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A Contribution to the Polynomial Eigen Problem

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Abstract : The relationship between eigenstructure (eigenvalues and eigenvectors) and latent structure (latent roots and latent vectors) is established. In control theory eigenstructure is associated with the state space description of a dynamic multi-variable system and a latent structure is associated with its matrix fraction description. Beginning with block controller and block observer state space forms and moving on to any general state space form, we develop the identities that relate eigenvectors and latent vectors in either direction. Numerical examples illustrate this result. A brief discussion of the potential of these identities in linear control system design follows. Additionally, we present a consequent result: a quick and easy method to solve the polynomial eigenvalue problem for regular matrix polynomials.

Keywords : eigenvalues/eigenvectors, latent values/vectors, matrix fraction description, state space description
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