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Localization Lab

MAHALANOBIS THRESHOLD

We need to set the threshold for the Mahalanobis distance (mahaThreshold), using the Matlab "chi2inv" function. The function *x = chi2inv(p,nu)* returns the inverse cumulative distribution function (*icdf*) of the chi-square distribution with degrees of freedom *nu*, evaluated at the probability values in *p*.

Knowing that the Mahalanobis distance is obtained by the formula:

$$d^2 = (Y_k - \widehat{Y}_{k+1/k})^T \left(C_k \cdot P_{k+1/k} \cdot C_k^T + Q_\gamma\right)^{-1} (Y_k - \widehat{Y}_{k+1/k})$$

where C(k)*P(k+1/k)*C(k)T is the covariance matrix of Y^ and Qgamma is the covariance matrix of Y; so the distance between Y and Y^ is evaluated keeping into account the respective variances.
The shape of the Chi-Square distribution depends on the dimension of the vector (Y-Y^), which in our case has dimension 2; this will be the value of the degree of freedom that we will consider.
We have also set the p value at 0.95 since the magnets that we are going to detect are likely to be the real one.