2022 Digital IC Design
Final Project

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Functional Simulation Result of LZ77 Encoder

Testing Pattern 0	Pass	Testing Pattern 1	Pass	Testing Pattern 2	Pass

```
# cycle 1a0de, expect(00,00,3) , get(00,00,3) >> Pass
# cycle 1a0ff, expect(00,00,8) , get(00,00,8) >> Pass
# cycle 1a120, expect(00,00,2) , get(00,00,2) >> Pass
# cycle 1a141, expect(00,00,7) , get(00,00,7) >> Pass
# cycle 1a163, expect(01,01,e) , get(01,01,e) >> Pass
# cycle 1a187, expect(15,02,$) , get(15,02,$) >> Pass
# ------------------------------------------------
# --------- Encoding finished, ALL PASS ---------
# ------------------------------------------------
# ** Note: $finish    : /home/kay/ICHW/2022_final_project/tb_Encoder.sv(293)
#    Time: 534440 ns  Iteration: 1  Instance: /testfixture_encoder
```

```
cycle 206bc, expect(0d,05,b) , get(0d,05,b) >> Pass
cycle 20685, expect(0f,03,9) , get(0f,03,9) >> Pass
cycle 206ac, expect(0b,03,6) , get(0b,03,6) >> Pass
cycle 206d1, expect(1d,01,5) , get(1d,01,5) >> Pass
cycle 206f6, expect(01,03,6) , get(01,03,6) >> Pass
cycle 2071c, expect(1b,02,9) , get(1b,02,9) >> Pass
cycle 2073f, expect(00,00,1) , get(00,00,1) >> Pass
cycle 20760, expect(00,00,$) , get(00,00,$) >> Pass
------------------------------------------------
--------- Encoding finished, ALL PASS ---------
------------------------------------------------
** Note: $finish    : /home/kay/ICHW/2022_final_project/tb_Encoder.sv(293)
   Time: 664805 ns  Iteration: 1  Instance: /testfixture_encoder
```

```
# cycle 1c814, expect(15,01,5) , get(15,01,5) >> Pass
# cycle 1c837, expect(17,01,4) , get(17,01,4) >> Pass
# cycle 1c85b, expect(19,02,7) , get(19,02,7) >> Pass
# cycle 1c880, expect(0b,02,0) , get(0b,02,0) >> Pass
# cycle 1c8a3, expect(00,00,$) , get(00,00,$) >> Pass
# ------------------------------------------------
# --------- Encoding finished, ALL PASS ---------
# ------------------------------------------------
# ** Note: $finish    : /home/kay/ICHW/2022_final_project/tb_Encoder.sv(293
#    Time: 584500 ns  Iteration: 1  Instance: /testfixture_encoder
```

Functional Simulation Result of LZ77 Decoder

Testing Pattern 0	Pass	Testing Pattern 1	Pass	Testing Pattern 2	Pass

```
   == Decoding string "669"
cycle 02001, expect 6, get 6 >> Pass
cycle 02002, expect b, get b >> Pass
cycle 02003, expect 9, get 9 >> Pass
   == Decoding string "1"
cycle 02004, expect 1, get 1 >> Pass
------------------------------------------------------
-------------- Decoding finished, ALL PASS -----------
------------------------------------------------------
------------------------------------------------------
----- Interpolation finished, result is written out -----
------------------------------------------------------
** Note: $finish    : /home/kay/ICHW/2022_final_project/tb_Decoder.sv(376)
   Time: 242020 ns  Iteration: 0  Instance: /testfixture_decoder
```

```
# cycle 01fff, expect 2, get 2 >> Pass
#    == Decoding string "7"
# cycle 02000, expect 7, get 7 >> Pass
#    == Decoding string "2e"
# cycle 02001, expect 2, get 2 >> Pass
# cycle 02002, expect e, get e >> Pass
#    == Decoding string "5f"
# cycle 02003, expect 5, get 5 >> Pass
# cycle 02004, expect f, get f >> Pass
# ------------------------------------------------------
# -------------- Decoding finished, ALL PASS -----------
# ------------------------------------------------------
# ------------------------------------------------------
# ----- Interpolation finished, result is written out -----
# ------------------------------------------------------
# ** Note: $finish    : /home/kay/ICHW/2022_final_project/tb_Decoder.sv(376)
#    Time: 242020 ns  Iteration: 0  Instance: /testfixture_decoder
```

```
#   == Decoding string "737"
# cycle 01fff, expect 7, get 7 >> Pass
# cycle 02000, expect 3, get 3 >> Pass
# cycle 02001, expect 7, get 7 >> Pass
#   == Decoding string "270"
# cycle 02002, expect 2, get 2 >> Pass
# cycle 02003, expect 7, get 7 >> Pass
# cycle 02004, expect 0, get 0 >> Pass
# ------------------------------------------------------
# -------------- Decoding finished, ALL PASS --------------
# ------------------------------------------------------
# ------------------------------------------------------
# ----- Interpolation finished, result is written out -----
# ------------------------------------------------------
# ** Note: $finish    : /home/kay/ICHW/2022_final_project/tb_Decoder.sv(376)
#    Time: 242020 ns  Iteration: 0  Instance: /testfixture_decoder
```

Quality of Interpolated Results

Testing Pattern 0	PSNR=23.87	Testing Pattern 1	PSNR=24.55	Testing Pattern 2	PSNR=27.88

```
(base) abc@KayLiu 2022_final_project_baseline_2 % python calPSNR.
py
PSNR of image 0: 23.8661690686536
PSNR of image 1: 24.54673113950642
PSNR of image 2: 27.875880720521792
```

Description of your design

這次的期末專案結合前面幾次作業，因為前面幾次作業在參考了助教給的範例 code 之後，覺得自己寫的電路很差，所以期末專案主要是用助教給的 code 去改的。

Encoder:

主要就是把 buffer 的長度、counter 的結束 number 做更改。

跟範例的架構是差不多的。

Decoder:

也是把之前的 code 的 buffer 的長度做更改之後就可以了。另外因為我是用 ubuntu 寫，encode 方式需要調整之後讀檔才不會有格式跑掉的問題。一直以為是自己 code 的問題，改寫了 state input 還是有問題，最後更改 encode 方式，

不知道有沒有其他同學遇到不同作業系統導致的問題。

Interpolate:

也是用範例 code 的架構去改的，嘗試了 D1, D2, D3 取兩個距離差最小的兩個方向 sum 再 average，結果只有 img0 比較好，最後還是用 baseline 的 code 去跑而已

Scoring = Pattern 0 PSNR + Pattern 1 PSNR + Pattern 2 PSNR

The higher, the better.