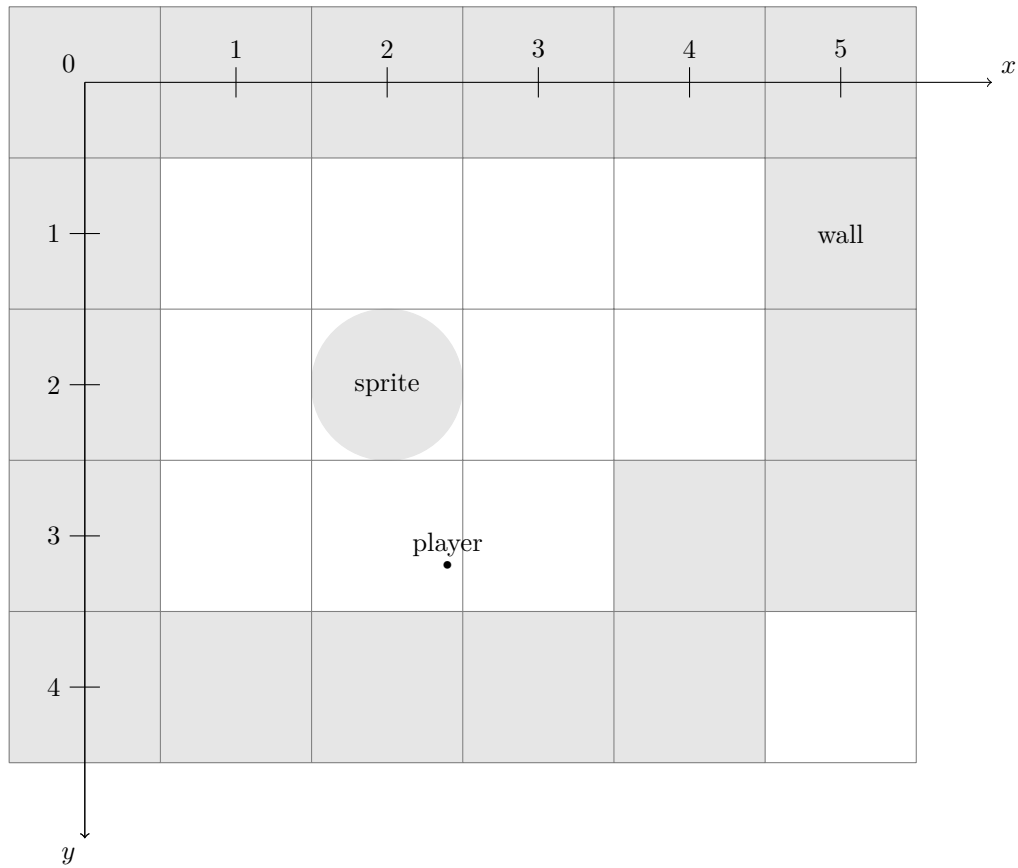


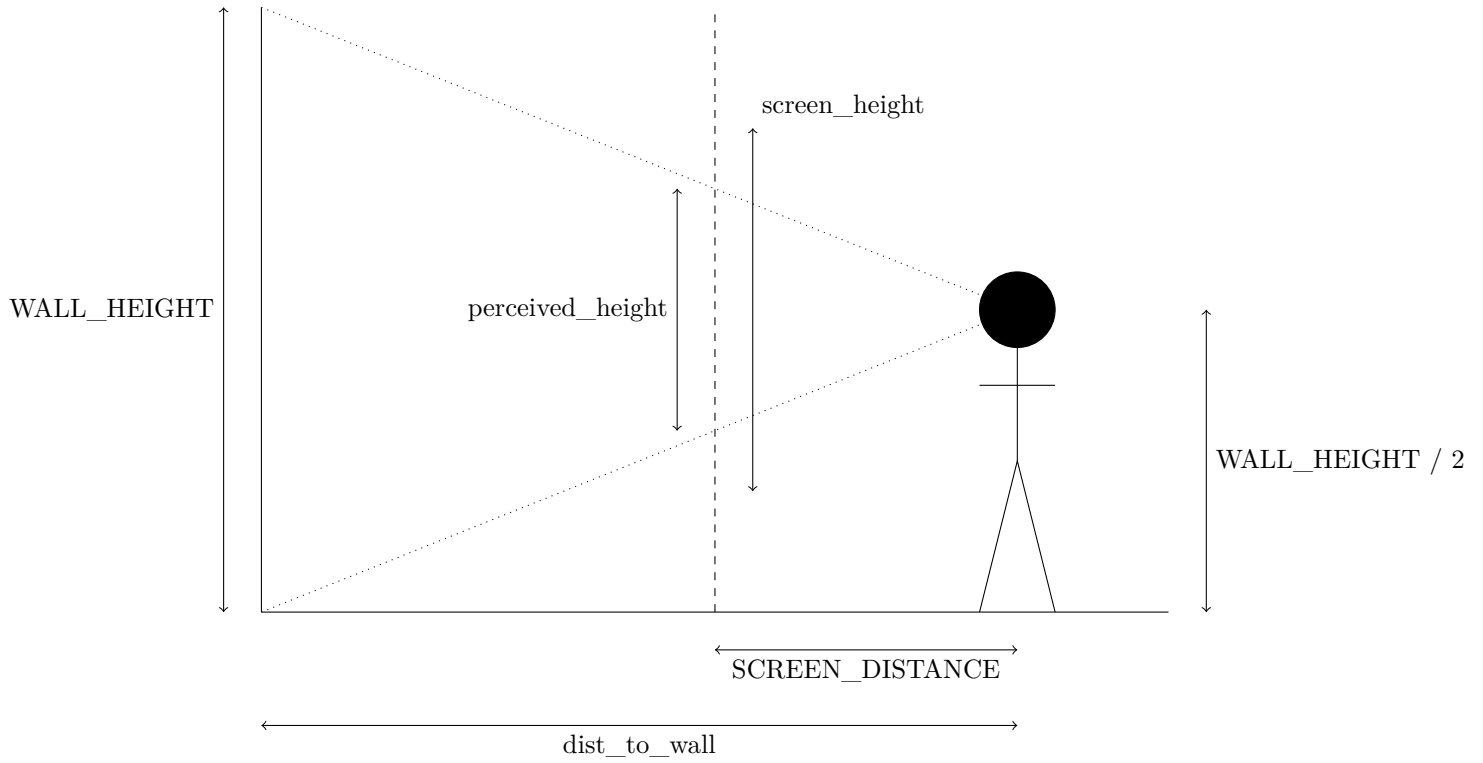
Raycasting in cub3d

July 23, 2020

1 The grid



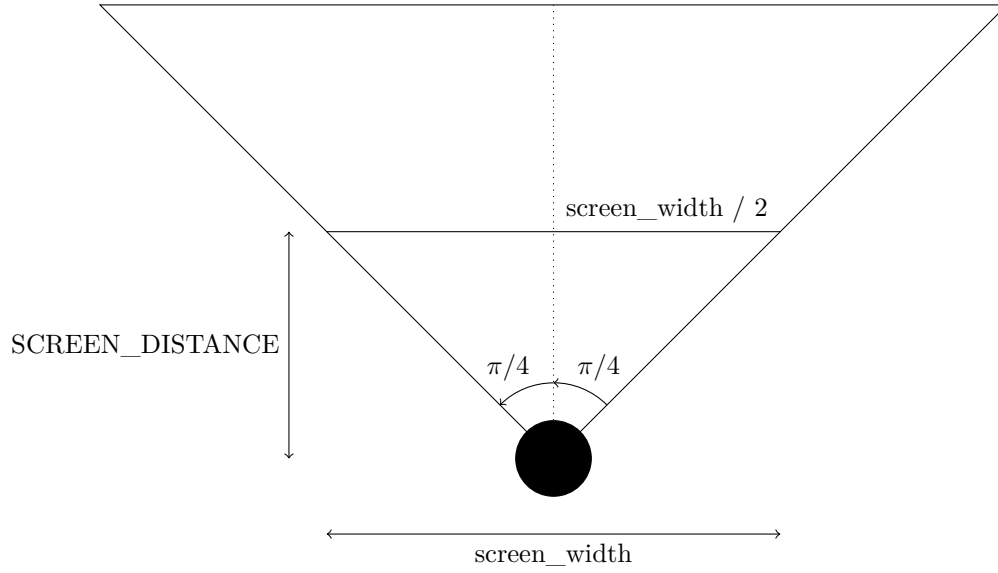
2 Drawing a pixel column



Hence, we have:

$$\frac{perceived_height}{WALL_HEIGHT} = \frac{SCREEN_DISTANCE}{dist_to_wall}$$

$$perceived_height = WALL_HEIGHT \times \frac{SCREEN_DISTANCE}{dist_to_wall}$$

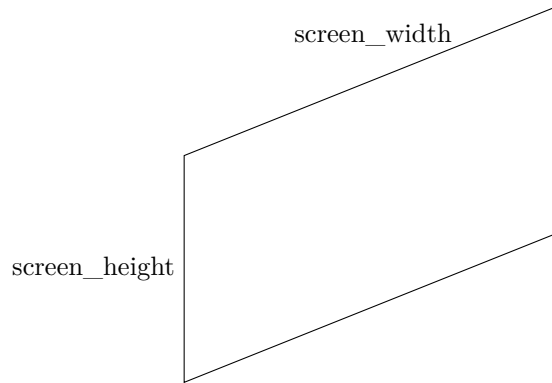


Hence:

$$\tan\left(\frac{\pi}{4}\right) = \frac{\text{screen_width}/2}{\text{SCREEN_DISTANCE}}$$

$$1 = \frac{\text{screen_width}}{2 \times \text{SCREEN_DISTANCE}}$$

$$\text{screen_width} = 2 \times \text{SCREEN_DISTANCE}$$



If $(\text{res.x}, \text{res.y})$ is the resolution of the window:

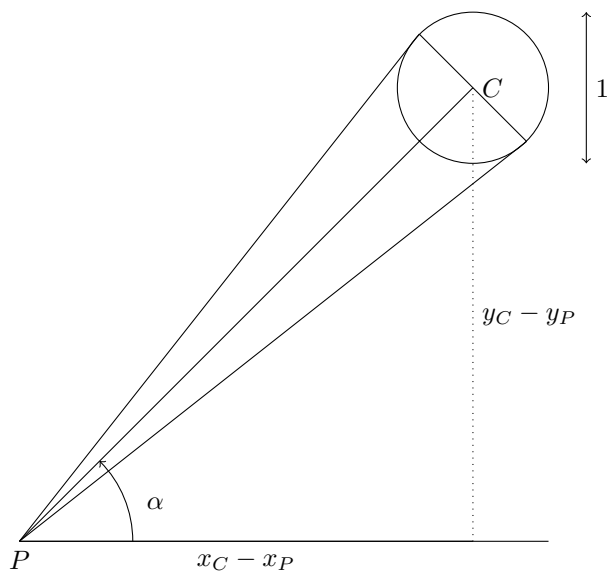
$$\frac{\text{screen_height}}{\text{res.y}} = \frac{\text{screen_width}}{\text{res.x}}$$

$$\text{screen_height} = \text{res.y} \times \frac{\text{screen_width}}{\text{res.x}}$$

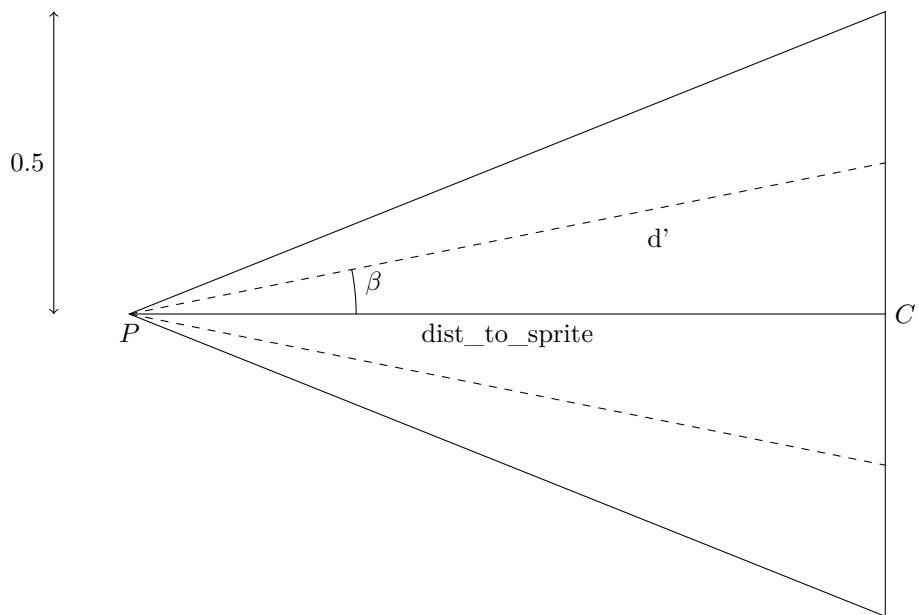
As showed above, $\text{screen_width} = 2 \times \text{SCREEN_DISTANCE}$, so

$$\text{screen_height} = 2 \times \text{SCREEN_DISTANCE} \times \text{res.y} \div \text{res.x}$$

3 Drawing a sprite



$$\alpha = \text{atan}\left(\frac{y_C - y_P}{x_C - x_P}\right)$$



$$\cos(\beta) = \frac{PC}{d'} = \frac{\text{dist_to_sprite}}{d'}$$

$$d' = \frac{\text{dist_to_sprite}}{\cos(\beta)}$$