Performance analysis between riscv64 and mips64

Lu Yahan

2020/10/29

Comparison of the total number of instructions between riscv64 and mips64

Build: riscv64.sim
Using: python3 ./v8-riscv-tools/CountInstr.py ./out/riscv64.sim/d8 ./out/mips64el.debug/d8 $test-case

test case	riscv instr count	mips64 instr count	diff	rate
sunspider-3d-cube	475928404	415508854	60419550	14.54%
sunsipder-access-fannkuch	397228043	345380701	51847342	15.01%
octane-box2d	11831897	10363187	1468710	14.17%
octane-richards	371305	328798	42507	12.93%
kraken-audio-fft	1563139528	1340949729	222189799	16.56%
kraken-ai-astar	2476899184	2097152743	379,746,441	18.10%

sunspider-access-fannkuch

riscv_instr	riscv_ratio	riscv_count	mips_instr	mips_ratio	mips_count
ld	16.15%	64153826	ld	18.39%	63502131
sd	12.32%	48942466	sd	14.12%	48784657
addi	12.16%	48294866	mov	12.53%	43263161
mv	8.30%	32976508	daddiu	12.18%	42073515
add	6.76%	26837454	dsll32	5.07%	17500188
slli	5.65%	22441519	beq	3.84%	13247554
lui	5.39%	21404731	and	3.36%	11601732
auipc	3.17%	12602923	bltzal	2.58%	8906944
andi	3.17%	12582263	bne	2.46%	8500262
li	2.84%	11267107	ori	2.26%	7789309

octane-box2dweb

arch1_instr	arch1_ratio	arch1_count	arch2_instr	arch2_ratio	arch2_count
ld	15.49%	1832895	ld	17.68%	1832165
addi	12.58%	1488550	sd	13.71%	1420311
sd	12.01%	1420513	daddiu	13.22%	1369774
mv	8.82%	1043286	mov	12.85%	1331732
add	6.67%	789045	dsll32	5.62%	581899
slli	6.32%	748108	beq	3.80%	394033
lui	5.76%	681336	and	2.98%	308507
andi	3.63%	429415	bltzal	2.47%	255822
li	3.52%	415942	bne	2.40%	248772
auipc	3.45%	407666	sltiu	2.34%	242613

sunspider-3d-cube js

arch1_instr	arch1_ratio	arch1_count	arch2_instr	arch2_ratio	arch2_count
ld	16.88%	49538774	ld	18.95%	49285189
sd	13.42%	39398983	sd	15.15%	39399074
addi	13.18%	38670424	mov	14.35%	37316254
mv	8.97%	26337547	daddiu	13.13%	34137416
add	6.97%	20444332	dsll32	4.68%	12159348
lui	5.96%	17504494	and	3.29%	8560012
slli	5.37%	15763736	bltzal	2.90%	7530696
li	3.55%	10416043	ori	2.87%	7468188
andi	3.20%	9405412	beq	2.80%	7291681
auipc	2.88%	8450674	jalr	2.49%	6471417

octane-richards

arch1_instr	arch1_ratio	arch1_count	arch2_instr	arch2_ratio	arch2_count
ld	15.37%	57072	ld	17.44%	57335
addi	12.45%	46235	sd	13.64%	44851
sd	12.03%	44676	daddiu	13.45%	44223
mv	8.91%	33093	mov	12.94%	42555
slli	6.68%	24787	dsll32	6.29%	20688
add	6.63%	24612	beq	3.62%	11889
lui	5.89%	21858	and	3.03%	9975
li	3.83%	14232	bne	2.46%	8084
andi	3.61%	13410	bltzal	2.43%	7974
auipc	3.19%	11834	sltiu	2.39%	7872

sunspider-bitops-bitwise-and

riscv_instr	riscv_ratio	riscv_count	mips64_instr	mips64_ratio	mips64_count
ld	15.35%	15071730	ld	16.74%	15057401
sd	12.85%	12617381	sd	14.03%	12617377
addi	12.04%	11816753	mov	12.41%	11166258
mv	8.41%	8251161	daddiu	12.33%	11096460
slli	6.80%	6675503	dsll32	6.78%	6098161
add	5.97%	5860893	beq	3.77%	3394124
lui	5.00%	4909198	and	3.51%	3154496
andi	3.54%	3472514	bne	3.09%	2782738
li	3.34%	3277871	bltzal	2.42%	2179321

sunspider/math-partial-sums.js

riscv_instr	riscv_ratio	riscv_count	mips_instr	mips_ratio	mips_count
ld	16.42%	51914844	ld	18.63%	52161438
addi	13.32%	42114803	sd	14.77%	41355390
sd	12.97%	41012404	daddiu	13.58%	38016200
mv	8.30%	26248885	mov	12.47%	34914519
add	6.71%	21227280	dsll32	4.19%	11731859
lui	6.05%	19114878	beq	3.33%	9334174
slli	5.35%	16925221	ori	3.20%	8956858
andi	3.51%	11104969	and	3.11%	8701814
li	3.39%	10730706	bltzal	2.51%	7012234

sunspider/string-base64

arch1_instr	arch1_ratio	arch1_count	arch2_instr	arch2_ratio	arch2_count
ld	16.29%	80573747	ld	18.48%	80314105
sd	12.92%	63878694	sd	14.70%	63872969
addi	12.72%	62904782	mov	13.60%	59102578
mv	8.80%	43497317	daddiu	13.41%	58300891
add	6.97%	34485124	dsll32	5.21%	22631589
lui	5.67%	28017181	beq	3.23%	14031125
slli	5.42%	26775905	and	3.20%	13887044
li	3.81%	18829986	bltzal	2.72%	11802479
andi	3.50%	17326664	ori	2.43%	10566699

kraken/imaging-darkroom.js

arch1_instr	arch1_ratio	arch1_count	arch2_instr	arch2_ratio	arch2_count
ld	14.35%	222165979	ld	12.57%	190405931
addi	9.99%	154601157	sd	9.41%	142589188
sd	9.21%	142589480	mov	9.10%	137909389
slli	6.81%	105426021	daddiu	8.86%	134224908
mv	6.18%	95719119	ori	7.82%	118472619
add	5.18%	80150333	lui	4.66%	70648146
lui	5.01%	77581546	dsll32	3.56%	53965706
auipc	4.50%	69674283	mul.d	3.55%	53836228
fmul.d	3.48%	53836228	mtc1	2.77%	42001326

kraken-audio-fft

riscv_instr	riscv_ratio	riscv_count	mips_instr	mips_ratio	mips_count
ld	13.27%	328722527	ld	15.65%	328231973
slli	9.34%	231434098	sltu	11.46%	240279388
and	8.02%	198694677	beq	9.99%	209517212
addi	6.23%	154204628	daddiu	6.79%	142339093
bne	6.01%	148882446	dsll32	6.16%	129129055
sltu	5.83%	144388350	and	5.73%	120179442
seqz	4.45%	110102397	bne	5.25%	110203283
sd	4.40%	109043351	sd	5.20%	109066116
add	4.26%	105567619	mov	4.72%	98952350
neg	3.87%	95931996	movn	4.56%	95669317

kraken-ai-astar

riscv_instr	riscv_ratio	riscv_count	mips_instr	mips_ratio	mips_count
slli	9.99%	156080780	ld	10.26%	137647692
ld	8.89%	138936883	sltu	9.68%	129842220
add	7.85%	122630064	mov	7.52%	100879308
addi	7.43%	116207359	dsll32	7.31%	97979671
sltu	5.64%	88238650	daddiu	6.78%	90934548
xori	5.53%	86485486	beq	6.67%	89437465
sd	5.39%	84328290	xori	6.45%	86485512
mv	5.01%	78347923	sd	6.29%	84325498
lui	3.13%	48983610	daddu	6.24%	83741741
auipc	2.94%	45927464	ldc1	2.75%	36919922

Benchmark IPC

Hifive Unleashed board
CPU：SIFIVE U54
Clock: 1G Hz
PEAK IPC: 1

Command:perf stat ./d8 ./test/benckmark/XXX.js

Name	IPC	Name	IPC
sunspiderbitops-bits-in-byte	0.58	octane box2d	0.44
sunspider math-partial-sums.js	0.59	octane richards.js	0.35
sunspider access-fannkuch.js	0.55	kraken audio-fft.js	0.55
sunspider 3d-cube.js	0.50	kraken ai-astar	0.37