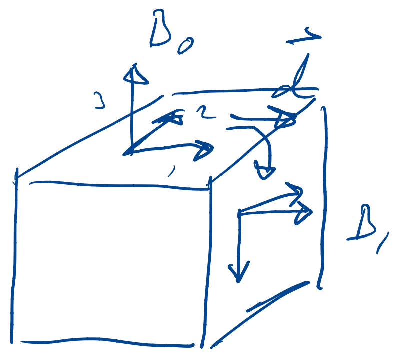
AOC DAY 22: MAZE ON CUBE



$$\vec{d} = a\hat{x}_0 + b\hat{y}_0$$

$$\vec{d}^{\perp} = a\hat{y}_0 + (-b)\hat{x}_0$$

$P: \begin{bmatrix} 1 & 0 \\ 0 & 1 \\ 0 & 0 \end{bmatrix}$

$$R: \quad |-n\rangle\langle d| + |d\rangle\langle n| + |d^{\perp}\rangle\langle d^{\perp}|$$

$$B = \begin{pmatrix} | & | & | \\ x & y & z \\ | & | & | \end{pmatrix} \qquad B_d = \begin{pmatrix} | & | & | \\ d & d^{T} & n \\ | & | & | \end{pmatrix} = B \underbrace{\begin{pmatrix} a & -b & \\ b & a & \\ & & 1 \end{pmatrix}}_{A}$$

IN BASIS B_d, R CAN BE EXPRESSED AS

$$R = B_d \underbrace{\begin{pmatrix} & & +1 \\ & +1 & \\ -1 & & \end{pmatrix}}_{R_d} B_d^{T} = B A R_d A^T B^T$$

THE ROTATED BASIS IS

$$B_1 = RB = B \underbrace{A R_d A^T}$$

$$A R_d A^T = \begin{pmatrix} a & -b & \\ b & a & \\ & & 1 \end{pmatrix} \begin{pmatrix} & & 1 \\ & 1 & \\ -1 & & \end{pmatrix} \begin{pmatrix} a & b & \\ -b & a & \\ & & 1 \end{pmatrix}$$

$$= \begin{pmatrix} b^2 & -ab & a \\ -ab & a^2 & b \\ -a & -b & \end{pmatrix}$$

OPERATIONS NEEDED

SURF, d_p → NEW SURF

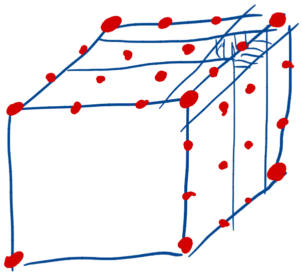
— d_p → NEW d_p, COORD?

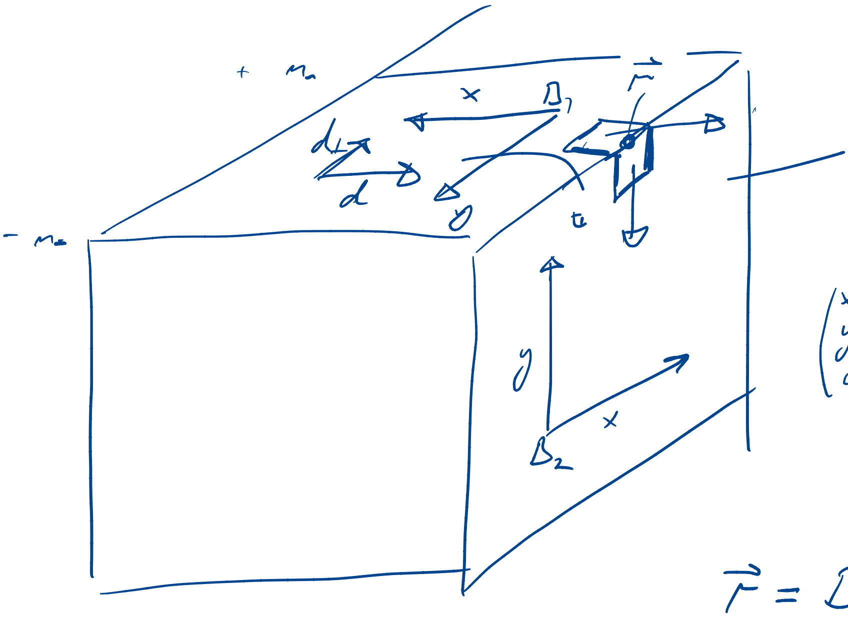
SYMMETRIC MAP OF INTEGERS

$$\underbrace{-3 \quad 0 \quad 1 \quad 3}_{2u-(n-1)} \qquad n = 4 \qquad \underbrace{\pm(n-1)}_{n_-}$$

$$x = 2p_0 - n_- \qquad = 2p_x - n_-$$

$$y = -(2p_+ - n_-) = n_- - 2p_1 \qquad = 2p_y - n_-$$





$$\begin{pmatrix} x' \\ y' \\ 0 \end{pmatrix} = B_2^T B_d' \begin{pmatrix} -n_- \\ u \\ 0 \end{pmatrix}$$

$$\vec{r} = B_i \begin{pmatrix} 2p_x^{(i)} - n_- \\ 2p_y^{(i)} - n_- \\ n_- \end{pmatrix} \begin{matrix}]\, x_i \\ ]\, y_i \\ \end{matrix} \quad i = 1, 2$$

$$\begin{pmatrix} x_2 \\ y_2 \\ n \end{pmatrix} = \underbrace{B_2^T B_1} \begin{pmatrix} y_1 \\ x_1 \\ n_- \end{pmatrix}$$

$$M = \begin{pmatrix} [& | & B_2^T n_1 \end{pmatrix} \qquad B_2^T n_1 = \begin{pmatrix} d_x \\ d_y \\ 0 \end{pmatrix}$$