

Caipirinha: A Free Graphical Viewer for Berkeley Spice

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Abstract

This paper presents Caipirinha viewer, a free software to be used in simulations generated by Spice like simulators. This viewer was designed for Windows and can be used with free Berkeley Spice. The use of a free electrical simulator and a free graphical viewer are a good alternative to be used in designs and simulations at the academic environment. Caipirinha is a simple and recent software then there is a lot of work to improve it, with the design of a more friendly interface and with the insertion of new functions, but this first version is enough to be used with the necessary accuracy for a lot of applications.

1. Introduction

The idea of the design of a free viewer to be used in spice simulations arises when a group of UFRGS master students was working in an echo canceller chip design [PRA 00], [AGO 00], [AGO 01] and noted that the available version of Hspice simulator (for Solaris) are not capable to run a correct simulation of the CMOS model BSIM3v3. Such the echo canceller design uses hundreds of transistors, the available shareware simulators and viewers, like Pspice, did not permit this simulations. Then the use of a free Berkeley Spice [UCB 01] becomes the natural choice. A free source code of Berkeley Spice for Linux was downloaded and this version was modified to be compiled for Windows. The problem then was the graphical viewer, that was not found in the internet software repositories. The alternative was the design of a new and free viewer.

The name choose to this new viewer was Caipirinha. Caipirinha was designed in Delphi [CAN 96] because this language has a very high level of programmability and has a lot of predefined components like menus, bottoms, windows, etc, making easy the Caipirinha design. The waveforms area was designed starting from a standard graphic component preinstalled in Delphi packages.

The platform choose was Windows because it had, to the authors, the best time-to-finish relationship in the graphic interface and in the software core design. Besides Windows is a very popular operational system and the simulations could be ran at the University or at home, with an important flexibility and independence of computer or place.

Caipirinha viewer was very useful to the echo canceller design, specially in the RAM design. Caipirinha together with Berkeley Spice was used in simulations with more than 1,500 transistors and with more than 25 waveforms simultaneously.

Caipirinha is a good tool for didactical goals, since it is a free and simple tool and it can be used together with a free and reliable Spice version.

Caipirinha viewer and Berkeley Spice are downloadable in [GME 01] and [LUC 01].

The next section of this paper will present Caipirinha viewer, its interface and its functionality. The last section will present the paper conclusions.

2. Graphical Viewer

The interface of Caipirinha viewer is very simple and is presented in Fig. 1.

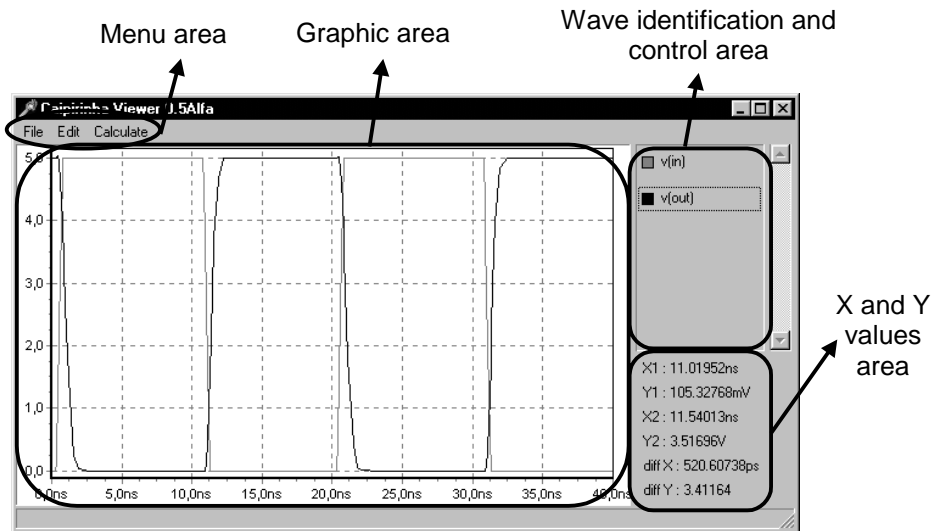


Figure 1 – Caipirinha Viewer interface.

The simulation presented in Fig. 1 was generated to a single inverter described in Spice. The textual Spice input for this simulation is presented in Fig. 2, where two waveforms are printed to output: V(IN) and V(OUT) the first one is the input waveform and the second one is the output waveform.

Caipirinha interface is divided in four main areas: menu area, wave identification and control area, X and Y values area and graphic area.

There are three components in Caipirinha menu area. The component **File** contains three sub components, one to **Open** a new waveforms file, one to **Reopen** the same waveforms file and one to **Quit** of Caipirinha viewer.

The component **Edit** allows the copy of the graphic area to clipboard, and there are two options: **Copy as Bitmap** and **Copy as Metafile**.

```
* Inversor Circuit
.include c:\user\cmos7tm.mod

Va VDD 0 5
Vb IN 0 pulse(0, 5, .3ns, .5ns, .5ns, 10ns, 20ns)

M1 VDD IN OUT VDD PMOS L=0.6u W=4.2u
M2 0 IN OUT 0 NMOS L=0.6u W=1.4u

Ca OUT 0 100ff

.TRAN 1p 40n
.print TRAN V(IN) V(OUT)
.END
```

Figure 2 – Spice input.

The last menu component, named **Calculate**, allows the **Average**, the **RMS** and the **Absolute Average** calculations of the selected waveform (in the wave identification and control area) in the printed period.

The wave identification and control area shows the color of each waveform printed in the graphic area. A double click in the waveform name steals away this waveform of the graphic area. A new double click shows again this waveform. A double click in the waveform color allows the change in the color used in this waveform.

Caipirinha is able to measure high resolution X and Y values using linear interpolation between points defined in Spice output file. These values are showed in X and Y values area.

The X and Y values area contains 6 values: X1, Y1, X2, Y2, diffX and diffY. This values are referent to points marked in graphic area, like will be presented latter. Values X1 and X2 are time values and value diffX is the difference between X1 and X2. Y1 and Y2 are wave dependent values (voltage or current) and are referent to the selected wave in the wave identification and control area. Value diffY is the difference between Y1 and Y2.

Values diffX and diffY are very useful for delay, rise times and fall times measures in digital circuits.

Graphic area is where the waveforms are printed. In this area is possible make zooming operations just with mouse selections. A top-down and left-right selection makes a zoom in operation, like is presented in Fig. 3, that is a zoom in Fig. 1. Any other selection makes a zoom out operation.

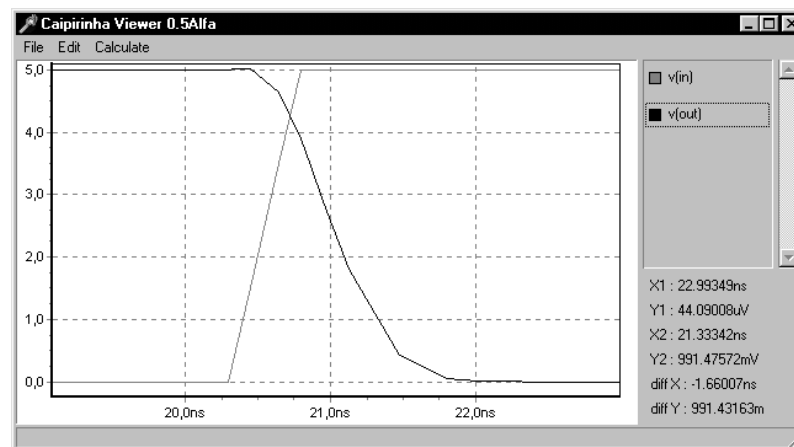


Figure 3 – Zoom in waveforms from Fig. 1.

One single click on the graphic area enables the measure start and X1 and Y1 values are able to capture the mouse pointer position. A new single click marks the start point of the measure, freezing X1 and Y1 values and enabling X2 and Y2 to capture the mouse pointer position. X and Y difference calculation are automatically enabled too. An other single click marks the final position of the measures and freeze all values in X and Y values area. A new single click allows the start of a new measure and a double click clear all values of X and Y values area.

It is possible to open various Caipirinha windows to view separately different waveforms of the same waveforms input file, opening the same file in various Caipirinha windows and showing just one wave per window.

3. Conclusions

Caipirinha was intended to be used as an alternative solution for a specific design at GME/UFRGS and it was very useful to this design. Nowadays it is freely available in the internet [GME 01], [LUC 01]. Caipirinha, together with Berkeley Spice, has been used by graduate and undergraduate students at UFRGS and even in other universities like PUC-RS and UFSM since they are free, simple and reliable tools for electrical simulation.

Next version of Caipirinha will be written in C since we believe strongly that it will be faster and will requires less memory than the current version.

Also, Spice software could be changed to generate an binary file as output, so Caipirinha would not need to use a parser and, then, the load file time could be reduced dramatically.

References

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