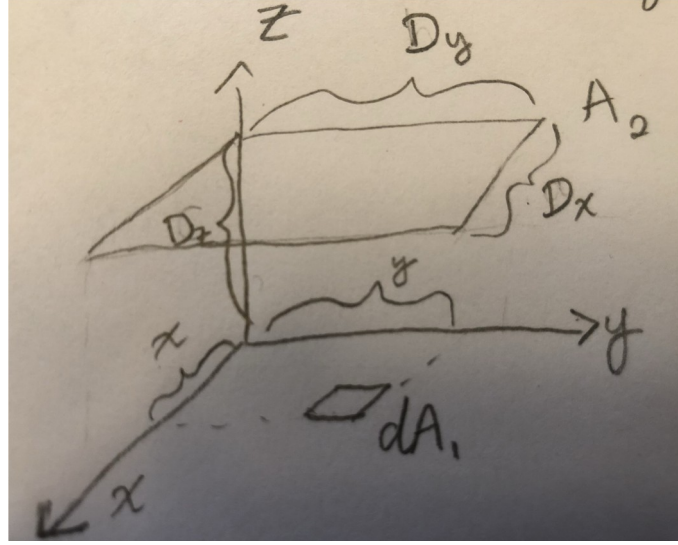


View Factor for a Square Area – Case 1

Problem: Use Monte Carlo method to determine view factor F_{12} for dA_1 and A_2 as shown below.



Solution: Sample the polar and azimuthal angles for a pair of random variables.

$$R_\theta = \sin^2(\theta)$$

$$R_\phi = \frac{\phi}{2\pi}$$

Since the bundle lands at $z = D_z$, we can find the displacement vector (x', y') by converting from polar coordinates.

$$\begin{aligned} z &= r \cos(\theta) = D_z \Rightarrow r = D_z \sec(\theta) \\ x' &= r \sin(\theta) \cos(\phi) = D_z \tan(\theta) \cos(\phi) \\ y' &= r \sin(\theta) \sin(\phi) = D_z \tan(\theta) \sin(\phi) \end{aligned}$$

And add the vectors to get the final position (x_2, y_2) .

$$\begin{aligned} x_2 &= x + D_z \tan(\theta) \cos(\phi) \\ y_2 &= y + D_z \tan(\theta) \sin(\phi) \end{aligned}$$

If $0 \leq x_2 \leq D_x$ and $0 \leq y_2 \leq D_y$, then the bundle hits A_2 .

To calculate the view factor F_{12} , launch N_1 bundles and count the number N_2 of them that land on A_2 .