भारतीय प्रौद्योगिकी संस्थान हैदराबाद
Indian Institute of Technology
Hyderabad

Introduction to Pygmy

Teaching Learning Center
IIT Hyderabad

G. V. V. Sharma *

Contents

1 Setup 1

2 Frequency 2

***Abstract*—This document provides a simple introduction to software and hardware using the Pygmy FPGA/microcontroller board. The exercises provided here are suitable for students from primary school till college.**

1 Setup

1.1. Connect the Pygmy to the Raspberry Pi through USB.

1.2. There is a button and an LED to the left of the USB port on the Pygmy. There is another button to the right of teh LED.

1.3. Press the right button first and immediately press the left button. The LED will be blinking green. The Pygmy is now in bootloader mode.

1.4. Login to termux-ubuntu on the android device and execute the following commands

```
cd /storage/emulated/0/Download
svn co https://github.com/
    gadepall/pygmy/trunk/
    installation/blink
ql_symbiflow -compile -src /
    storage/emulated/0/Download/
    blink -d ql-eos-s3 -P PU64 -
    v helloworldfpga.v -t
    helloworldfpga -p
    quickfeather.pcf -dump
    binary
scp /storage/emulated/0/
    Download/blink/
    helloworldfpga.bin pi@192
    .168.0.114:
```

Make sure that the appropriate IP address for the raspberry pi is given in the above command.

1.5. Now execute the following commands on the raspberry pi.

```
python3 /root/pygmy-dev/pygmy-
    sdk/TinyFPGA-Programmer-
    Application/tinyfpga-
    programmer-gui.py --port /
    dev/ttyACM0 --appfpga /home/
    pi/helloworldfpga.bin --mode
     fpga
```

1.6. Make sure that the correct USB port address is given in the above command. Then press the button to the right of the USB port. After some time, the LED will start blinking red.

*The author is with the Department of Electrical Engineering, IIT Hyderabad, 502285, India. email: gadepall@ee.iith.ac.in.

2 Frequency

2.1. In the following verilog program,

```
codes/blink/helloworldfpga.v
```

pay attention to the following lines

```
delay = delay+1;
if(delay > 20000000)
begin
delay=27'b0;
led=!led;
end
```

It may be deduced from the above that the blink frequency is 20 MHz.

2.2. In instruction 2.1, replace

```
if(delay > 20000000)
```

with

```
if(delay==27'
   b100110001001011010000000)
```

and execute the verilog code.

2.3. Since the delay is 20 MHz, the blink period is 1 second. Modify the verilog code so that the blink period becomes 0.5s.

2.4. Find the bit length of 20 MHz.
Solution:

$$\log_2(20000000) \approx 27 \tag{2.4.1}$$

2.5. Obtain the above answer using a Python code.
Solution: Exeucte the following code and compare with instruction 2.2.

```
codes/blink/freq_count.py
```

2.6. Replace the following line in the code in instruciton 2.1

```
assign redled = led; //If you
   want to change led colour to
    red,
```

with

```
assign blueled = led;
```

and execute the code.