Generating and Using Pattern Files for Digital Design Simulation

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Introduction

The pattern file is a description of the respective truth table, although the only available entries are the inputs and the carry-in (i.e., the A and B inputs and the Cin), which are generated from all possible combinations of 1's and 0's. These combinations are then used by Asimut to generate a simulation pattern file with filled-in outputs, such as SUM and CARRY OUTS, which should correspond to the truth table.

Pattern File Generation

You will notice that the pattern file fed into Asimut has no outputs filled in. However, after Asimut processes the pattern file, the output simulation pattern file has the outputs filled in. It is important to ensure that the input names for the pattern file correspond to the VHDL file's input names to avoid Asimut throwing input errors.

Methods of Generating Pattern Files

1. **Manually**: Pattern files can be made manually with the knowledge of the truth tables.
2. **Using Genpat**: Genpat can also generate pattern files, but for it to work, one needs a corresponding .c file. This file is written in C language to generate the input truth table pattern, which Genpat uses to produce a pattern file.
3. **Using Python**: Python can generate the expected truth table, and this information can be used to structure a pattern file.

Pattern File Formats

When generating a pattern file, be aware of the pattern file formats.

Demonstration for a Two-Input Single-Bit Adder

This demonstration uses Python to generate a pattern file. Run the script `pattern_truth_table_gen.py` to generate one:

```
python3 pattern_truth_table_gen.py
```

After generating the pattern file, Asimut uses it to generate a simulation pattern file:

```
asimut -b file file_pat file_simulation
```

This bash command format has five sections:

1. `asimut` - This command calls Asimut to validate the digital design.
2. `-b` - Consider the root file description as a behavioural description.
3. `file` - Provide the base file name without extension from `file.vbe` or `file.vhdl`.
4. `file_pat` - This is the pattern generated by Python. You might need to rename it to `file_pat.pat`.
5. `file_simulation` - This is the requested output file from Asimut, a simulation pattern file.

Using XPAT

XPAT is used to view these digital designs. If running `xpat file_simulation.pat` displays nothing, import the PAT file from within XPAT by manually selecting the file from XPAT's file menu. Alternatively, use:

```
xpat -l file_simulation.pat
```

Automating the Process

A Python script can run the whole process from generating the simulation PAT file to the final file_as file. Run:

```
python3 flow.py
```