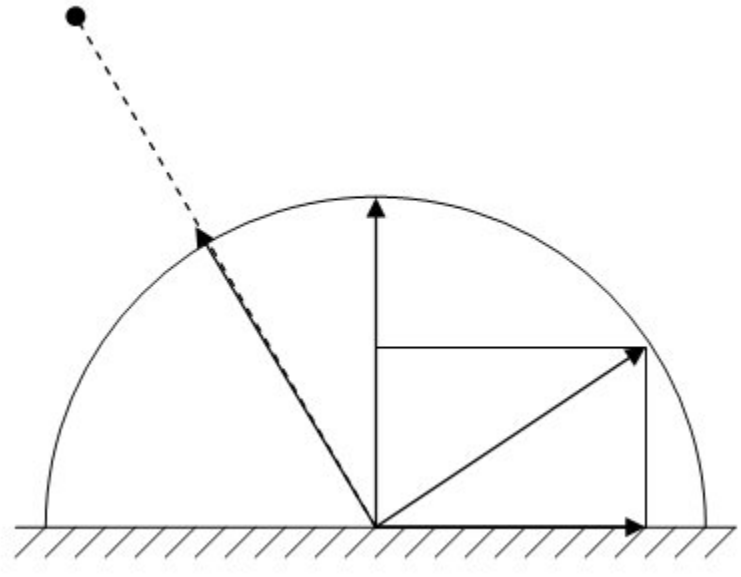
Shiny Sprites

Effect Description

The purpose is to create some particles which are lit like a piece of glass : sparkling in a random way.

Mathematics of this effect



The purpose is to create a pseudo random pertubation of the Normal of the surface.

Such a perturbation may change the results of

- the specular value : $\vec{N}.\vec{H}$
- the diffuse value : $\vec{N}.\vec{L}$

On the surface of this particle, we can express any normals $\vec{N'}$ by

$$\vec{N'} = \vec{N}cos(\beta) + \vec{N_\perp}sin(\beta)$$

$\vec{N}$ is the Normal vector of the particle and $\vec{N_\perp}$ is the perpendicular vector of $\vec{N}$

$cos(\beta) \text{and} sin(\beta)$ The surface Normal will be stored in a table : depending on $\vec{N}.\vec{L}$ we will refere to a couple of cos sin values in an array of SZ size :

$$
\begin{aligned}
d &= integer(\vec{N}.\vec{L} \times SZ) \\
&= cos(\alpha) \\
\vec{N'} &= \vec{N} costbl[d] + \vec{N_\perp} sintbl[d] \\
\vec{N'}.\vec{L} &= \vec{N}.\vec{L} costbl[d] + \vec{N_\perp}.\vec{L} sintbl[d]
\end{aligned}
$$

Since the vector are normalized :

$$
\begin{aligned}
\vec{N}.\vec{L} &= cos(\alpha) \\
\vec{N_\perp}.\vec{L} &= sin(\alpha) \\
&= \sqrt{1 - cos^2(\alpha)} \\
&= \sqrt{1 - (\vec{N}.\vec{L})^2} \\
\vec{N'}.\vec{L} &= cos(\alpha) costbl[d] + \sqrt{1 - cos^2(\alpha)} sintbl[d]
\end{aligned}
$$

We may apply the same for the specular factor. Hence we obtain :

$$
\begin{aligned}
d &= integer(\vec{N}.\vec{L} \times SZ) \\
\vec{N'}.\vec{L} &= \vec{N}.\vec{L} costbl[d] + \sqrt{1 - (\vec{N}.\vec{L})^2} sintbl[d] \\
\vec{N'}.\vec{H} &= \vec{N}.\vec{H} costbl[d] + \sqrt{1 - (\vec{N}.\vec{H})^2} sintbl[d]
\end{aligned}
$$