

03 Logic networks

03.06 Lab 1

Gate-level design and simulation using TkGate

A. Introduction

The first laboratory experience is based on *TkGate 1.8*, a digital circuit simulator with a tcl/tk-based graphical editor that is freely distributed, open source, and runs under Linux.

This is the description provided by the author, J. P. Hansen, on the home page of www.tkgate.org:

TkGate is an event-driven digital circuit simulator with a tcl/tk-based graphical editor. TkGate supports a wide range of primitive circuit elements as well as user-defined modules for hierarchical design. The distribution comes with a number of tutorial and example circuits which can be loaded through the "Help" menu. The example circuits include a simple CPU, programmed to run the Animals game. For more information, check out the documentation. TkGate is free software provided with source code under the Gnu Public License.

Key Features:

- Graphical circuit design
 - Hierarchical design through user defined modules.
 - Easy to use point-and-click user interface.
 - Create hyperlinks to move about in circuit or load other files.
 - Multi-lingual interface (Catalan, English, French, German, Japanese, Spanish, Welsh)
 - Verilog-like save file format.
- Logic simulation
 - Control through the GUI or through script files.
 - Suitable for simulation at transistor, gate or register transfer level.
 - Six valued logic model including 0, 1, floating, unknown, "low" and "high".
 - Support for custom delay models.
 - Graphical display of simulation results.
 - Breakpoints, single-step and clock-step simulator control.
 - Static critical path analysis.
- Primitive circuit elements include:
 - Basic gates (AND, OR, etc.)
 - Switch-level NMOS and PMOS transistors
 - Tristate buffers
 - Alu components (Adders, shifters, multipliers)
 - Memory elements (Registers, RAMs, ROMs)
 - An interactive "tty" element allows design of circuits that can interact with the user.
- Support tools include a microcode/macrocode compiler to assist in creating large projects such as microprocessor designs.

B. Software distribution

You can download the software either from <http://www.tkgate.org/> or from the alternate mirror sites available at <http://sourceforge.net/projects/tkgate>. The current release is the 1.8.7, but a beta release of TkGate 2.0 is also available at <http://www.tkgate.org/> (last accessed in November 2010).

To install the package download the distribution and type the following commands under linux:

```
> gunzip tkgate-1.8.7.tgz
> tar xvf tkgate-1.8.7.tar
> cd tkgate-1.8.7
> ./configure
> make
```

To launch the program type

```
> libexec/tkgate
```

To install the executable run

```
> make.install
```

TkGate is also installed on the application server made accessible to all ACS students (**server1.sti.uniurb.it**) through a remote terminal interface. Additional information about the application server and its remote-terminal interface can be found in the **Students' handbook**. It is strongly recommended that you install TkGate on your own PC in order to use it locally. Use the application server only to run applications you cannot install locally.

C. Documentation

The html documentation is available at <http://www.tkgate.org/1.8/index.html>. A pdf version of the same documentation (called **tkgate.doc.x.pdf**) is available in the library together with these handouts.

D. Tutorial

When you launch tkgate a tutorial is automatically loaded. I strongly invite you to take the tutorial before using the tool. The tutorial can be always reloaded from the help menu.