The SLOW-tracer uses 9 jittered rays per pixel but does not use space subdivision or a bounding box scheme to improve its performance. The scene to be traced contains 1000 randomly distributed spheres and the image size is 600 by 400 pixels. If ray tracing is stopped after the 3rd reflection or refraction, estimate how many rays will be fired to produce the final image. You may assume that any ray will have a 20% chance of hitting a sphere, 25% of the spheres are reflective or refractive and that there are two light sources.



p = 9 * 600 * 400 primary rays

p/5 rays hit a sphere and we must send 2 * p/5 shadow feelers.

25% are reflective so send out a further q = 0.25p/5 secondary rays

q/5 hits so we add 2*q/5 shadow feelers.

25% are reflective so send out a further r = 0.25q/5 tertiaryary rays

r/5 hits so we add 2*r/5 shadow feelers. no more recursions

we have: total = p + 2p/5 + q + 2q/5 + r + 2r/5= 2,160,000 + 864,000 + 108,000 + 43,200 + 540 + 216 = 3,175,956

Note that the calcualtion is for the number of rays - another question would be how many intersection tests are performed?