

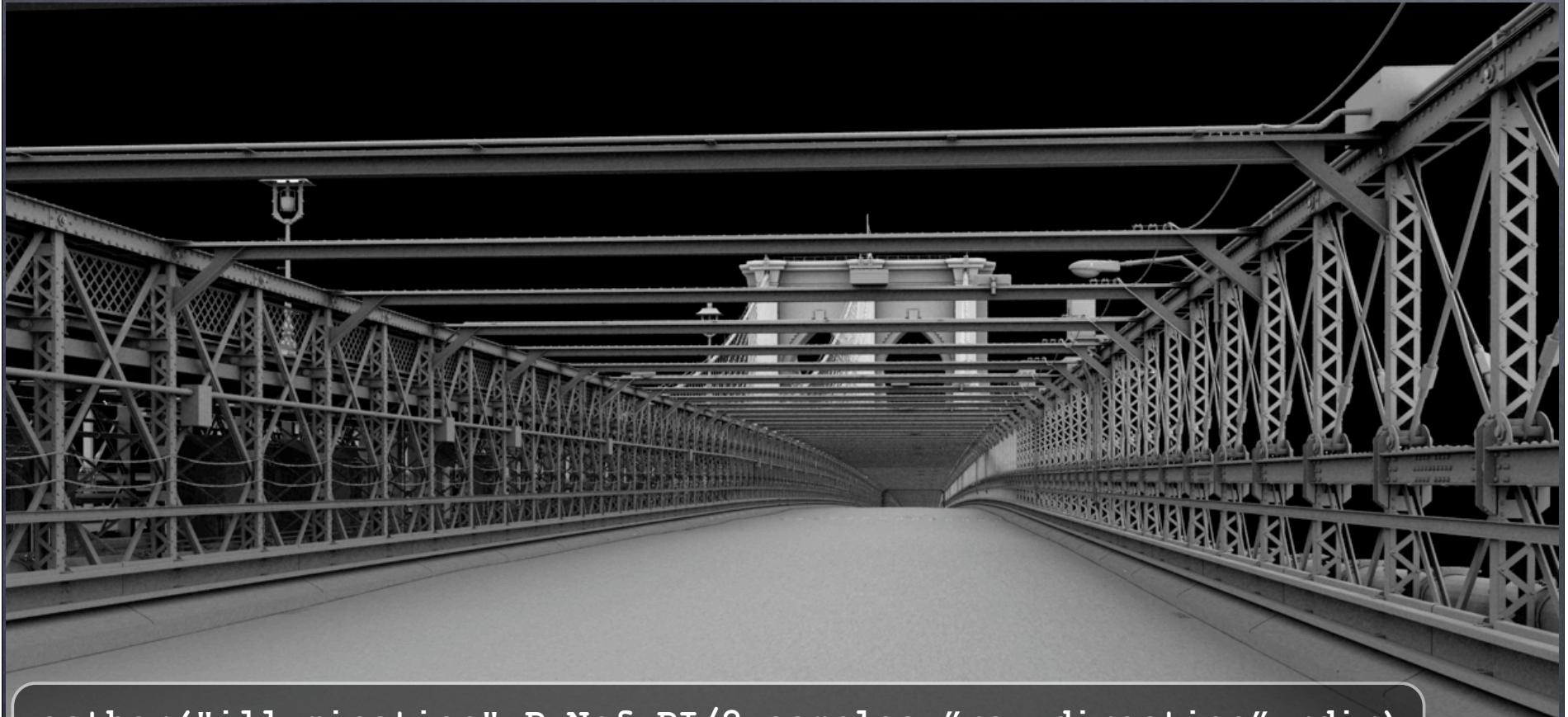
# Save 97%\* with Hybrid Ambient Occlusion

( \*Some restrictions apply. Offer not valid in Puerto Rico. )

Søren Ragsdale  
Stupid RAT Tricks, Siggraph 2005

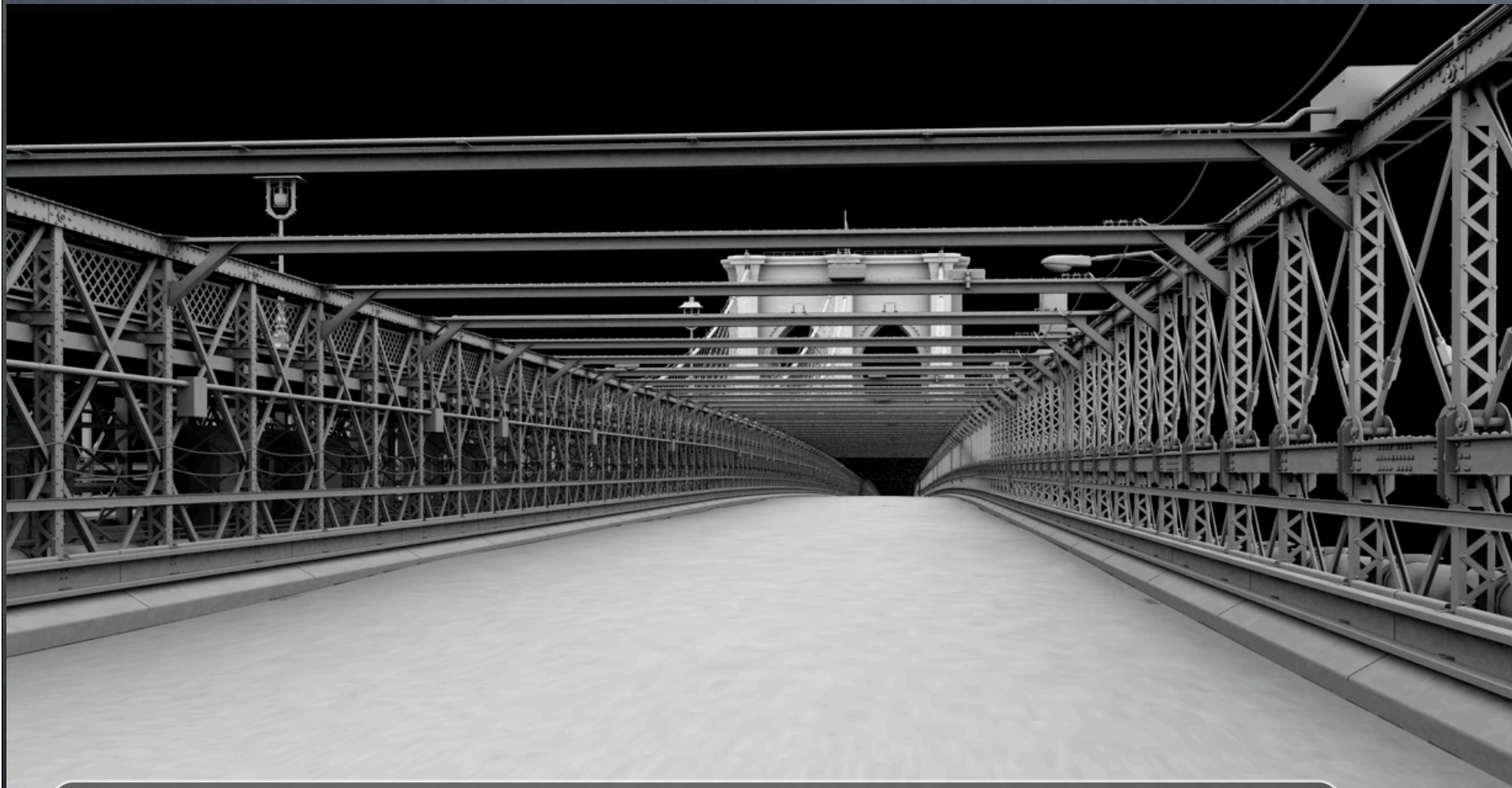
prman-12.0, gather() = 21:12:14

prman-12.5, gather() = 08:26:55 (estimated)



```
gather("illumination", P, Nnf, PI/2, samples, "ray:direction", rdir)
    hits += 1;
else
    envdir += rdir;
occ = hits/samples;
envdir = normalize(envdir);
```

prman-12.0, occlusion() = 16:11:06  
prman-12.5, occlusion() = 03:22:06



```
occ = occlusion(P,Nnf,samples,"environmentdir",envdir);
```

14 Artists

+ 80 Render Nodes

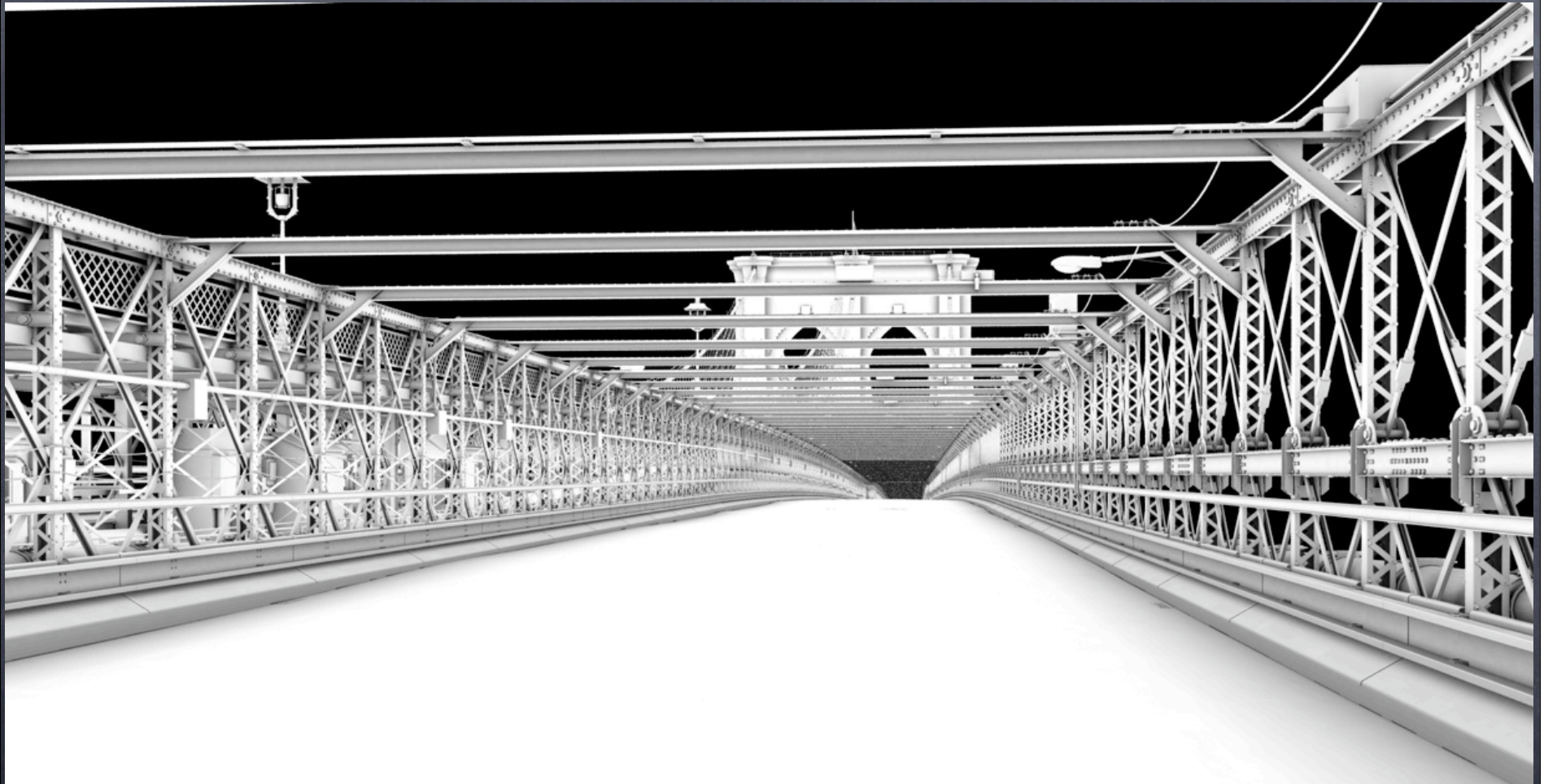
+ 45 Finals Per Week

+ 16:00:00/frame

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= 1 unhappy producer

prman-12.0, occlusion() + "maxdist" = 6:50:02 (estimated)  
prman-12.5, occlusion() + "maxdist" = 2:44:01



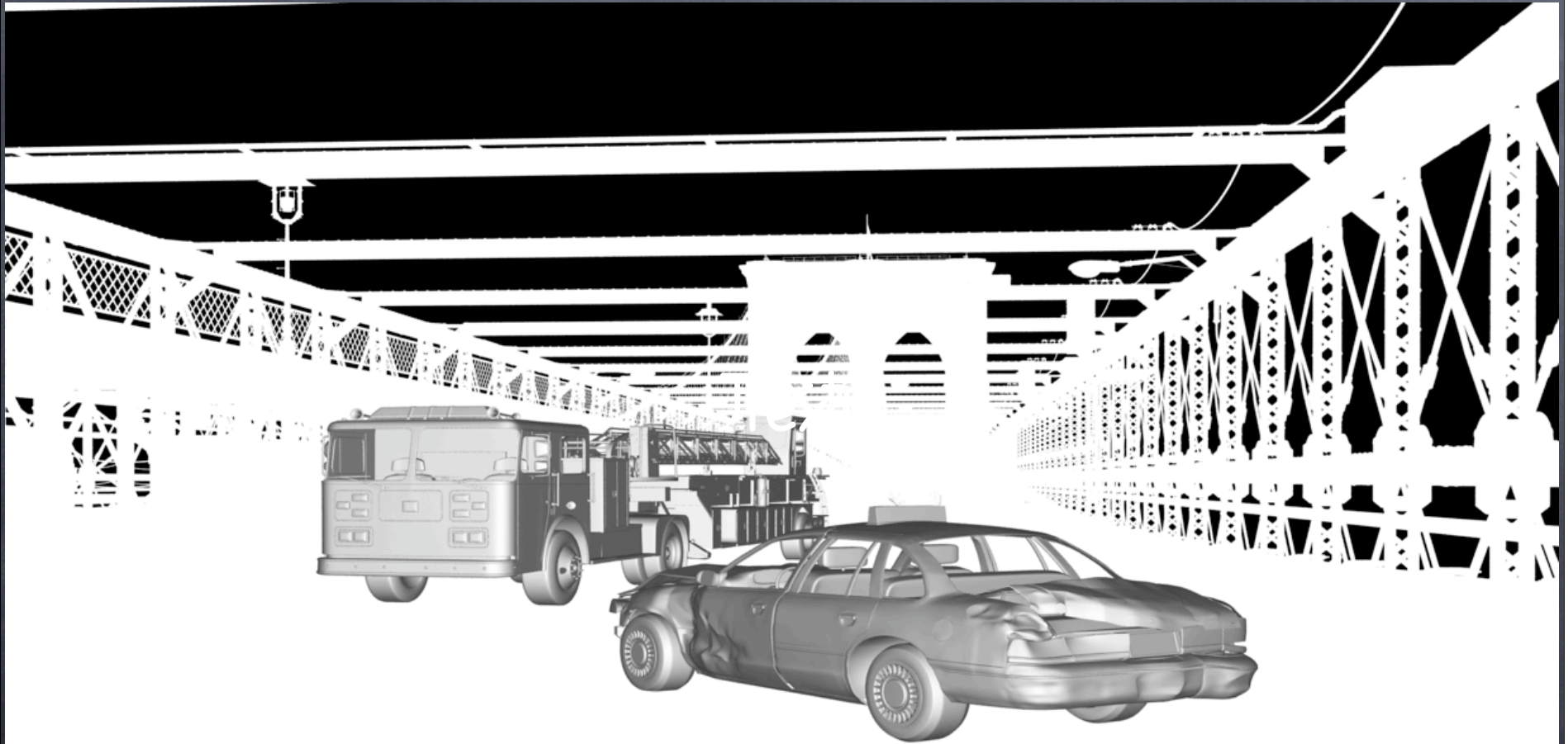
```
occlusion(P,Nnf,samples,"environmentdir",envdir,"maxdist",maxdist);
```

prman-12.0, texture3d() = 28:11 (user 03:22) 39.84 GB  
prman-12.5, texture3d() = 09:20 (user 05:42) 2.59 GB



```
texture3d(input_cache,point P,normal Nnf,  
"occlusion",c_occ, "envdir", c_envdir);
```

## But what about moving objects?



- Cache static occlusion with brick maps
- Cast live occlusion rays to moving objects in trace sets
- Combine cached & live occlusion in the shader at render time

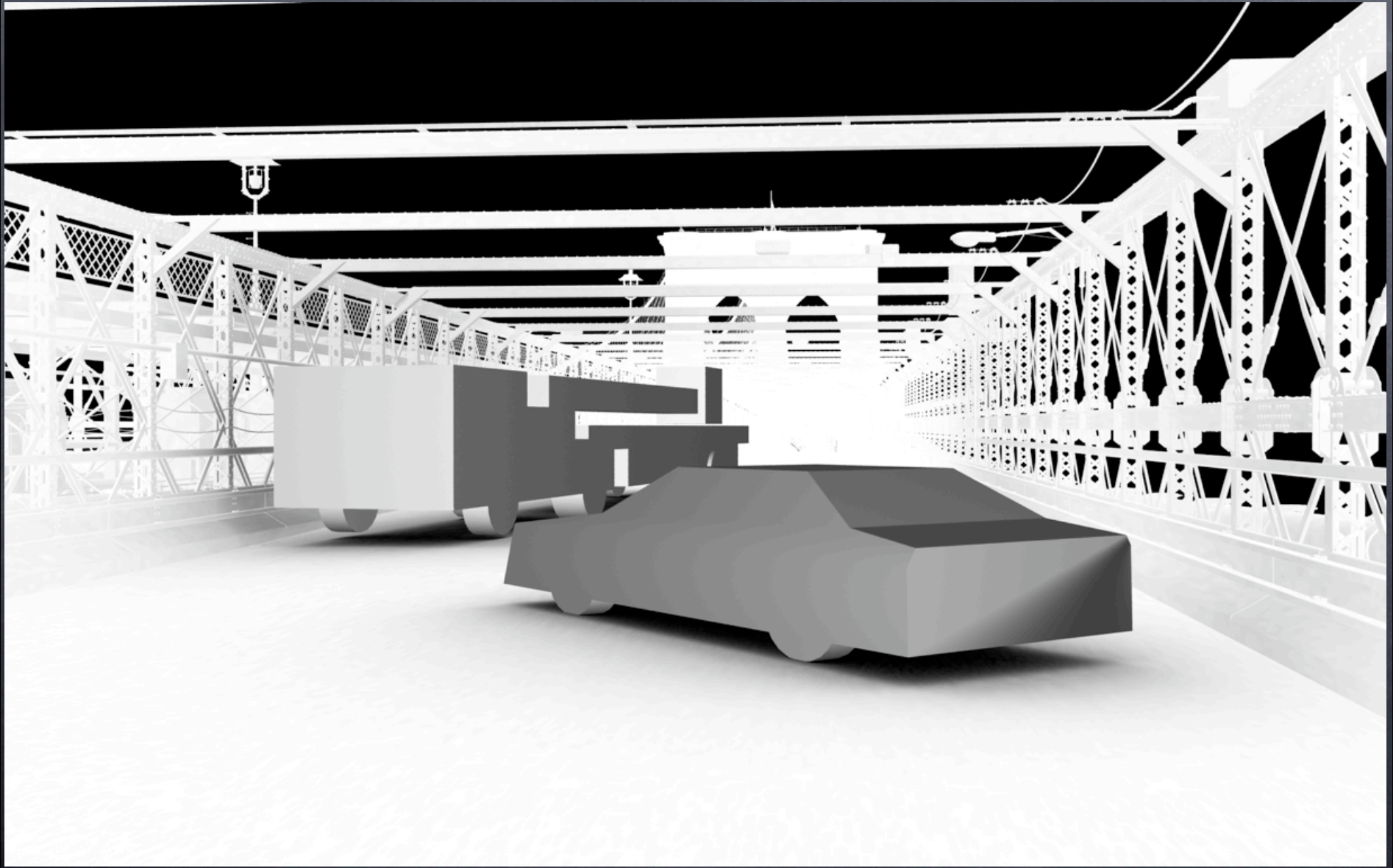
prman-12.0, occlusion()+texture3d() = 1:40:56  
prman-12.5, occlusion()+texture3d() = 0:55:27



```
texture3d(bkmap, P, Nnf, "occlusion", c_occ, "envdir", c_envdir);  
live_occ = occlusion(P, Nnf, samples, "subset", subset,  
                  "environmentdir", live_envdir);  
occ = 1 - ((1 - c_occ) * (1 - live_occ));  
envdir = mix(c_envdir, live_envdir, live_occ / (live_occ + c_occ));
```



Use low-res geometry to minimize intersection tests.



prman-12.0, occlusion()+texture3d() = 1:13:57  
prman-12.5, occlusion()+texture3d() = 0:35:40



```
texture3d(bkmap, P, Nnf, "occlusion", c_occ, "envdir", c_envdir);  
live_occ = occlusion(P, Nnf, samples, "subset", subset,  
                  "environmentdir", live_envdir);  
occ = 1 - ((1 - c_occ) * (1 - live_occ));  
envdir = mix(c_envdir, live_envdir, live_occ / (live_occ + c_occ));
```