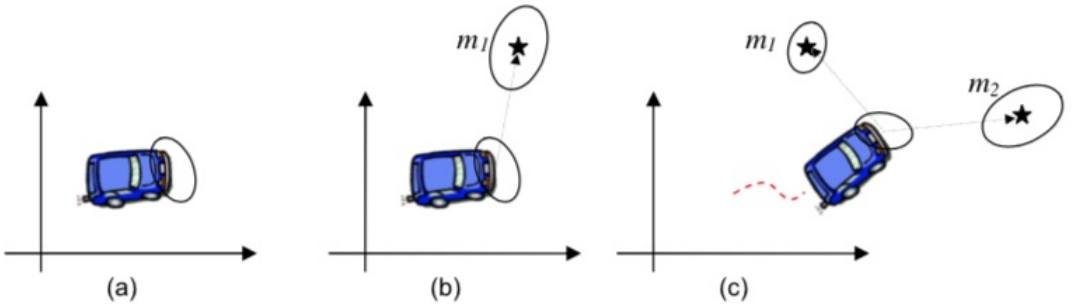
SLAM: Simultaneous Localization and Mapping



SLAM: Simultaneous Localization and Mapping

$$
\begin{aligned}
\hat{\mathbf{x}}_{k|k} &= \{\hat{\mathbf{x}}_{L_{k|k}}^T \; \hat{\mathbf{m}}_{1_{k|k}}^T \; \hat{\mathbf{m}}_{2_{k|k}}^T \; \dots \; \hat{\mathbf{m}}_{N_{k|k}}^T\}^T \\
\mathbf{P}_{k|k} &= \mathrm{E}\{\tilde{\mathbf{x}}_{k|k}\tilde{\mathbf{x}}_{k|k}^T\} \\
&= \mathrm{E}\left\{ \begin{bmatrix} \tilde{\mathbf{x}}_{L_{k|k}} \\ \tilde{\mathbf{m}}_{1_{k|k}} \\ \vdots \\ \tilde{\mathbf{m}}_{N_{k|k}} \end{bmatrix} \begin{bmatrix} \tilde{\mathbf{x}}_{L_{k|k}} \\ \tilde{\mathbf{m}}_{1_{k|k}} \\ \vdots \\ \tilde{\mathbf{m}}_{N_{k|k}} \end{bmatrix}^T \right\} \\
&= \begin{bmatrix} \mathbf{P}_{LL_{k|k}} & \mathbf{P}_{L1_{k|k}} & \cdots & \mathbf{P}_{LN_{k|k}} \\ \mathbf{P}_{1L_{k|k}} & \mathbf{P}_{11_{k|k}} & \cdots & \mathbf{P}_{1N_{k|k}} \\ \vdots & \vdots & \ddots & \vdots \\ \mathbf{P}_{NL_{k|k}} & \mathbf{P}_{N1_{k|k}} & \cdots & \mathbf{P}_{NN_{k|k}} \end{bmatrix}
\end{aligned}
$$

$x_L \left\{ \begin{matrix} x \\ y \\ \varphi \end{matrix} \right\} \quad m_i \left\{ \begin{matrix} x_i \\ y_i \end{matrix} \right\}$

SLAM: Simultaneous Localization and Mapping

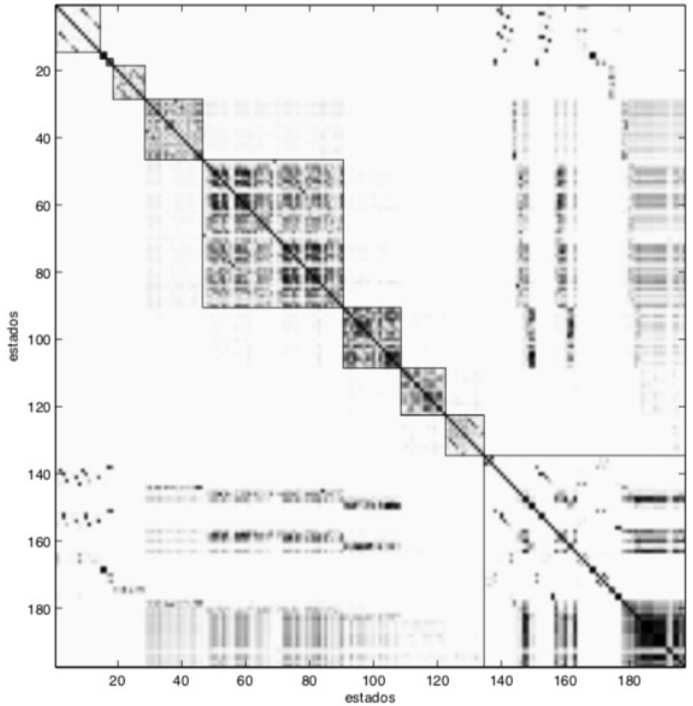
$$\mathbf{x}_k = \begin{bmatrix} \mathbf{x}_{L_k} \\ \mathbf{m}_{i_k} \end{bmatrix} = \mathbf{f}[\mathbf{x}_{k-1}, \mathbf{u}_k] = \begin{bmatrix} \mathbf{f}[\mathbf{x}_{L_{k-1}}, \mathbf{u}_k] + \mathbf{v}_k \\ \mathbf{m}_{i_{k-1}} \end{bmatrix}$$

SLAM: Significado de las correlaciones

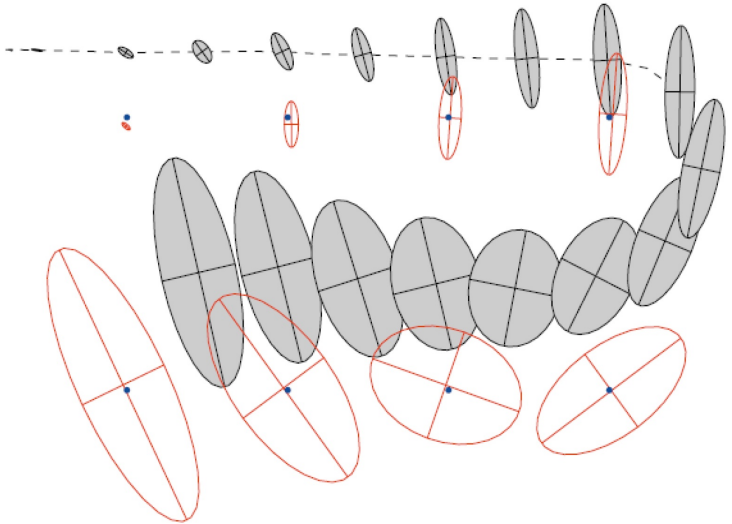
$$\mathbf{z}_k = \begin{bmatrix} z_{r,k} \\ z_{\theta,k} \end{bmatrix} = \begin{bmatrix} \sqrt{(m_{x,k} - x_k)^2 (m_{y,k} - y_k)^2} \\ \frac{\pi}{2} + \arctan\left(\frac{m_{y,k} - y_k}{m_{x,k} - x_k}\right) + \varphi_{Lk} \end{bmatrix} = \mathbf{h}[\mathbf{x}_{L_k}, \mathbf{m}_{i_k}]$$

$$\begin{aligned} \mathbf{W}_k &= \mathbf{P}_{k|k-1} \nabla \mathbf{h}_{\mathbf{x},i}^T \mathbf{S}_k^{-1} \\ &= \begin{bmatrix} \mathbf{P}_{LL_{k|k-1}} \nabla \mathbf{h}_{\mathbf{x}_L}^T + \mathbf{P}_{Li_{k|k-1}} \nabla \mathbf{h}_{\mathbf{m}_i} \\ \mathbf{P}_{1L_{k|k-1}} \nabla \mathbf{h}_{\mathbf{x}_L}^T + \mathbf{P}_{1i_{k|k-1}} \nabla \mathbf{h}_{\mathbf{m}_i} \\ \vdots \\ \mathbf{P}_{iL_{k|k-1}} \nabla \mathbf{h}_{\mathbf{x}_L}^T + \mathbf{P}_{ii_{k|k-1}} \nabla \mathbf{h}_{\mathbf{m}_i} \\ \vdots \\ \mathbf{P}_{jL_{k|k-1}} \nabla \mathbf{h}_{\mathbf{x}_L}^T + \mathbf{P}_{ji_{k|k-1}} \nabla \mathbf{h}_{\mathbf{m}_i} \\ \vdots \\ \mathbf{P}_{NL_{k|k-1}} \nabla \mathbf{h}_{\mathbf{x}_L}^T + \mathbf{P}_{Ni_{k|k-1}} \nabla \mathbf{h}_{\mathbf{m}_i} \end{bmatrix} \mathbf{S}_k^{-1} \end{aligned}$$

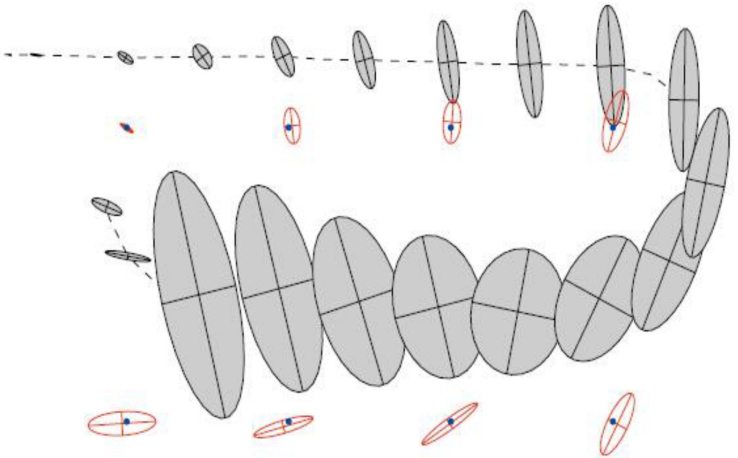
SLAM: Significado de las correlaciones



SLAM: Cierre de Lazo

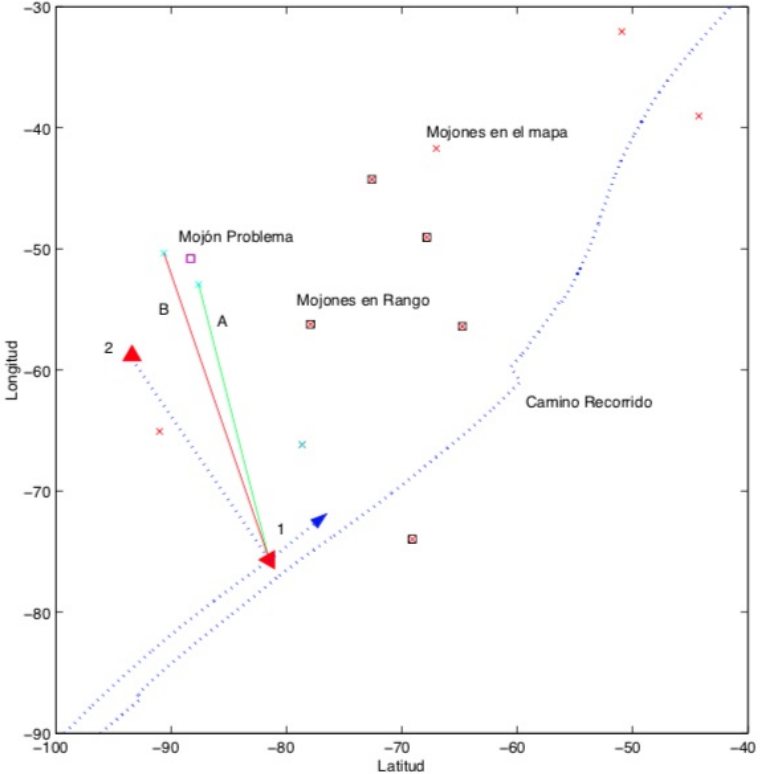


(a)



(b)

Asociación de Datos



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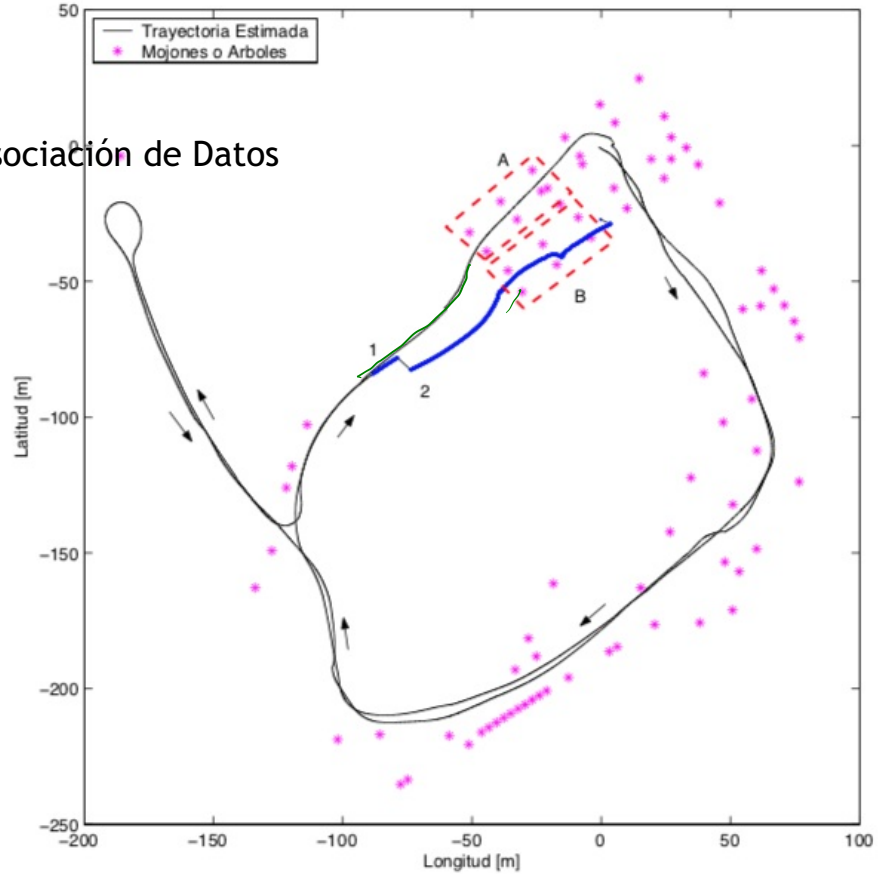
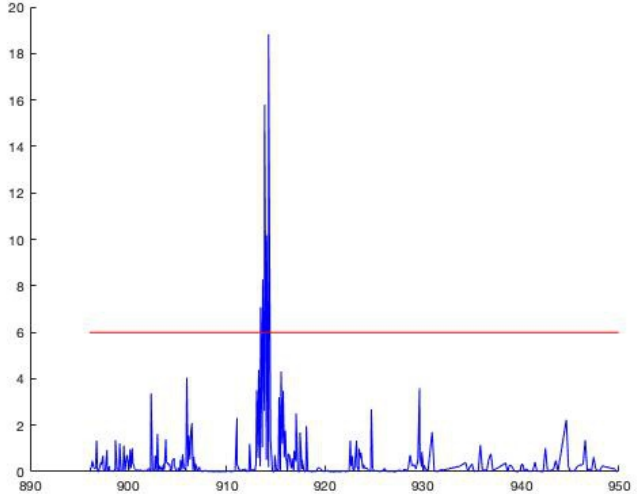
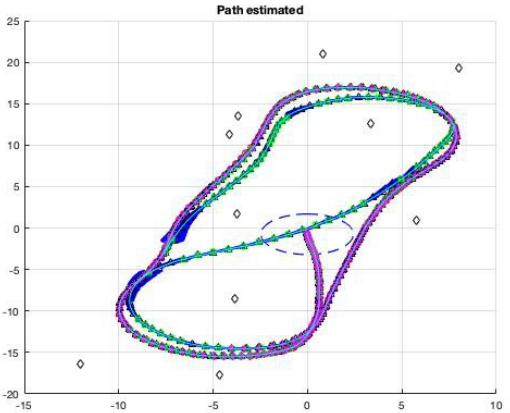


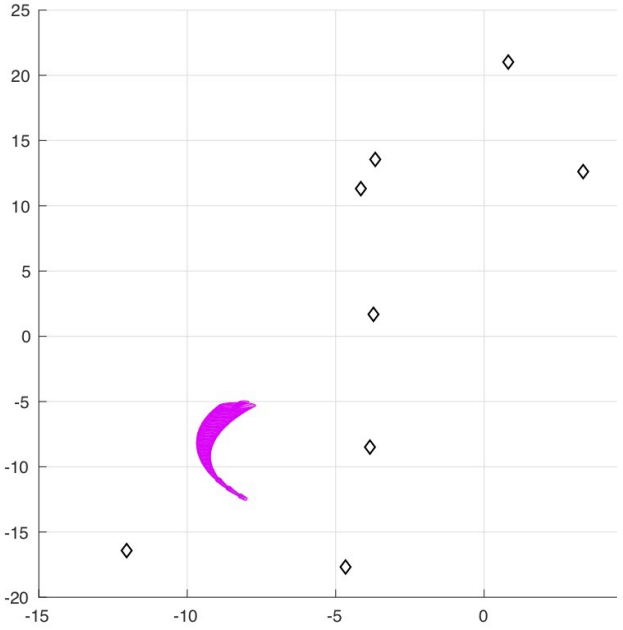
Asociación de Datos

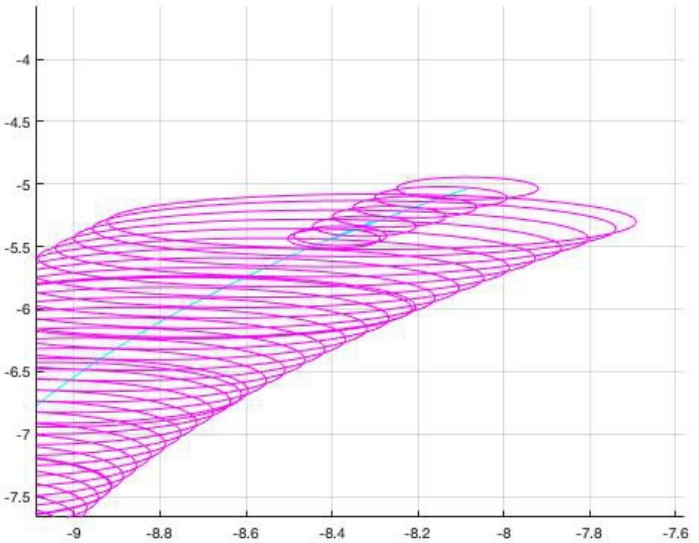
Cota de Validación



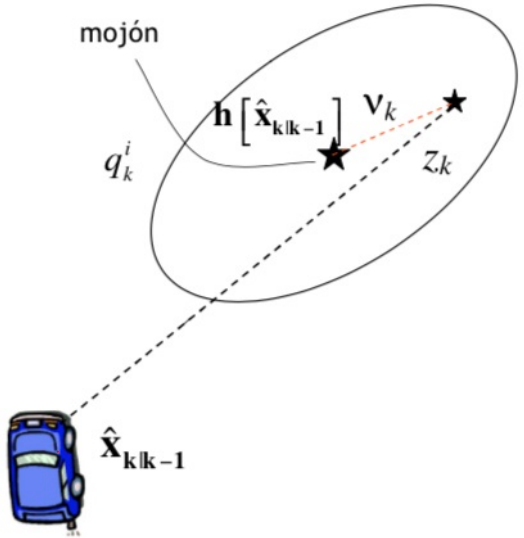


Cota de Validación

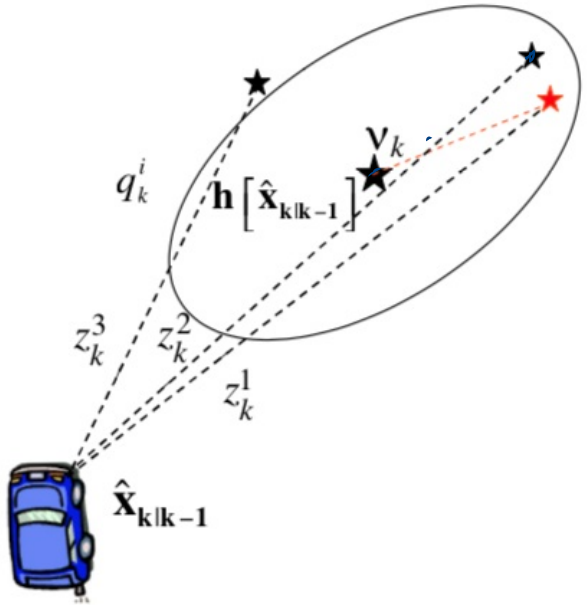




Asociación de Datos

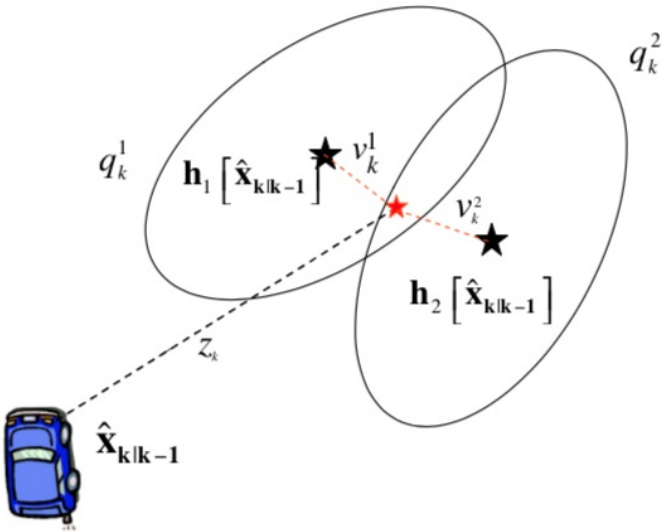


Asociación de Datos



VECINO + CERCANO

Asociación de Datos



Asociación de Datos