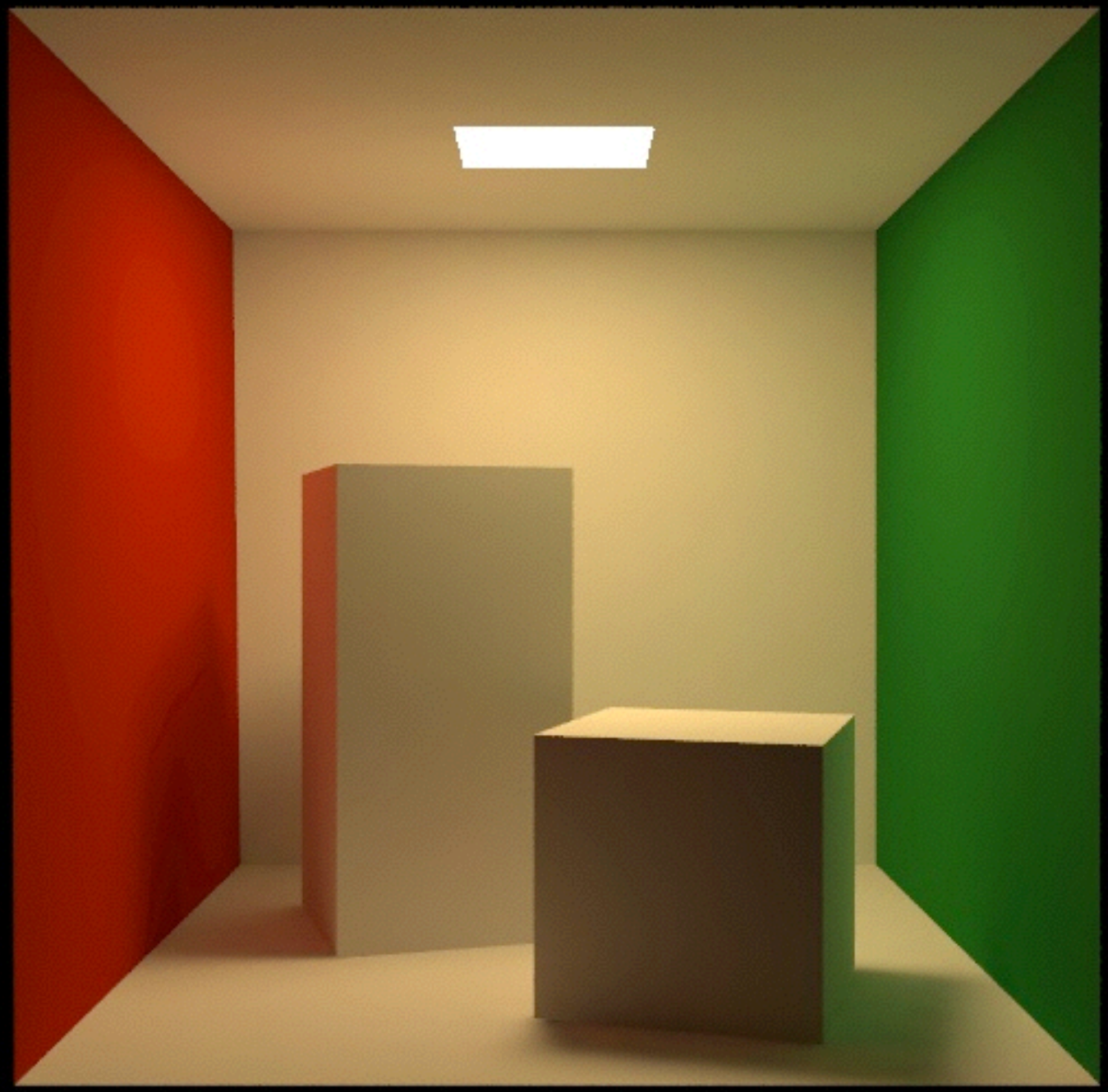
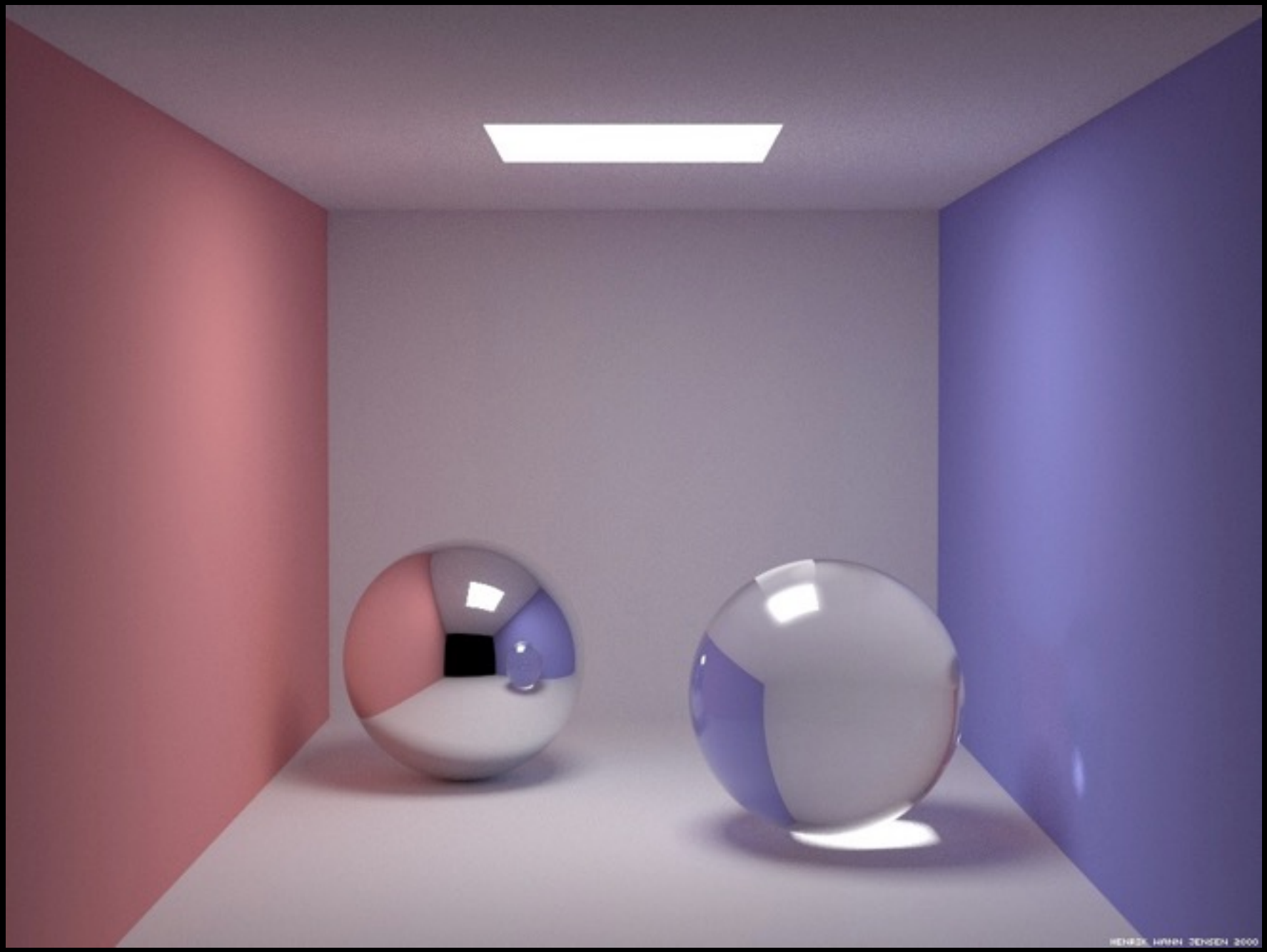
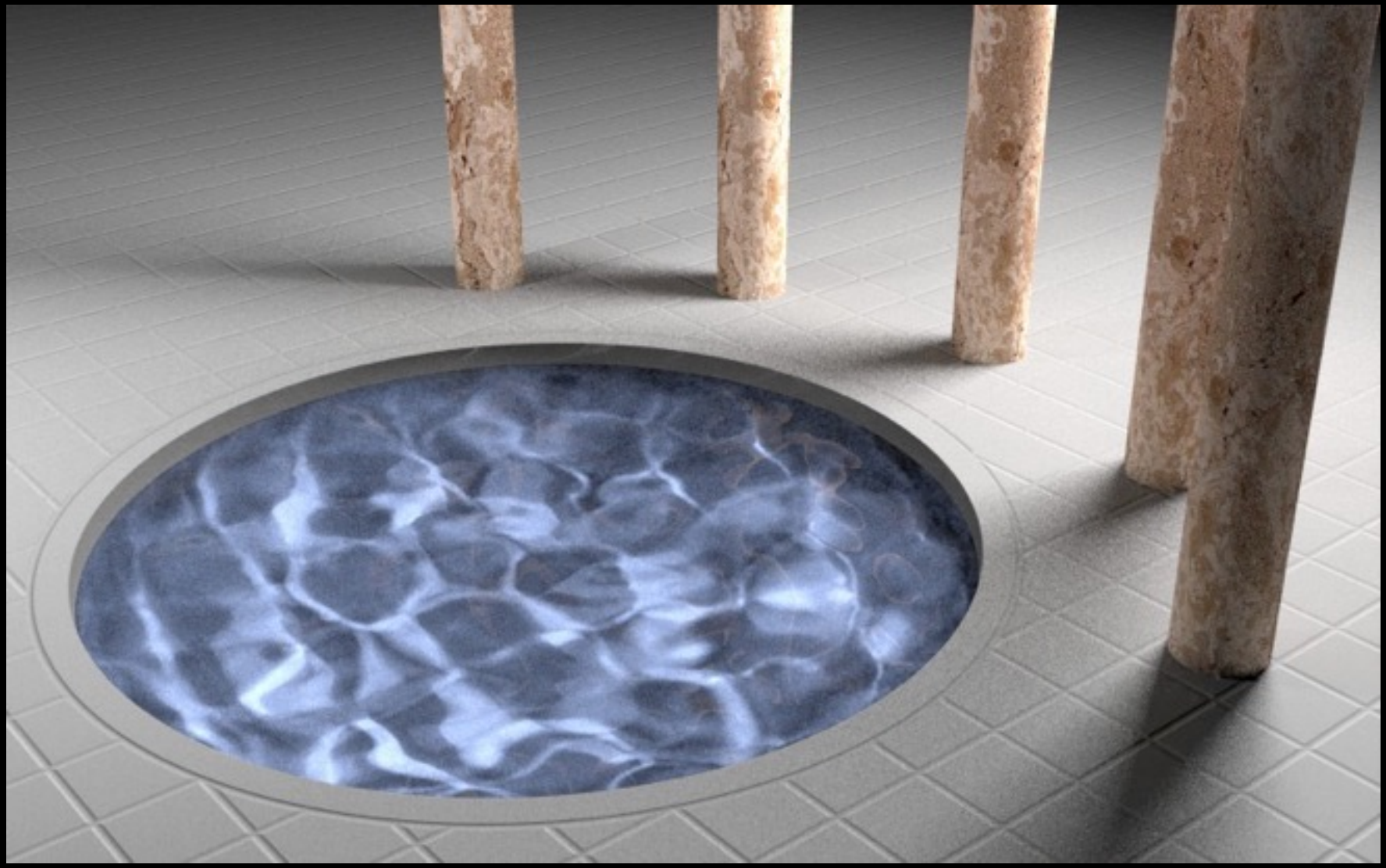
Path Tracing

Images for CS6630 lecture




HENRIK WANN JENSEN 2000



Kajiya-style path tracing, version 0:

rayRadianceEst(x, ω):
    y = traceRay(x, ω)
    return emittedRadiance(y, –ω) + reflectedRadianceEst(y, –ω)

reflectedRadianceEst(x, ωr):
    ωi = uniformRandomPSA(n(x))
    return π * brdf(x, ωi, ωr) * rayRadianceEst(x, ωi)

Kajiya-style path tracing, version 0.5:

```
rayRadianceEst(x, ω):
    y = traceRay(x, ω)
    return emittedRadiance(y, –ω) + reflectedRadianceEst(y, –ω)

reflectedRadianceEst(x, ωr):
    if random() < survivalProbability:
        ωi = uniformRandomPSA(n(x))
        return π * brdf(x, ωi, ωr) * rayRadianceEst(x, ωi) / survivalProbability
    else
        return 0
```

Kajiya-style path tracing, version 0.75:

```
rayRadianceEst(x, ω):
    y = traceRay(x, ω)
    return emittedRadiance(y, –ω) + reflectedRadianceEst(y, –ω)

reflectedRadianceEst(x, ωr):
    if random() < survivalProbability:
        ωi, pdf = brdfSample(x, n(x))
        return brdf(x, ωi, ωr) * rayRadianceEst(x, ωi) / (pdf * survivalProbability)
    else
        return 0
```

Kajiya-style path tracing, version 1.0:

```
rayRadianceEst(x, ω):
    y = traceRay(x, ω)
    return emittedRadiance(y, –ω)
        + reflectedRadianceEst(y, –ω)

directRadianceEst(x, ωr):
    ωi, pdf = luminaireSample(x, n(x))
    y = traceRay(x, ωi)
    return brdf(x, ωi, ωr)
        * emittedRadiance(y, –ωi) / pdf

reflectedRadianceEst(x, ωr):
    return directRadianceEst(x, ωr)
        + indirectRadianceEst(x, ωr)

indirectRadianceEst(x, ωr):
    if random() < survivalProbability:
        ωi, pdf = brdfSample(x, n(x))
        y = traceRay(x, ωi)
        return brdf(x, ωi, ωr)
            * reflectedRadianceEst(y, –ωi)
            / (pdf * survivalProbability)
    else:
        return 0
```

Kajiya-style path tracing, version 1.0m:

```
directRadianceEst(x, ωr):
    ωl, pll = luminaireSample(x, n(x))
    pbl = brdfPDF(ωl)
    ωb, pbb = brdfSample(x, n(x))
    plb = luminairePDF(ωb)
    yl = traceRay(x, ωl)
    yb = traceRay(x, ωb)
    fl = brdf(x, ωl, ωr)
        * emittedRadiance(yl, –ωi)
    fb = brdf(x, ωb, ωr)
        * emittedRadiance(yb, –ωi)
    return fl / (pll + pbl) + fb / (plb + pbb)
```

```
reflectedRadianceEst(x, ωr):
    return directRadianceEst(x, ωr)
        + indirectRadianceEst(x, ωr)

indirectRadianceEst(x, ωr):
    if random() < survivalProbability:
        ωi, pdf = brdfSample(x, n(x))
        y = traceRay(x, ωi)
        return brdf(x, ωi, ωr)
            * reflectedRadianceEst(y, –ωi)
            / (pdf * survivalProbability)
    else:
        return 0
```

Kajiya-style path tracing, version 1.1:

```
reflectedRadianceEst(x, ωr):
    ωl, pll = luminaireSample(x, n(x))
    pbl = brdfPDF(ωl)
    ωb, pbb = brdfSample(x, n(x))
    plb = luminairePDF(ωb)
    yl = traceRay(x, ωl)
    yb = traceRay(x, ωb)
    fl = brdf(x, ωl, ωr)
        * emittedRadiance(yl, –ωl)
    fb = brdf(x, ωb, ωr)
        * emittedRadiance(yb, –ωb)
    reflRad = fl / (pll + pbl) + fb / (plb + pbb)
    if random() < survivalProbability:
        reflRad += brdf(x, ωb, ωr) / pbb
            * reflectedRadianceEst(yb, –ωb)
            / survivalProbability
    return reflRad
```