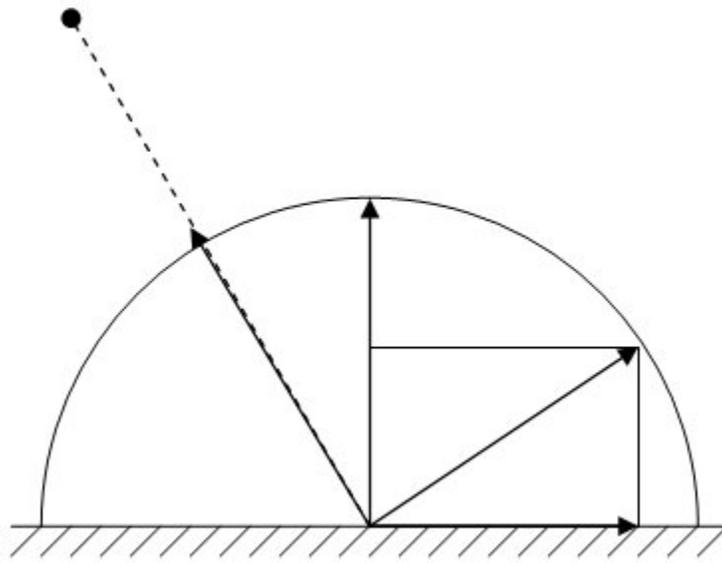


# Shiny Sprites

## 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 :  $\vec{N} \cdot \vec{H}$
- the diffuse value :  $\vec{N} \cdot \vec{L}$

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  $\vec{N}$

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

$$\begin{aligned}
d &= \text{integer}(\vec{N} \cdot \vec{L} \times SZ) \\
&= \cos(\alpha) \\
\vec{N}' &= \vec{N} \text{costbl}[d] + \vec{N}_\perp \text{sindbl}[d] \\
\vec{N}' \cdot \vec{L} &= \vec{N} \cdot \vec{L} \text{costbl}[d] + \vec{N}_\perp \cdot \vec{L} \text{sindbl}[d]
\end{aligned}$$

Since the vector are normalized :

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

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

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