پاسخ تمرین شماره ۲ gem5 درس معماری کامپیوتر

امیر حسین عاصم یوسفی ۹۶۱۱۰۳۲۳

۲۴ خرداد ۱۳۹۸

برای انجام این آزمایش از برنامه Hanoi Tower با مقدار ورودی ۱۵ استفاده شده است که اجرای آن تقریبا ۵ دقیقه و ۲۶ ثانیه طول می کشد و کد آن به پیوست ارسال شده است .

برای این که برنامه بر روی Config File ای که طراحی کرده ایم اجرا شود باید از دستور زیر استفاده کرد:

./build/X86/gem5.opt configs/example/MyConfig.py -c mytest/a.out

که نتایج اجرا برای هرکدام از Config های مختلف به صورت زیر است .

	Move disk 1 from rod B to rod A
Move disk 1 from rod B to rod A Move disk 2 from rod B to rod C	Move disk 2 from rod B to rod C
Move disk 1 from rod A to rod C	Move disk 1 from rod A to rod C
Move disk 3 from rod B to rod A	Move disk 3 from rod B to rod A
Move disk 1 from rod C to rod B	Move disk 1 from rod C to rod B
Move disk 2 from rod C to rod A Move disk 1 from rod B to rod A	Move disk 2 from rod C to rod A
Move disk 1 from rod B to rod A Move disk 6 from rod B to rod C	Move disk 1 from rod B to rod A Move disk 6 from rod B to rod C
Move disk 1 from rod A to rod C	Move disk 6 from rod B to rod C
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Move disk 1 from rod C to rod B	Move disk 1 from rod C to rod B
Move disk 3 from rod A to rod C	Move disk 3 from rod A to rod C
Move disk 1 from rod B to rod A	Move disk 1 from rod B to rod A
Move disk 2 from rod B to rod C	Move disk 2 from rod B to rod C
Move disk 1 from rod A to rod C	Move disk 1 from rod A to rod C
Move disk 4 from rod A to rod B	Move disk 4 from rod A to rod B
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Move disk 1 from rod A to rod C	Move disk 1 from rod A to rod C
Move disk 2 from rod A to rod B	Move disk 2 from rod A to rod B
Move disk 1 from rod C to rod B	Move disk 1 from rod C to rod B
Move disk 5 from rod A to rod C	Move disk 5 from rod A to rod C
Move disk 1 from rod B to rod A	Move disk 1 from rod B to rod A
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Move disk 1 from rod C to rod B	Move disk 1 from rod B to rod B
Move disk 2 from rod C to rod A	Move disk 1 from rod C to rod A
Move disk 1 from rod B to rod A	Move disk 1 from rod B to rod A
Move disk 4 from rod B to rod C	Move disk 4 from rod B to rod C
Move disk 1 from rod A to rod C	Move disk 1 from rod A to rod C
Move disk 2 from rod A to rod B	Move disk 2 from rod A to rod B
Move disk 1 from rod C to rod B	Move disk 1 from rod C to rod B
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Move disk 2 from rod B to rod C	Move disk 2 from rod B to rod C
Move disk 1 from rod A to rod C	Move disk 1 from rod A to rod C
Exiting @ tick 5450747059500 because exiting with last active thread context	Exiting @ tick 60223 <u>3</u> 6527000 because exiting with last active thread context
© ⊜ ⊕ asav@ubuntu: ~/gem5	⊗ ⊜ ⊕ asay@ubuntu: ~/gem5
Move disk 2 from rod C to rod A	Move disk 2 from rod C to rod A
Move disk 1 from rod B to rod A	Move disk 1 from rod B to rod A Move disk 3 from rod C to rod B
Move disk 3 from rod C to rod B	Move disk 3 from rod C to rod B
Move disk 1 from rod A to rod C Move disk 2 from rod A to rod B	Move disk 1 from rod A to rod C Move disk 2 from rod A to rod B
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Move disk 5 from rod A to rod C	Move disk 5 from rod A to rod C
Move disk 1 from rod B to rod A	Move disk 1 from rod B to rod A
Move disk 1 from rod B to rod A Move disk 2 from rod B to rod C	Move disk 1 from rod B to rod A Move disk 2 from rod B to rod C
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سوال ۱

برای ارزیابی کارکرد مدل های مختلف پردازنده می توان زمان اجرا (Execution Time) را در نظر گرفت . علت آن هم این است که زمان اجرا به راحتی می تواند تفاوت در تغییر فرکانس و حافظه را به مانشان دهد

زیرا در صورتی که حافظه نتواند یک در خواست را در یک کلاک جواب دهد با توجه به حجم برنامه تاثیر به سزایی در زمان اجرا دارد . همچنین درمورد پردازنده اگر یک پرازنده نتواند عملیات ها خود را در مدت یک کلاک انجام دهد و نتیجه درست را بدهد می تواند با توجه به حجم برنامه تاثیر به سزایی در زمان اجرا بگذارد .

سوال۲

با توجه به معیار گفته شده در بالا می توان به جدول زیر رسید

	1GHz Execution Time	2GHz Execution Time	4GHz Execution Time	2GHz vs 1GHz(Improvement Percentage)	4GHz vs 2GHz (Improvement Percentage	SUM
TimingSimpleCPU	332.7	355.15	340.44	-6.74782086	4.141911868	-2.60590899
MinorCPU	748.72	710.86	676.02	5.056629982	4.901105703	9.957735685

با توجه به جدول بالا می توان دید <u>MinorCPU</u> بسیار حساس تر می باشد .

علتش تفاوت در ساختار این دو پردازنده می باشد زیرا در پردازنده حساس تر عملیات به صورت pipeline انجام میشه و بنابراین تغییر در فرکانس می تواند در طول هر step تاثیر بگذارد بنابراین درکل زمان اجرا را تغییر به سزایی می دهد .

سوال ۳

با توجه به معیار گفته شده در سوال ۱ می توان به جدول زیر رسید

		I .				
	DDR3 Execution Time	HBM Execution Time	LPDDR2Execution Time	2GHz vs 1GHz(Improvement Percentage)	4GHz vs 2GHz (Improvement Percentage	SUM
TimingSimpleCPU	353.28	365.35	340.05	-3.416553442	6.924866566	3.508313124
MinorCPU	728.97	759.21	756.42	-4.148318861	0.367487256	-3.7808316

همان طور که می توان دید $rac{ ext{TimingSimpleCPU}}{ ext{TimingSimpleCPU}}$ نسبت به تغییرات ِحافظه حساس تر است .

علت این که این مدل پردازنده حساس تر است به این دلیل که دسترسی های آن به حافظه بیشتر است بنابراین تغییرات در حافظه که منجر به تغییرات در زمان پاسخگویی حافظه به درخواست های پردازنده می شود تاثیرات بیشترین بر روی این پردازنده دارد .

سوال ۴

نسبت به تغییرات CPU حساس تر است زیرا ساختار این دو پردازنده که یکی Pipeline و دیگری به صورت Multicycle می باشد بیشتری تاثیر را در زمان اجرا دارد .

سوال ۵

بله . زیرا هر برنامه تعداد منحصر به فرد دسترسی به حافظه و عملیات های پردازشی دارد بنابراین حتما نتایج آزمایش متفاوت خواهد بود .