A graphical approach to free objects in Rees-Sushkevich varieties

NORMAN R. REILLY
Department of Mathematics and Statistics
Simon Fraser University, BURNABY
nreilly@sfu.ca

A *completely 0-simple semigroup* is just a semigroup with a zero, no ideals other than S and $\{0\}$ and containing an idempotent element e ($e^2 = e$) that is primitive ($f^2 = f, fe = ef = f \Longrightarrow f = e$). The class of completely 0-simple semigroups was the first class of semigroups to be analysed in depth (by Rees and Sushkevich) in the 1930s and it has played a fundamental role in the theory of semigroups ever since. In 1997, T.E.Hall et al. provided a basis for the variety $\mathbf{RS_n}$ generated by completely 0-simple semigroups over groups of exponent n and this has opened up an interesting line of investigation for these varieties. The goal here is to describe the structure of the regular principal factors of the free objects in $\mathbf{RS_n}$. The approach is mainly graphical using the ideas of the fundamental group of a graph in combination with the R. L. Graham normalization of a completely 0-simple semigroup in Rees-matrix form relative to a spanning tree of the bipartite graph associated with the idempotents.