

Preservation of Amalgamated Free Products under Semidirect Constructions and Applications

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Abstract: *In this paper, we investigate the interaction between semidirect products and free products with amalgamation in the category of groups. We establish that the semidirect product functor preserves amalgamated free products under suitable conditions. Using exact sequences and categorical arguments, we derive structural results for groups acting on trees. As an application, we obtain an alternative decomposition of classical matrix groups using amalgamated products of finite groups. Our results provide a unified perspective on group actions, extensions, and decomposition theory.*

Keywords: *suitable conditions*