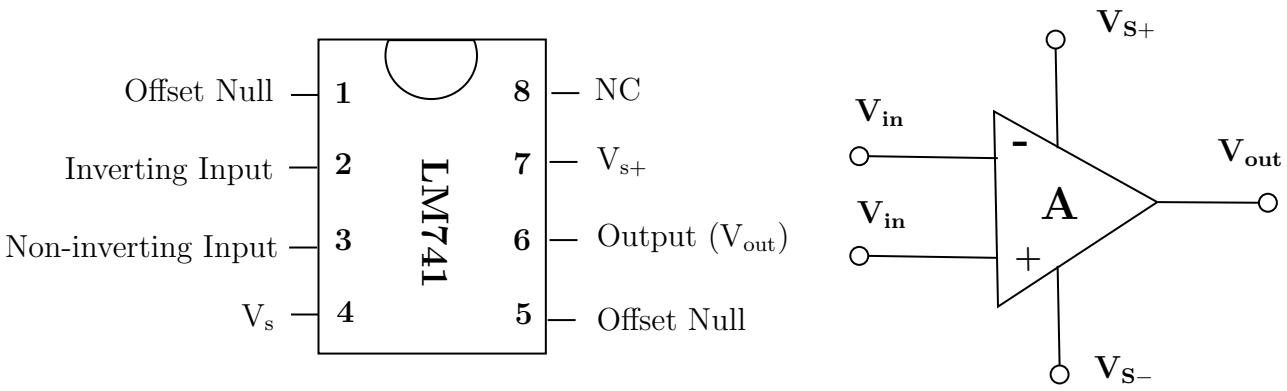

Figure 1: Pin configuration of LM741 OPAMP (left) and its circuit symbol (right)

The OpAmp can be used in various configurations such as inverting amplifier, non-inverting amplifier, adder, subtractor,differentiator, integrator etc. In this experiment, we will study the OpAmp as an inverting amplifier, non-inverting amplifier, adder and subtractor.

1.2 Inverting Amplifier

The OpAmp can be used as an inverting amplifier by connecting it as per the following circuit diagram.

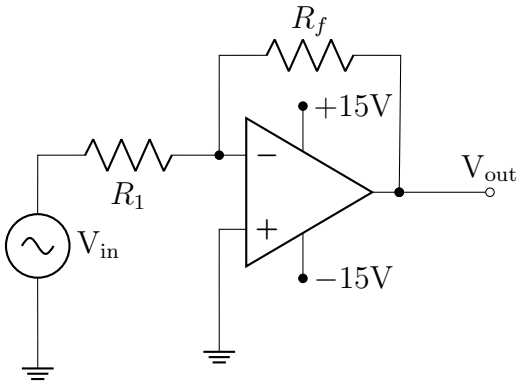

Figure 2: Circuit diagram of OpAmp as an Inverting Amplifier

1.3 Non-Inverting Amplifier

The circuit diagram of an OpAmp as a non-inverting amplifier is shown below.

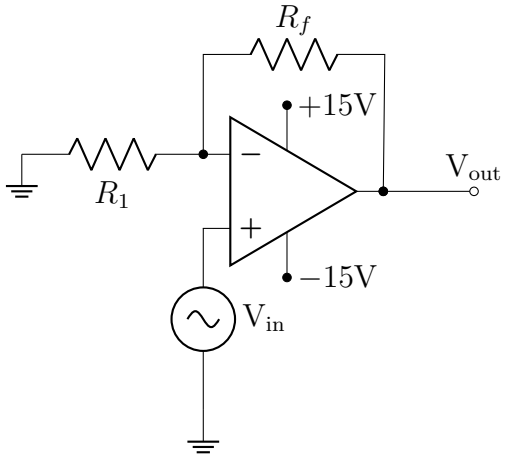

Figure 3: Circuit diagram of OpAmp as a Non-Inverting Amplifier

1.4 Adder

The OpAmp can be used as an adder by connecting it as per the following circuit diagram.

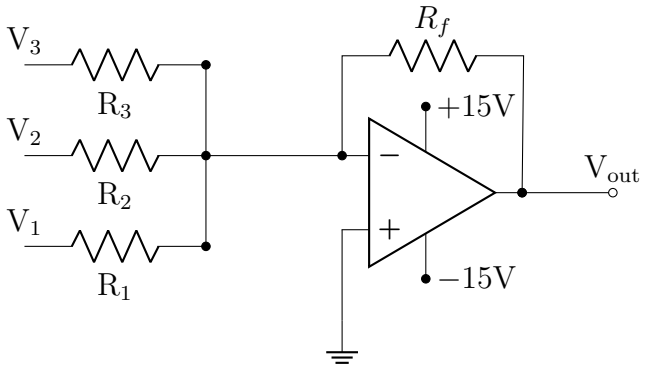

Figure 4: Circuit diagram of OpAmp as an Adder

1.5 Subtractor

The circuit diagram for OpAmp as a subtractor is shown below.

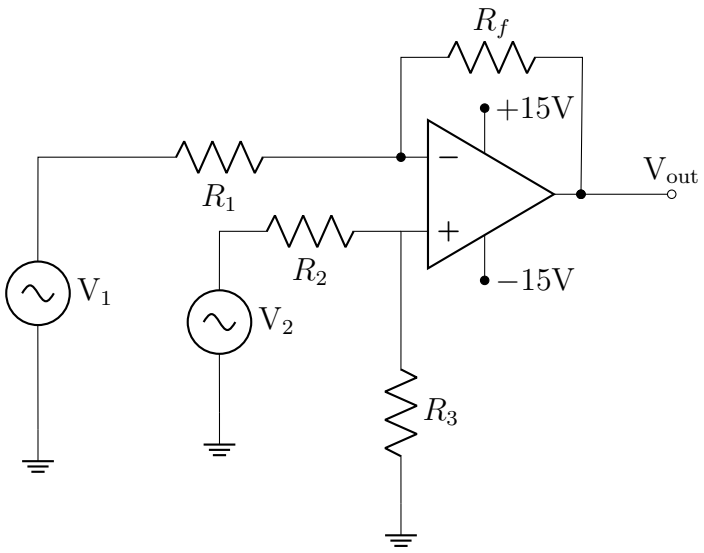

Figure 5: Circuit diagram of OpAmp as a Subtractor

2 Data and Analysis

3 Results and Discussion

4 Sources of Error