CSCI 4448 Robots

In Class Day 7

2.3. R_x (translation) (vector)

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & \cos & -\sin & 0 \\ 0 & \sin & \cos & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & 0 & -a \\ 0 & 1 & 0 & -b \\ 0 & 0 & 1 & -c \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \\ 1 \end{bmatrix}$$

R_y (or) R_z

$$\begin{bmatrix} \cos & 0 & \sin & 0 \\ 0 & 1 & 0 & 0 \\ -\sin & 0 & \cos & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \text{ (or) } \begin{bmatrix} \cos & -\sin & 0 & 0 \\ \sin & \cos & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

4.1.1 origin / vector (normal vector)

.2 $\min \begin{bmatrix} x_1 & y_1 \\ \vdots & \vdots \\ x_n & y_n \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix}$ $\quad \min \sum_{i=1}^{n} \left((r_i - \mu) \cdot \hat{N} \right)^2$

3 no constraints, decision vars - origin/vectors, linear

4 nonlinear unconstrained

5 find eigen vectors of correlation matrix

6 PCA, use SVD on mcd to find eigenvectors of correlation matrix

4.2.7 center, radius $x(t)$, $y(t)$

$(x-h)^2 + (y-k)^2 = R^2$

.8 center, radius

.9 $\min \sum_{i=1}^{n} \left(\|r_i - c\| - R \right)^2$, nonlinear

.10 $R \geq 0$, linear

.11 nonlinear constrained

.12

22 $U = \int_0^z mg \, dp = mgz$

23 $U = \int_{|r|}^{\infty} \frac{GMm}{p^2} dp = -\frac{GMm}{|r|}$

24 $U = \int_{\infty}^{|r|} \frac{kQq}{p^2} dp = -\frac{kQq}{|r|}$

25 $-Gp \int_{-\frac{L}{2}}^{\frac{L}{2}} \frac{d\lambda}{|\vec{r} - \vec{r}_m|}$

$s(t) = \begin{bmatrix} x_2 - x_1 \\ y_2 - y_1 \end{bmatrix} t + \begin{bmatrix} x_1 \\ y_1 \end{bmatrix}$

26 $-Gp \int_0^1 \frac{s'(t)\,dt}{|\vec{r} - s(t)|}$

27 $-Gp \int_{-\frac{b}{2}}^{\frac{b}{2}} \int_{-\frac{a}{2}}^{\frac{a}{2}} \frac{dx\,dy}{|\vec{v} - \langle x, y \rangle|}$

28 $-Gp \int_{-R}^{R} \int_{-\sqrt{R^2 - x^2}}^{\sqrt{R^2 - x^2}} \frac{dy\,dx}{|\vec{r} - \langle x, y \rangle|}$ (Cartesian)

$-Gp \int_0^{2\pi} \int_0^1 \frac{r\,dr\,d\theta}{|\vec{r} - \langle r\cos\theta, r\sin\theta \rangle|}$

29 potential at any point is sum of potentials at that point

30 same as before

33 Global min $(-1, -1)$

$(2, 2)$ escapes

34 still escapes @ -3

-10 world work

35 still escaped