FLAM

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R&D Assignment

Domain: R&D

Problem: To Find the Values of Unknown Parameters

equations Variables

$$x = \left(t\left(\cos\theta\right) - e^{M|t|} \cdot \sin\left(0.3t\right)\sin\left(\theta\right) + X \right)$$

$$y = \left(42 + t\left(\sin\left(\theta\right) + e^{M|t|} \sin\left(0.3t\right)\cos\left(\theta\right) \right) \right.$$

Unknown

$$\theta, M, X$$

Given range:-

$$0^\circ < \theta < 50^\circ$$

$$-0.05 < M < 0.05$$

$$0 < X < 100$$

t range:-

$$6 < t < 60$$

map to dataset

$$ti = 6 + \frac{i}{N-1}(60-6) \qquad \begin{pmatrix} N = 1500 \\ i = 0, 1, \ldots 1499 \end{pmatrix}$$

Compute Predicted (x,y) Parameters

(i)

$$\theta_{rad} = \theta \times \frac{\pi}{180}$$

$$e_i = e^{M|t_i|}$$

$$x_{pred\,i} = t_i \cos\theta_{rad} - e_i \sin(0.3 t_i) \sin\theta_{rad} + x_i$$

$$y_{pred} = 42 + t_i \sin\theta_{rad} + e_i \sin(0.3 t_i) \cos\theta_{rad}.$$

To find the μ

$$E(\theta, M, X) = \sum_{i=0}^{1499} (|x_{pred\,i} - x_i| + |y_{pred\,i} - y_i|)$$

Example:-

Take Assume

$\theta = 20^\circ$

$M = 0$

$X^0 = 10$

$i = 0$ to 6

$$\theta_{rad} = 20 \times \frac{\pi}{180} = \frac{3.14}{9} = 0.3491 \text{ rad}$$

$\cos\theta = 0.9397$

$\sin\theta = 0.3420$

$\sin(0.3\,t_0) = 0.9738$

$e^{M(t+1)} = e^{0} = 1$ → (From Exponential rule $e^0 = 1$)

$x_{Pred} = 6(0.939) - 1(0.973)(0.3420) + 10$

$= 5.6362 - 0.331 + 10$

$= 15.30$

$y_{Pred} = 42 + 6(0.3420) + 1(0.9738)(0.9397)$

$= 42 + 2.052 + 0.915$

$= 44.96$

→ Changing of θ Value helps to generate

least L_1 Score (or) we get least error Value.