ΕΘΝΙΚΟ ΜΕΤΣΟΒΙΟ ΠΟΛΥΤΕΧΝΕΙΟ
ΣΧΟΛΗ ΗΛΕΚΤΡΟΛΟΓΩΝ ΜΗΧΑΝΙΚΩΝ ΚΑΙ ΜΗΧΑΝΙΚΩΝ ΥΠΟΛΟΓΙΣΤΩΝ

Σχεδιασμός Ενσωματωμένων Συστήματων
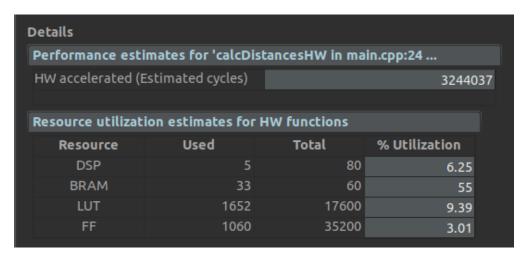## Άσκηση 3η

Αναστάσιος Στέφανος Αναγνώστου   Σαββίνα Νάστου
03119051   03119146
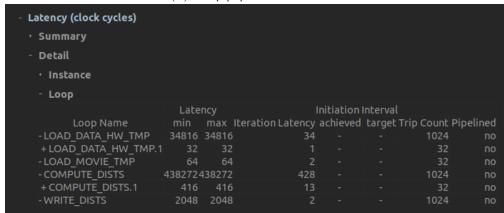
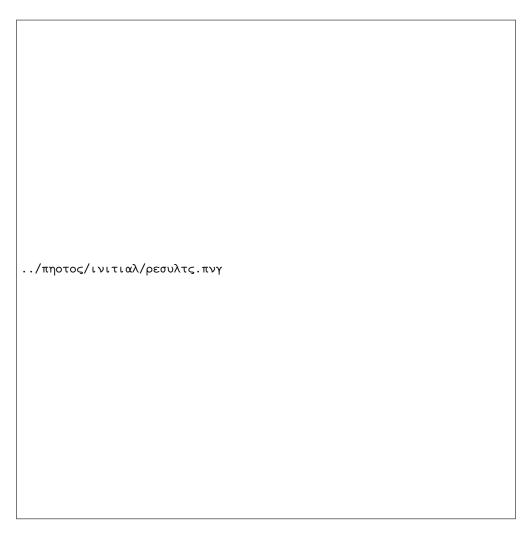14 Δεκεμβρίου 2023

Περιεχόμενα

Άσκηση 1

Εκτίμηση Επίδοσης

Details

Performance estimates for 'calcDistancesHW in main.cpp:24 ...

HW accelerated (Estimated cycles)	3244037

Resource utilization estimates for HW functions

Resource	Used	Total	% Utilization
DSP	5	80	6.25
BRAM	33	60	55
LUT	1652	17600	9.39
FF	1060	35200	3.01

(αʹ) Εκτίμηση hardware κύκλων

Latency (clock cycles)
- Summary
- Detail
  - Instance
  - Loop

Loop Name	Latency min	Latency max	Iteration Latency	Initiation Interval achieved	Initiation Interval target	Trip Count	Pipelined
-LOAD_DATA_HW_TMP	34816	34816	34	-	-	1024	no
+LOAD_DATA_HW_TMP.1	32	32	1	-	-	32	no
-LOAD_MOVIE_TMP	64	64	2	-	-	32	no
-COMPUTE_DISTS	438272	438272	428	-	-	1024	no
+COMPUTE_DISTS.1	416	416	13	-	-	32	no
-WRITE_DISTS	2048	2048	2	-	-	1024	no

(βʹ) Ανάλυση βρόγχων

Πραγματική Επίδοση

Επιτάχυνση μέσω HLS Directives

../πηοτος/ινιτιαλ/ρεσυλτς.πνγ

Σχήμα 2: Πραγματικοί Κύκλοι

Details

Performance estimates for 'calcDistancesHW in main.cpp:24 ...

HW accelerated (Estimated cycles)	402718

Resource utilization estimates for HW functions

Resource	Used	Total	% Utilization
DSP	56	80	70
BRAM	34	60	56.67
LUT	12986	17600	73.78
FF	10735	35200	30.5

(α΄) Εκτίμηση hardware κύκλων

Performance Estimates

- **Timing (ns)**
  - **Summary**

Clock	Target	Estimated	Uncertainty
ap_clk	10.00	8.68	1.25

- **Latency (clock cycles)**
  - **Summary**

Latency		Interval		
min	max	min	max	Type
38078	38078	38079	38079	none

  - **Detail**
    - **Instance**
    - **Loop**

Loop Name	Latency		Iteration Latency	Initiation Interval		Trip Count	Pipelined
	min	max		achieved	target		
- LOAD_DATA_HW_TMP	32768	32768	33	32	1	1024	yes
- LOAD_MOVIE_TMP	32	32	2	1	1	32	yes
- COMPUTE_DISTS	4242	4242	151	4	1	1024	yes
- WRITE_DISTS	1024	1024	2	1	1	1024	yes

(β΄) Ανάλυση βρόγχων


```
Recommendation system start to make inference
...
Recommendations for movie with id 0:
0. Jurassic Park (1993), with distance of 10.7121
1. Fish Called Wanda  A (1988), with distance of 11.0793
2. Back to the Future (1985), with distance of 11.6404
3. Star Wars: Episode VI — Return of the Jedi (1983), with distance of 11.8849
4. Lion King  The (1994), with distance of 12.0623
5. Raising Arizona (1987), with distance of 12.1552
6. Wizard of Oz  The (1939), with distance of 12.1861
7. Batman (1989), with distance of 12.2066
8. Princess Bride  The (1987), with distance of 12.3085
9. E.T. the Extra-Terrestrial (1982), with distance of 12.3996

Hardware cycles : 422051
Software cycles : 1391146
Speedup         : 3.29616
Correct = 1024, Score = 1.000000
```
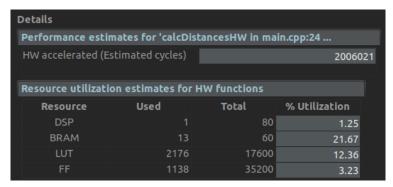
(γ΄) Πραγματικοί κύκλοι
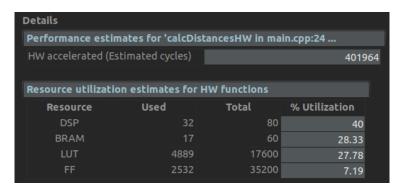
5

Άσκηση 2

Επιλέχθηκαν $INT\_BITS = 10$bits, και $DEC\_BITS = 2$bits.

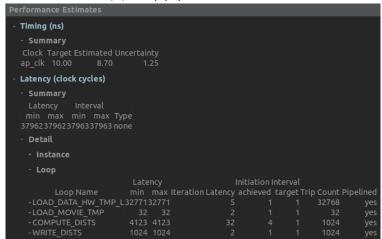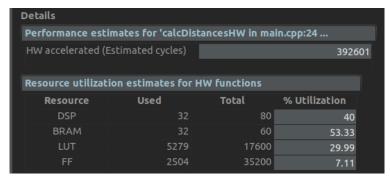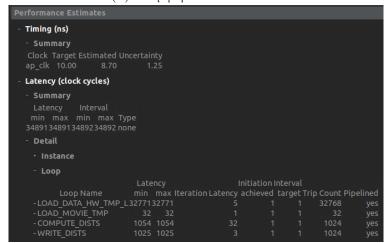| Resource	Used	Total	% Utilization
DSP	1	80	1.25
BRAM	13	60	21.67
LUT	2176	17600	12.36
FF	1138	35200	3.23

Details
Performance estimates for 'calcDistancesHW in main.cpp:24 ...
HW accelerated (Estimated cycles) — 2006021

Resource utilization estimates for HW functions

(αʹ) Εκτίμηση hardware κύκλων

../πηοτος/ςυστομ/λοοπς.πνγ

(βʹ) Ανάλυση βρόγχων

(αʹ) Εκτίμηση hardware κύκλων

(βʹ) Ανάλυση βρόγχων

(γʹ) Πραγματικοί κύκλοι

Άσκηση 3

Άσκηση 3

(α΄) Εκτίμηση hardware κύκλων

(β΄) Ανάλυση βρόγχων

(γ΄) Πραγματικοί κύκλοι