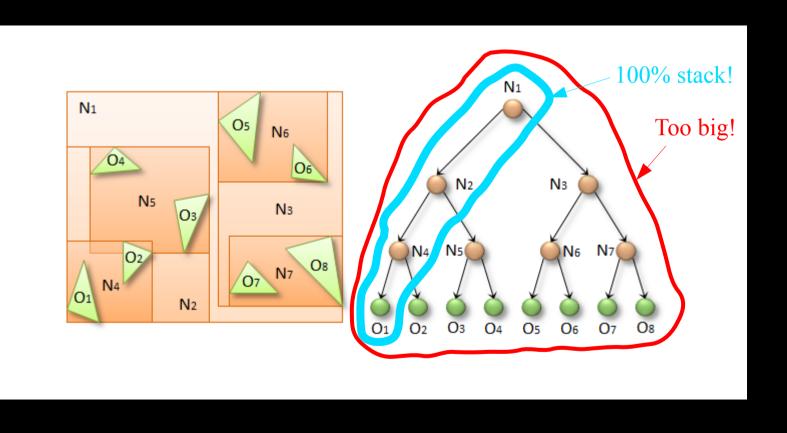


Overview



Overview

• Goal: gigaray/sec (1e9 rays/second) on reasonably sized chip (< 700mm², preferably smaller)

- Store current traversal on local stack
- Also as much of several traversals as possible
- Think of this as a better L1-cache

• Also optimize stuff/write really good pathtracer

	LOADED	TYPE Interior	POINTE
1	 0	 <unloaded></unloaded>	-
2	1	 Interior	-
3	1	 Interior	
4	 0	<pre><unloaded></unloaded></pre>	-
5	1	 Interior	4
6	 0	 <unloaded></unloaded>	
7	1	 Interior	-
8	 0	<pre><unloaded></unloaded></pre>	-
9	1	Interior	4
10	 0	<unloaded></unloaded>	
11	1	Interior	•
12	 0	<unloaded></unloaded>	-
13	1	 Interior	-
14	 0	<unloaded></unloaded>	•
15	1	Interior	-
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17	 0	<unloaded></unloaded>	
18	1	Interior	-
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20	1	Interior	
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23	0	<unloaded></unloaded>	
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26		 Triangle	
27		 Triangle	
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30		 Triangle	4
31	0	 <unloaded> </unloaded>	
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34	1	 Interior <unloaded></unloaded>	—
35	0		
36		 Interior	—
37	 0		
38	1	<pre> <unloaded></unloaded></pre>	-
39	 0	 <unloaded> </unloaded>	
40	 0	 <unloaded></unloaded>	—

A Full Stack

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39		<unloaded> </unloaded>		39	0	<unloaded></unloaded>		39	-	<empty></empty>	1
40	0	<unloaded> </unloaded>		40	0	<unloaded></unloaded>		40	-	<empty></empty>	

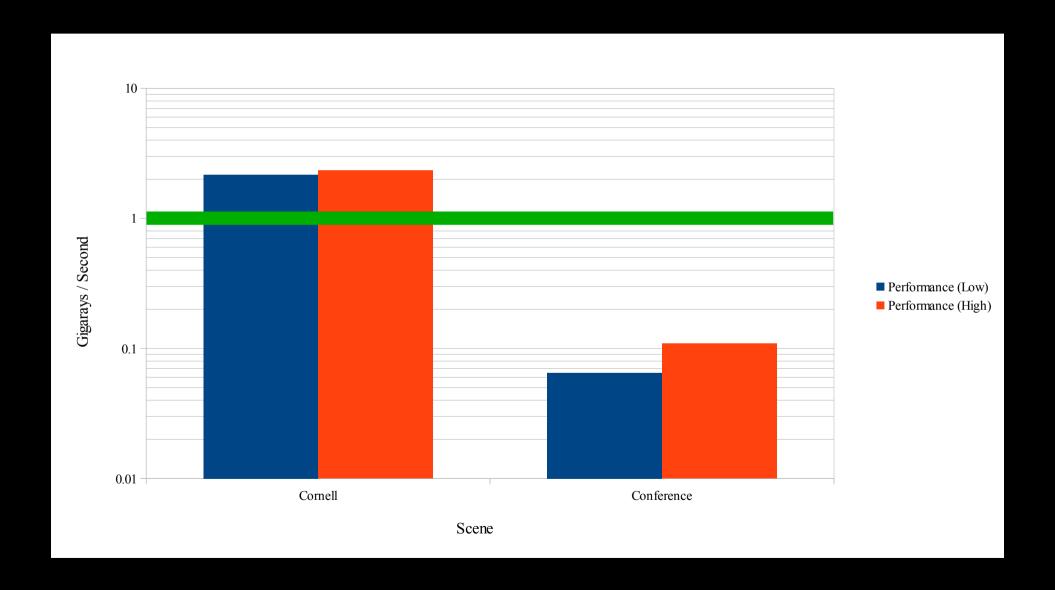
Results (Major Factors)

- A lot of scene fits on the stack (reuse)
- Shadow rays (coherent, occluders usually nearby)

- Very little of scene fits (less reuse)
- Threads jumping in screen-space with shallow depth (incoherency, less reuse)

• Motivating example . . .

Results (Min and Max)



Results

- Cornell
 - Everything fits on stack, and each processor can reuse
- Conference
 - Not everything fits on stack and processors jump in image space a lot → much less reuse
- Hairball/Dragon (simulation too large → too long)

Performance vs. Area

• Area calculation bogus for localstore size (constant)

• Used default size (with allowances for simulator/debug info.), map to same size stack

- 297mm² → reasonably sized chip!
 - Inaccurate; but probably not by too much

Performance Comparison

- Reference path tracer runs . . . differently
 - Use L1 and no L2
 - Try to match areas
 - Unsuccessful; and area calculations bogus anyway

Certainly looks like my way is faster overall

Weird slowdowns though.
 Might be ray profiling code.

Difficulties

- Simulator
 - Very slow
 - No debugging
 - Bugs and unimplemented features
- Clever mistakes
 - $\sim 2,000$ lines of deep pointer arithmetic
 - Fancy compiler options (gah)

Conclusion

Mixed results

• Should be combined with ray rescheduling of some kind (even just one thread gets 16 pixels → big win)

 Lots more comparison work is needed → weakest part of project

• Still room for optimization . . .

Questions

Image Credits

- me
- others