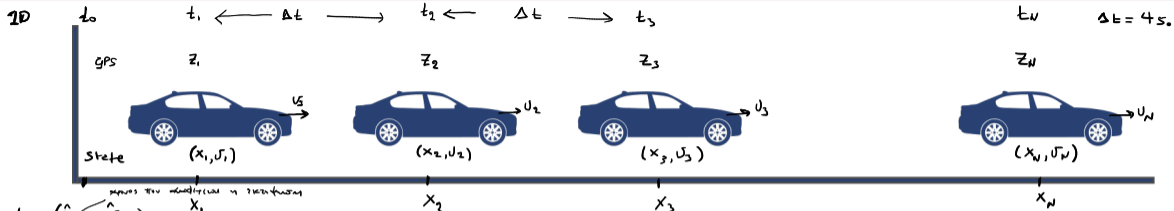


MEM-205 Περιγραφική Στατιστική
Τμήμα Μαθηματικών και Εφ. Μαθηματικών, Πανεπιστήμιο Κρήτης

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Εισαγωγή στα State-Space models



$t_0: (\hat{x}_{0,0}, \hat{u}_{0,0}) \leftarrow$
μέτρος που αναμετράται η ταχύτητα
μέτρος που λαμβάνει την επιτάχυνση

$u_1 = u_2 = \dots = u_N$

$$x_{m+1} = x_m + v_m \Delta t$$

Δυναμικό μοντέλο του συστήματος.

$$v_{m+1} = v_m$$

$$\hat{x}_{1,0} = \hat{x}_{0,0} + \hat{v}_{0,0} \Delta t$$

$$\hat{v}_{1,0} = \hat{v}_{0,0}$$

$t_1: GPS \rightarrow z_1$

Ακρίβεια στην απόσταση

$$z_1 - \hat{x}_{1,0}$$

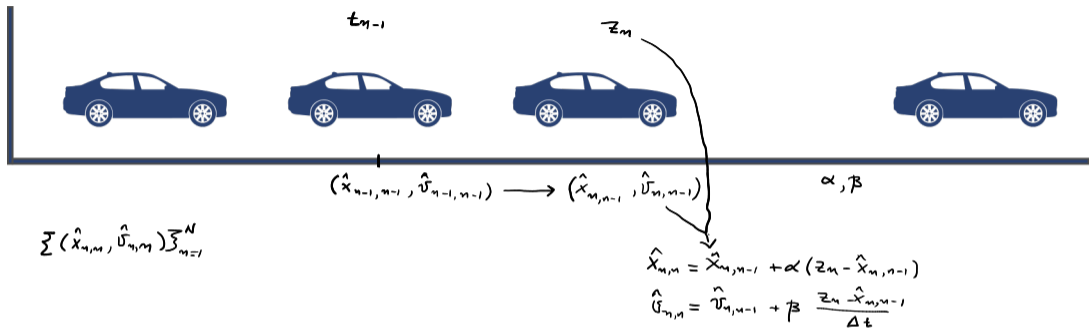
$$\hat{x}_{1,1} = \hat{x}_{1,0} + \alpha (z_1 - \hat{x}_{1,0}), \alpha \in (0,1)$$

Ακρίβεια στην ταχύτητα

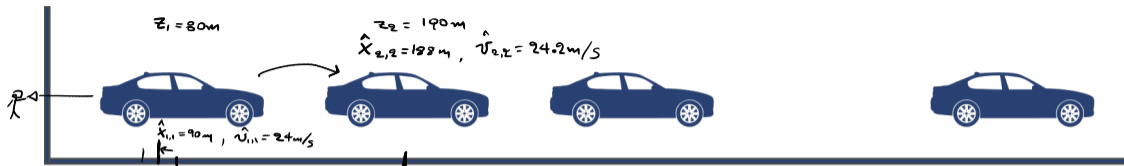
$$\frac{z_1 - \hat{x}_{1,0}}{\Delta t}$$

$$\hat{v}_{1,1} = \hat{v}_{1,0} + \beta \frac{z_1 - \hat{x}_{1,0}}{\Delta t}, \beta \in (0,1)$$

Εισαγωγή στα State-Space models



Εισαγωγή στα State-Space models



$$t_0: \hat{x}_{0,0} = 0 \text{ m} \quad \hat{v}_{0,0} = 25 \text{ m/s} \quad \Delta t = 4 \text{ s} \quad \alpha = 0.5, \beta = 0.2$$

$$\hat{x}_{1,0} = \hat{x}_{0,0} + \hat{v}_{0,0} \cdot \Delta t = 0 + 25 \cdot 4 = 100 \text{ m}$$

$$\hat{v}_{1,0} = \hat{v}_{0,0} = 25 \text{ m/s}$$

$$t_1: z_1 = 80 \text{ m}$$

$$\hat{x}_{1,1} = \hat{x}_{1,0} + \alpha (z_1 - \hat{x}_{1,0}) = 100 - \frac{1}{2} \cdot 20 = 90 \text{ m}$$

$$\hat{v}_{1,1} = \hat{v}_{1,0} + \beta \frac{z_1 - \hat{x}_{1,0}}{\Delta t} = 25 + 0.2 \frac{80 - 100}{4} = 24 \text{ m/s}$$

$$\hat{x}_{2,1} = \hat{x}_{1,1} + \hat{v}_{1,1} \cdot \Delta t = 90 + 24 \cdot 4 = 186 \text{ m}$$

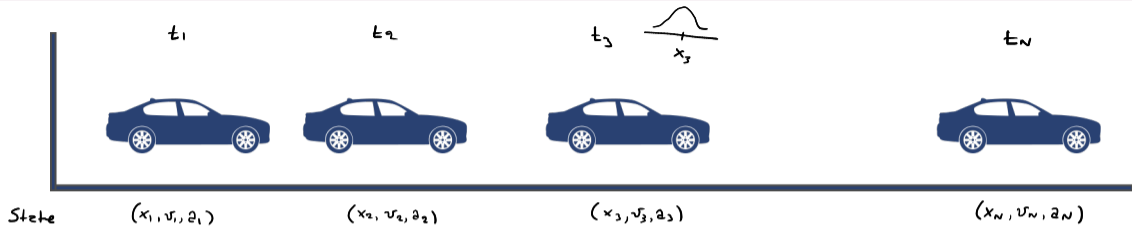
$$\hat{v}_{2,1} = \hat{v}_{1,1}$$

$$t_2: z_2 = 190 \text{ m}$$

$$\hat{x}_{2,2} = \hat{x}_{2,1} + \alpha (z_2 - \hat{x}_{2,1}) = 186 + \frac{1}{2} \cdot 4 = 188 \text{ m}$$

$$\hat{v}_{2,2} = \hat{v}_{2,1} + \beta \frac{z_2 - \hat{x}_{2,1}}{\Delta t} = 24 + 0.2 \frac{4}{4} = 24.2 \text{ m/s}$$

Εισαγωγή στα State-Space models



Αναφορικό Μοντέλο του Γυρισματος

$$x_{n+1} = x_n + v_n \Delta t + \frac{1}{2} a_n \Delta t^2$$

$$v_{n+1} = v_n + a_n \Delta t$$

$$a_{n+1} = a_n$$

$$\hat{x}_{n,n} = \hat{x}_{n,n-1} + \alpha (z_n - \hat{x}_{n,n-1})$$

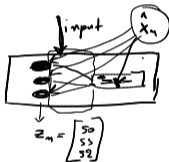
$$\hat{v}_{n,n} = \hat{v}_{n,n-1} + \beta \frac{z_n - \hat{x}_{n,n-1}}{\Delta t}$$

$$\hat{a}_{n,n} = \hat{a}_{n,n-1} + \gamma \frac{2(z_n - \hat{x}_{n,n-1})}{\Delta t^2}$$

$$t_{n-1}: (\hat{x}_{n-1,n-1}, \hat{v}_{n-1,n-1}, \hat{a}_{n-1,n-1}) \longrightarrow (\hat{x}_{n,n-1}, \hat{v}_{n,n-1}, \hat{a}_{n,n-1}) \checkmark$$

$$t_n: z_n \longrightarrow (\hat{x}_{n,n}, \hat{v}_{n,n}, \hat{a}_{n,n})$$

Εισαγωγή στα State-Space models



Εισαγωγή στα State-Space models

