Integrator

1 Theory

An Op-amp integrator circuit is formed by connecting an RC network across the operational amplifier's feedback path. As its name implies, the Op-amp Integrator is an operational amplifier circuit that performs the mathematical operation of Integration, that is we can cause the output to respond to changes in the input voltage over time, as the op-amp integrator produces an output voltage which is proportional to the integral of the input voltage.

When a step voltage is firstly applied to the input of an integrating amplifier, the uncharged capacitor has very little resistance and behaves like a short circuit allowing maximum current to ow via the input resistor, as potential difference exists between the two plates. No current flows into the amplifiers input. As the impedance of the capacitor at this point is very low, the gain ratio is also very small giving an overall voltage gain of less than one (voltage follower circuit).

As the feedback capacitor begins to charge up due to the in influence of the input voltage, its impedance slowly increase in proportion to its rate of charge. The capacitor charges up at a rate determined by the RC time constant of the series RC network. Negative feedback forces the op-amp to produce an output voltage that maintains a virtual earth at the op-amps inverting input.

2 Schematic Diagram

The schematic diagram of Integrator circuit in eSim is shown below.

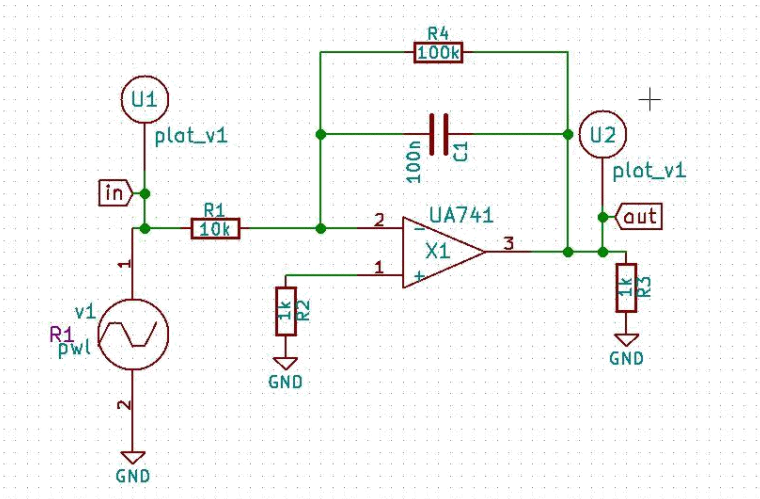

Figure 1: schematic diagram of Integrator circuit

3 Simulation Results

1. Python plots:

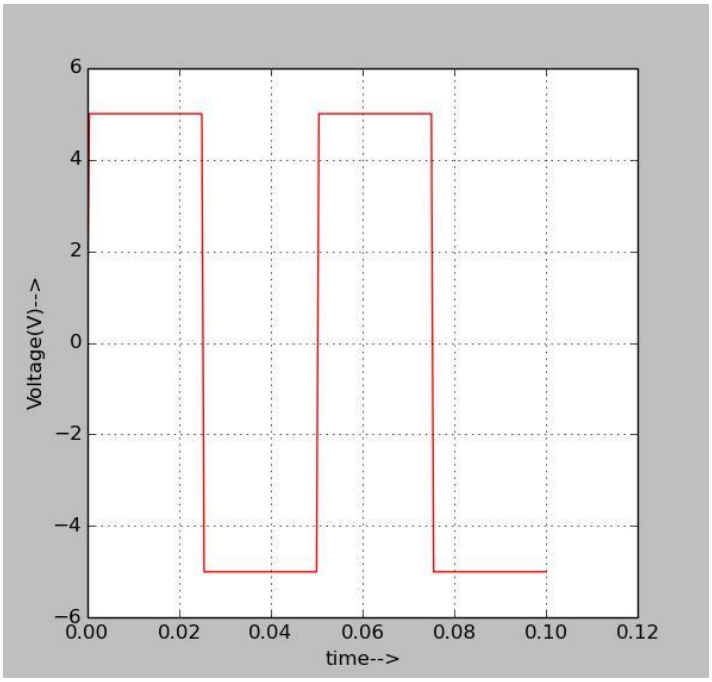

Figure 2: input plot

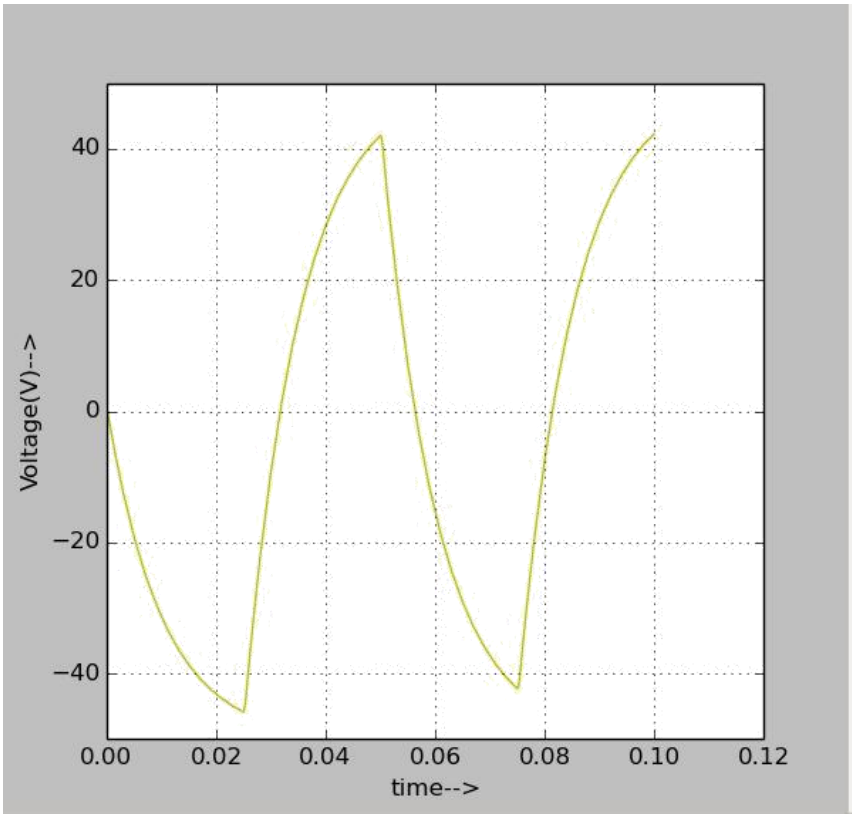

Figure 3: output plot

2. Ngspice plots:

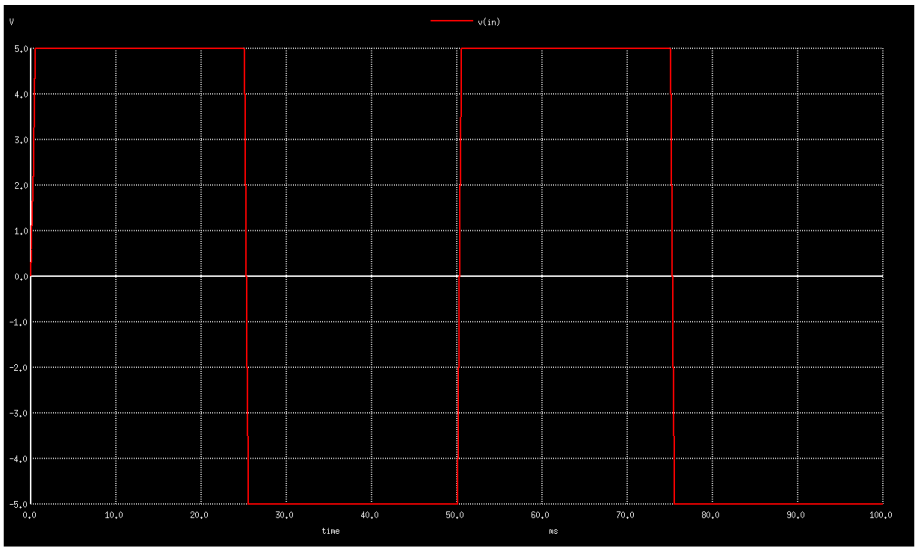

Figure 4: input plot

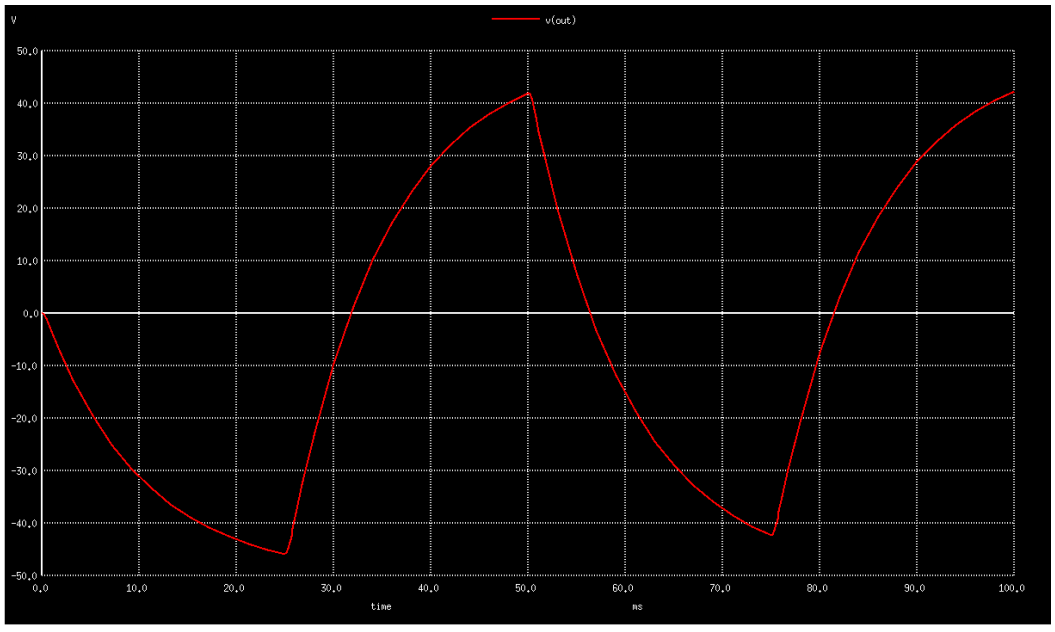

Figure 5: output plot

4. Reference:

[1] http://www.electronics-tutorials.ws/opamp/opamp_6.html referred on 15/04/2017.