Notes of Computer Vision

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1 Introduction

2 Foundation

2.1 Linear Algebra

Rotation Equation 2D counter-clockwise rotation by an angle θ

$$x' = \cos\theta x - \sin\theta y$$
$$y' = \cos\theta y + \sin\theta x.$$

Matrix formulation is

$$\begin{bmatrix} x' \\ y' \end{bmatrix} = \begin{bmatrix} cos\theta & -sin\theta \\ sin\theta & cos\theta \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix}.$$

If you rotate the vector $x = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$, by an angle θ, its new coordinates are $\begin{bmatrix} \cos\theta \\ \sin\theta \end{bmatrix}$ and if you rotate the vector $y = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$, by an angle θ, its new coordinates are $\begin{bmatrix} -\sin\theta \\ \cos\theta \end{bmatrix}$. This gives the general formula for the new coordinates (x', y') of the point (x, y) after rotation.

The 2D rotation matrix (R) satisfies

- $R \cdot R^T = I$
- $\det(R) = 1$.

References

Computer Vision: Foundations and Applications (CS 131, 2017), Stanford University.