13. SNCP with stability

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Compute (if any) an additional feedback which assigns the eigenvalues of the plant without destroying non-interaction, i.e., $W(t)$ is diagonal and the feedback is internally asymptotically stable.

Let $V_i^* = \ker \begin{pmatrix} c_i \\ \cdots \\ c_i A^{r_i - 1} \end{pmatrix}$

and compute the maximal controllability subspace contained in V_i^*:

$\mathcal{E}_i^0 = \{0\}$

$\vdots$

$\mathcal{E}_i^j = V_i^* \cap \left(A\, \mathcal{E}_i^{j-1} + \mathrm{Im}(B)\right)$

for $j = k^*$, if $\mathcal{E}^{j+1} = \mathcal{E}^j \Rightarrow \mathcal{E}_i^j = \mathcal{E}_i^{k^*} \quad \forall j > k^*$.

Call $P_i^* = \mathcal{E}_i^{k^*}$ and set $P^* = \bigcap_{i=1}^{m} P_i^*$ intersection

Proposition: Any F which solves SNCP is such that $(A+BF)P^* \subset P^*$

therefore a necessary and sufficient condition for NSCP is $\sigma\left((A+BF^*)|_{P^*}\right) \subset \mathbb{C}^-$

(its spectrum does not depend on F)

F^* can be used in order to verify if the previous condition holds.