




Leavitt path algebra of the action graph of a semigroup act

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The Action graph of a semigroup act was defined by the authors in [P. Mukherjee, R. Mukherjee and S. K. Sardar, Action graph of a semigroup act & its functorial connection, *Categ. Gen. Algebr. Struct. Appl.* **18**(1) (2023) 43–80] as a combinatorial representation of the acting semigroup. In this paper, we first study some algebraic properties of subacts of a semigroup act which relate graphical properties of the corresponding action graph. We then consider the Leavitt path algebra of action graph and characterize the properties like primality, primitivity, ideal simplicity, etc. Simplicity of the Leavitt path algebra of action graph is found to have a nice connection with the *intersection-large* subacts of the underlying semigroup act. The notion of *extendable subacts* of a semigroup act has been introduced and used to characterize the simplicity of Leavitt path algebra for row-finite action graph. Finally, we characterize the simplicity, graded ideal simplicity, purely infinite simplicity of the Leavitt path algebras of a particular class of action graphs namely the Cayley graphs of semigroups. Some of our results in this paper provide suitable generalizations of the existing results on Leavitt path algebra of Cayley graphs as well as of power graphs of finite groups.

Keywords: Leavitt path algebra; action graph of a semigroup act; intersection-large subact; simplicity; Cayley graph of semigroup.

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