Parametrization of line is
blend between points

$$pos(t, p0, pM) := p0 \cdot (1 - t) + pM \cdot t$$

$$\frac{d}{dt} pos(t, p0, pM) \rightarrow pM - p0$$

arclength of a line between 2
pts

$$\int_0^1 |pM - p0| \, dt \rightarrow \sqrt{(pM - p0)^2}$$

$$\int_0^1 \left(\overrightarrow{pos(t, p0, pM)} \cdot \vec{y}\right) \cdot \left| \frac{d}{dt} pos(t, p0, pM) \right| dt \rightarrow \frac{y \cdot (pM + p0) \cdot \sqrt{(pM - p0)^2}}{2}$$

$$h(p) := \|p\| - Rp$$

$$\frac{d}{} \overrightarrow{pos(t)} \rightarrow ?$$

dt

$Pv \qquad fragDir \qquad R := 70 \quad Rp \qquad Ha$

$$Pve\_(Pv) := (0 - Pv) \cdot fragDir + \sqrt{R^2 - \|Pv + ((0 - Pv) \cdot fragDir) \cdot fragDir\|^2}$$

$$EndL(p, dir) := (0 - p) \cdot dir + \sqrt{R^2 - \|p + ((0 - p) \cdot dir) \cdot dir\|^2}$$

$$EndP(p, dir) := EndL(p, dir) \cdot dir + p$$

Calculation of endpoint for view ray

$$pLerp(t, p0, pM) := p0 \cdot (1 - t) + pM \cdot t$$

in final solution replace all squares with direct multiplication

$$ro(h) := Adens0 - \frac{h}{Ha} \cdot Adens0$$

$$scat(ro) := sk \cdot ro$$

$endlPv$
$endlPve$
$endpPv$
$endpPve$

$$\int_0^1 ro\left(h\left(lrps\left(t,s\right)\right)\right)\cdot EndP\left(pLerp\left(s,Pv,Pve\right),toLdir\right)\,\mathrm{d}t$$

$$\int_0^1 \left\|EndP\left(pLerp\left(s,Pv,Pve\right),toLdir\right)\right\|\cdot LmaxV\,\mathrm{d}s$$

$$vpoint\left(s\right):=pLerp\left(s,Pv,Pve\right)$$

$$Lendp\left(s\right):=pLerp\left(s,endpPv,endpPve\right)$$

$$scanLightPt\left(t,s\right):=pLerp\left(t,vpoint\left(s\right),Lendp\left(s\right)\right)$$

$$RayAtmLen\left(s\right):=pLerp\left(s,endlPv,endlPve\right)$$

length of ray through atmosphere to v point

$$H\left(s\right):=pLerp\left(s,0,Ha\right)\rightarrow Ha\cdot s$$

$$Hr\left(t,s\right):=pLerp\left(t,H\left(s\right),Ha\right)\rightarrow Ha\cdot s\cdot\left(-t+1\right)+Ha\cdot t$$

$$rayPowerLeft\left(s\right):=Light\cdot sk^{\left(\int_0^1 1\cdot RayAtmLen\left(s\right)\,\mathrm{d}t\right)}$$

sk is 0..1 where 0.9 means 10% of light gets scattered

$$rayPowerToEye\left(s\right):=rayPowerLeft\left(s\right)\cdot sk\cdot focusP\cdot\left(ro\left(H\left(s\right)\right)\right)$$

$$\int_0^1 rayPowerToEye(s) \cdot LmaxV \, ds \to \frac{Adens0 \cdot Light \cdot LmaxV \cdot focusP \cdot \left\langle sk^{endlPve+1} + \left((endlPv - endlPve) \cdot \ln(sk) - 1\right) \cdot sk^{endlPv+1} \right\rangle}{(endlPve - endlPv)^2 \cdot \ln(sk)^2}$$

$$\int_0^1 rayPowerLeft(s) \cdot LmaxV \, ds \to \frac{Light \cdot LmaxV \cdot \left\langle sk^{endlPve} - sk^{endlPv} \right\rangle}{(endlPve - endlPv) \cdot \ln(sk)}$$

$$\int_0^1 \int_0^1 ro(h(scanLightPt(t,s))) \cdot Lendp(s) \, dt \cdot LmaxV \, ds$$

$$\int_0^1 \int_0^1 ro(h(pLerp(t, pLerp(s,Pv,Pve), EndP(pLerp(s,Pv,Pve), toLdir)))) \cdot \left| \frac{d}{dt} pLerp(t, pLerp(s,Pv,Pve), EndP(pLerp(s,Pv,Pve), toLdi