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Representation type of semigroups generated by idempotents with partial null multiplication

This is joint work with Professor V. M. Bondarenko.

Let I be a finite set without 0 and J a subset in $I \times I$ without diagonal elements (i.e. those of the form (i, i)). Denote by $S(I, J)$ the semigroup with generators e_i, where $i \in I \cup 0$, and the following relations:

1) $e_0 = 0$;

2) $e_i^2 = e_i$ for any $i \in I$;

3) $e_i e_j = 0$ for any pair $(i, j) \in J$.

We study finite-dimensional representations of such semigroups over any field k.

To each pair (I, J) (I being a finite set and J a subset in $I \times I$ without diagonal elements) we associate the oriented graph $\Gamma(I, J) = (\Gamma_0, \Gamma_1)$ as follows. The set Γ_0 of vertices of Γ is equal to I and the set Γ_1 of arrows of Γ consists of all arrows $i \to j$ with $(i, j) \notin J$, $i \neq j$.

We prove the following theorems.

Theorem 1. *A semigroup $S(I, J)$ is of finite representation type over a field k if and only if the graph $\Gamma(I, J)$ is a disjoint union of Dynkin diagrams (with some directions of edges).*

Theorem 2. *A finite semigroup $S(I, J)$ is of tame representation type over a field k if and only if the graph $\Gamma(I, J)$ is a disjoint union of ordinary and extended Dynkin diagrams (with some directions of edges).*