

# On the extension monoid product of Kronecker modules

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## Abstract

For  $d \in \mathbb{N}^2$  let  $M_d$  be the set of isomorphism classes of *Kronecker modules* of dimension  $d$ . For subsets  $\mathcal{A} \subset M_d$ ,  $\mathcal{B} \subset M_e$  we define the extension monoid product  $\mathcal{A} * \mathcal{B}$  to be the set of isoclasses of all extensions of modules  $M$  with  $[M] \in \mathcal{A}$  by modules  $N$  with  $[N] \in \mathcal{B}$  (here  $[X]$  denotes the isomorphism class of the Kronecker module  $X$ ).

In our talk we deal with the explicit description of the extension monoid product in some important cases, revealing interesting combinatorial properties. Kronecker modules correspond to *matrix pencils* in linear algebra and we show how our results can lead to the explicit solution (in some special cases for now) of the *matrix subpencil problem*, an important open problem with applications in control theory and engineering.

This talk is based on joint work with Csaba Szántó.

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