Ray Tracing in CnC

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Simple

Better

Animated

Awesome

Ray Tracing in CnC

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A Simple Ray Tracer

A Slightly Better Ray Tracer

An Animated Ray Tracer

An Awesome Ray Tracer

A Simple Ray Tracer

Ray Tracing in CnC

Washington State University
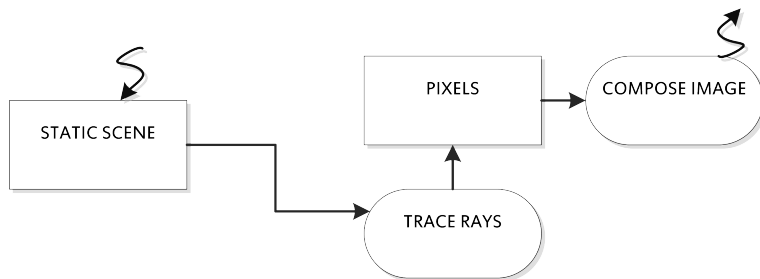
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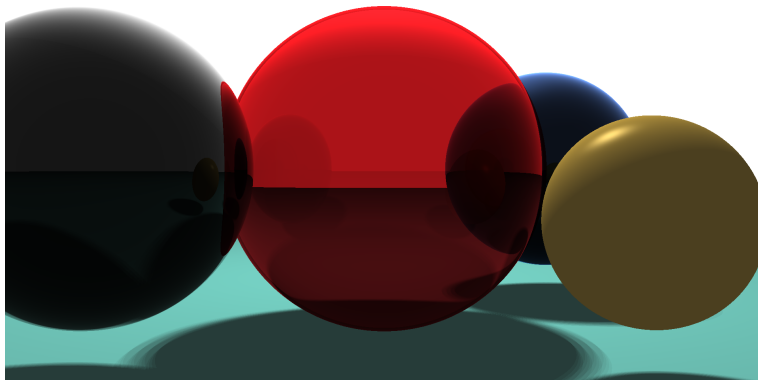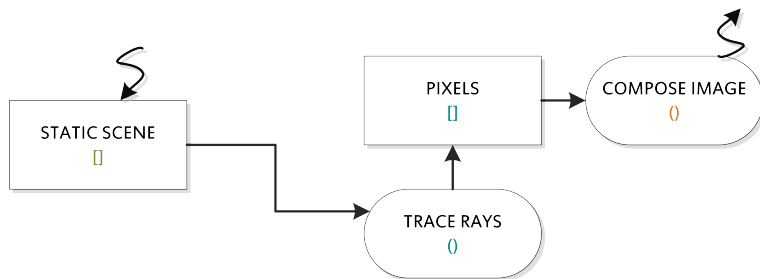# A Simple Ray Tracer

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- ▶ 1080x1920
- ▶ 2073600 pixels
- ▶ 2073600 x 4 x 4 initial rays
- ▶ **23.9314** seconds to compute
- ▶ **1** instance of the trace rays step

A SIMPLE RAY TRACER

RAY TRACING IN CNC

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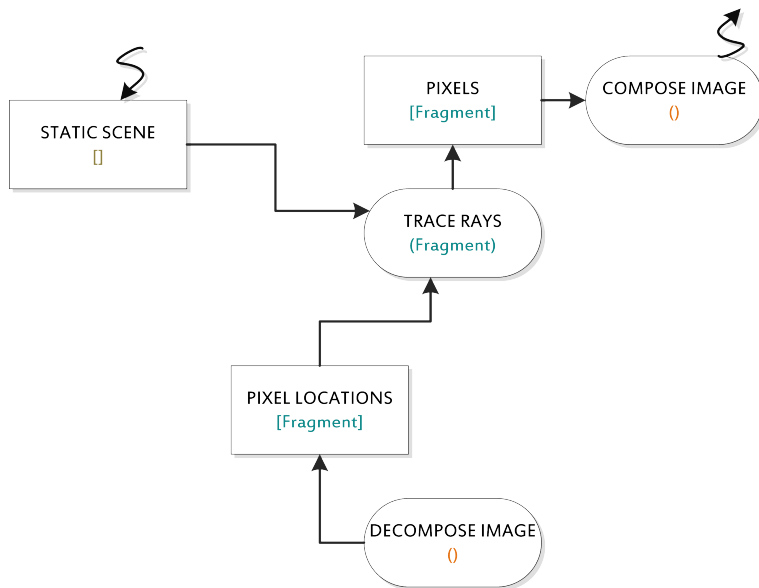
STATIC SCENE
[]

PIXELS
[]

COMPOSE IMAGE
()

TRACE RAYS
()

A Slightly Better Ray Tracer

STATIC SCENE
[]

PIXELS
[Fragment]

COMPOSE IMAGE
()

TRACE RAYS
(Fragment)

PIXEL LOCATIONS
[Fragment]

DECOMPOSE IMAGE
()

A Slightly Better Ray Tracer

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- 1080x1920
- 2073600 pixels
- 2073600 x 4 x 4 initial rays split amongst 8 fragments (259200 pixels each)

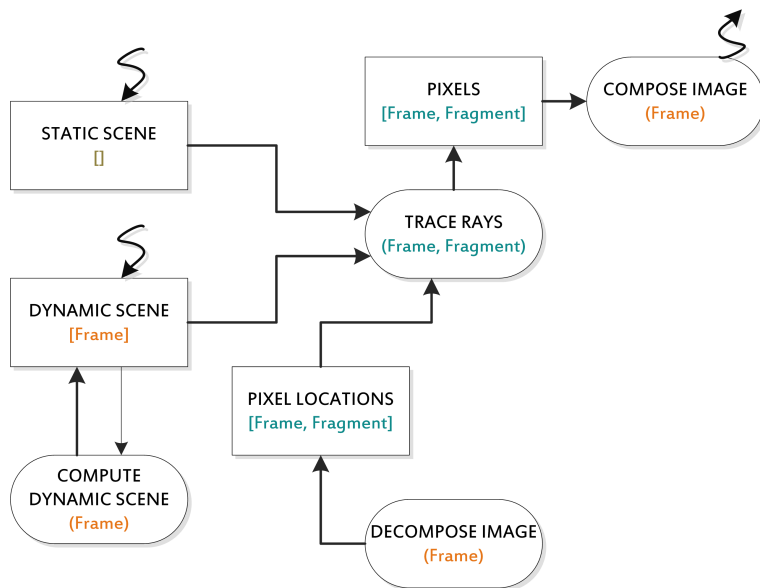| 1	2	3	4
2.86122	5.78101	3.40776	5.82813
5	6	7	8
7.89721	7.67004	8.41823	5.80659

- **6.19** average seconds to compute
- **8** instances of the trace rays step

AN ANIMATED RAY TRACER

RAY TRACING IN CNC

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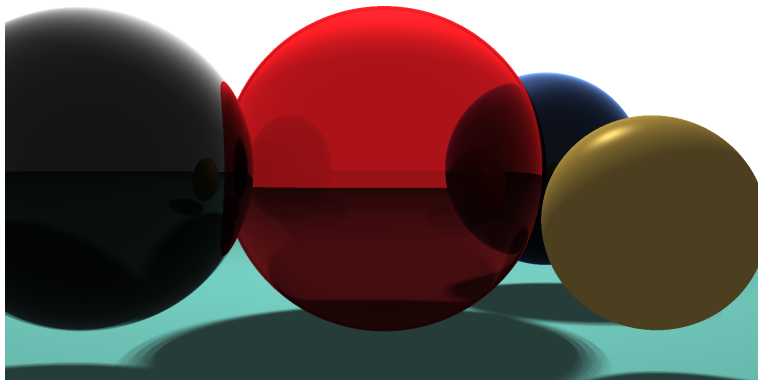# An Animated Ray Tracer

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An Animated Ray Tracer

Ray Tracing in
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- 1080x1920 x 10 frames
- 2073600 pixels per frame
- 2073600 x 4 x 4 initial rays per frame split amongst 8 fragments (259200 pixels each)
- **6.19** average seconds to compute
- **80** instances of the trace rays step

RAY TRACING IN
CNC

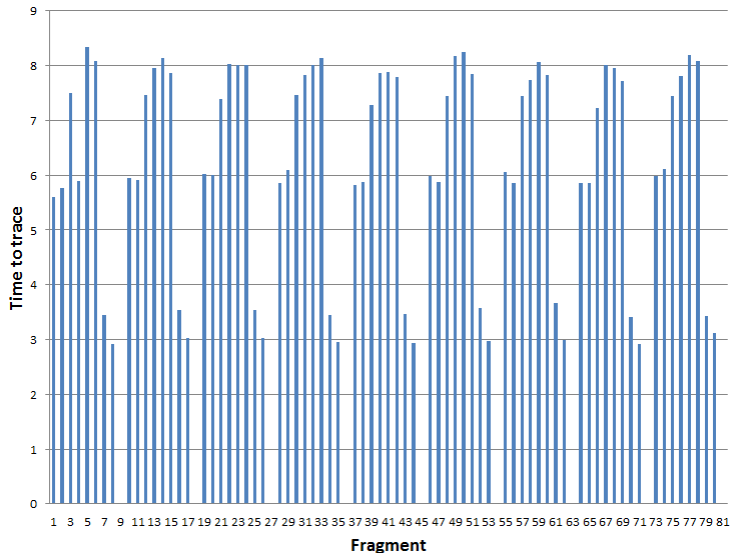WASHINGTON
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An Animated Ray Tracer

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- Producing high definition images at around 6 seconds per frame, not bad!
- A standard deviation of 1.9 hurts the actual time per frame, 8.12
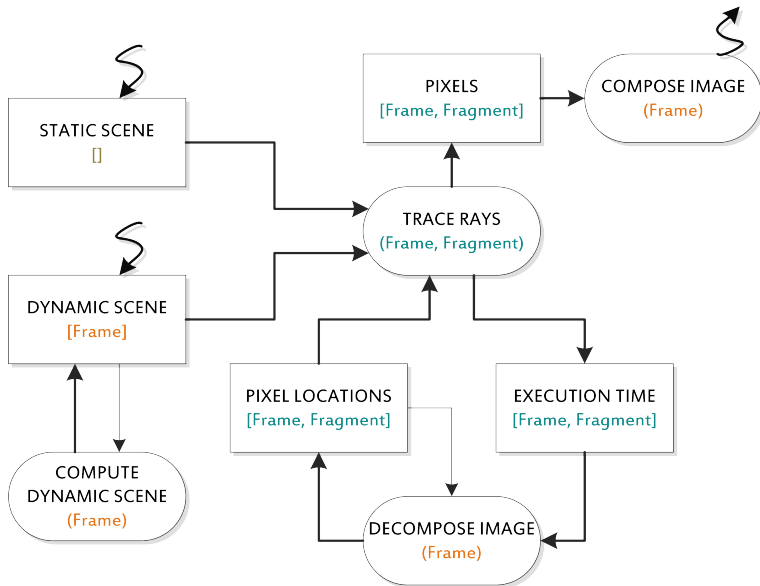- But... what if we dynamically assign the pixels based on the previous computation time?

An Awesome Ray Trace

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STATIC SCENE
[]

DYNAMIC SCENE
[Frame]

COMPUTE DYNAMIC SCENE
(Frame)

PIXELS
[Frame, Fragment]

COMPOSE IMAGE
(Frame)

TRACE RAYS
(Frame, Fragment)

PIXEL LOCATIONS
[Frame, Fragment]

EXECUTION TIME
[Frame, Fragment]

DECOMPOSE IMAGE
(Frame)

Computation Time per Fragment
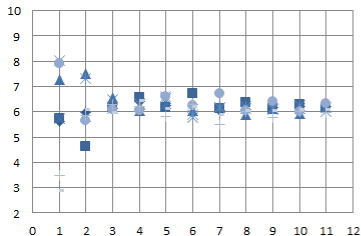
Ray Tracing in CnC
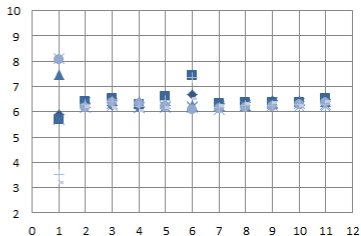
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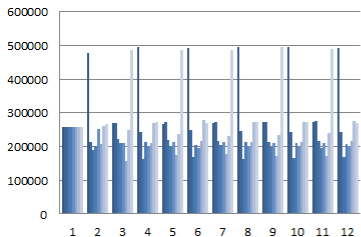
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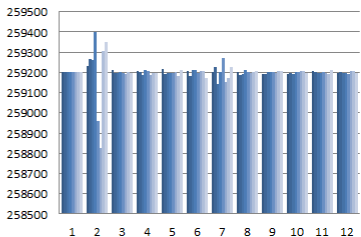Execution Time per Frame (Sequential Picking)

Execution Time per Frame (Random Picking)

Pixels per Frame per Bin (Sequential Picking)

Pixels per Frame per Bin (Random Picking)

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- Tested using two different algorithms, sequential and random picking
- Statistics were taken after the first iteration

case	average	worst	best	sdd
no fragments	**6.16**			
constant size	6.19	8.35	**2.91**	1.90
sequential picking	6.17	7.51	4.62	0.35
random picking	6.32	**7.44**	6.05	**0.21**