Invariant Subspaces and Rigidity Theory

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Given a periodic framework $\mathcal{C}$ in $\mathbb{R}^d$, its vector space $\mathcal{F}(\mathcal{C}, \mathbb{R})$ of first-order flexes is the shift-invariant space of $\mathbb{R}^d$-valued velocity fields on the joints of $\mathcal{C}$, which satisfy the first-order condition for every bar. This invariance property has brought into play several tools from analytic and algebraic spectal synthesis.

In this talk, we shall discuss recent applications of spectral synthesis, which have led to a (first) characterisation of first-order rigidity for crystal frameworks. Moreover, we shall explore generalisations of the rigid unit mode spectrum, or RUM spectrum, for symmetric frameworks. This talk is based on joint works with Prof. Stephen Power, Dr Derek Kitson and Prof. John E. McCarthy.