

Penrose Rotation

Yoon, M.

Published on Friday 4th August, 2023

1 Introduction

In the sense of Lorentz contraction, it is commonly used that the expression that a moving object appears shortened. However, describing what we actually see is a subtly different problem, since the light travels from the object to the eye takes a nonzero time. Not until 1959, more than 40 years after special relativity had been established, it was published that a moving sphere appears to be also a sphere to any observer.

2 Aberration of Light

$$\tan \frac{\theta'}{2} = \sqrt{\frac{1-v}{1+v}} \tan \frac{\theta}{2} \tag{1}$$

3 Stereographic Projection

4 Penrose Rotation

Suppose a sphere S is at rest in the inertial frame \mathcal{S} . A stationary observer at the origin of \mathcal{S} , sees the sphere as its circular outline.

References

- [1] R. Penrose. The apparent shape of a relativistically moving sphere. *Mathematical Proceedings of the Cambridge Philosophical Society*, 55(1):137–139, 1959.

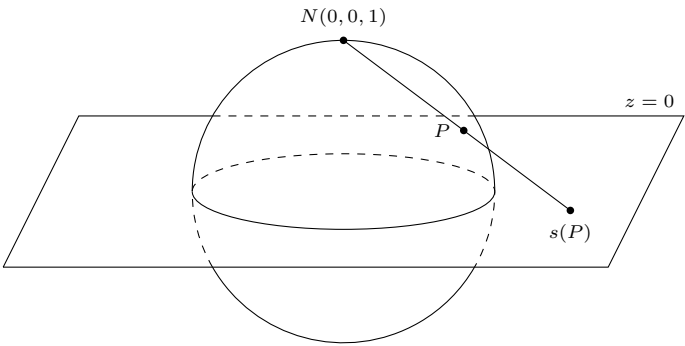


Figure 1: Stereographic projection