## Perturbations of canonical forms

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The talk will address various aspects of the local behavior of canonical forms of matrices, matrix pairs etc., under small changes in the matrix. Basic canonical forms are considered, such as the Jordan canonical form, and other forms. Open problems will be stated.

Here is one problem of the type indicated: We say that complex matrices $A$ and $B$ have the same Jordan structure if the number of distinct eigenvalues $\mu_1, \dots, \mu_k$ of $B$ is equal to the number of distinct eigenvalues $\lambda_1, \dots, \lambda_k$ of $A$, and there is a bijection $\alpha$ on $\{1, 2, \dots k\}$ such that the sequence of partial multiplicities (sizes of Jordan blocks) of $A$ corresponding to $\lambda_j$ coincides with that of $B$ corresponding to $\mu_{\alpha(j)}$. Given a matrix $A$, what are the possible Jordan structures such that for every $\varepsilon > 0$ there is a matrix $B$ having the Jordan structure in question and satisfying $\|A - B\| < \varepsilon$? The answer was given by Marcus - Parilis (1983), den Boer - Thijsse (1980).

An anologous problem was solved by Gracia, de Hoyos, Zaballa (1989) for pairs of matrices $(A_1, A_2)$ where $A_1$ is $n \times n$ and $A_2$ is $n \times p$, under the group action

$$(A_1, A_2) \quad \longrightarrow \quad (PA_1P^{-1} + PA_2R, PA_2Q^{-1})$$

with invertible $P$ and $Q$, and assuming that the pair $(A_1, A_2)$ is controllable. The canonical form for this action is known as Brunovsky form (1970).