Assignment 01

Basil Peterhans, Eric Buffle, Linard Büchler

September 29, 2020

Contents

1 Ray-plane intersection

A ray equation can be formulated as follows:

$$\mathbf{r}(t) = \mathbf{o} + t\mathbf{d}$$

For a plane $\mathbf{n}$, the ray-plane intersection can be formulated as:

$$\mathbf{n}^\top(\mathbf{o} + t\mathbf{d}) - b = 0$$

solving for t, we get

$$\begin{aligned}
\mathbf{n}^\top(\mathbf{o} + t\mathbf{d}) - b &= 0 \\
\mathbf{n}^\top\mathbf{o} + t\mathbf{n}^\top\mathbf{d} - b &= 0 \\
\implies t\mathbf{n}^\top\mathbf{d} &= b - \mathbf{n}^\top\mathbf{o} && = 0 \\
\implies t &= \frac{b - \mathbf{n}^\top\mathbf{o}}{\mathbf{n}^\top\mathbf{d}}
\end{aligned}$$

2 Ray-cylinder intersection + normal derivations

A cylinder can be described by

- A position vector $\mathbf{p}_1$ describing the first end point of the long axis of the cylinder
- A position vector $\mathbf{p}_2$ describing the second end point of the long axis of the cylinder
- a radius r

The axis of the cylinder can be written as $\Delta\mathbf{p} = \mathbf{p}_1 - \mathbf{p}_2$ Source : [?]

References

[1] https://www.doc.ic.ac.uk/~dfg/graphics/graphics2010/GraphicsLecture11.pdf