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Group Theory Used in Computer Graphics: Innovative Topics & Applications

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Abstract: *Group theory provides a rigorous algebraic framework for modelling symmetry and transformation structures arising in applied mathematical systems. In this paper, we investigate the role of finite and continuous transformation groups in computer graphics, with particular emphasis on cyclic and dihedral groups, as well as the Lie groups SO(3) and SE(3). A group-action-based formulation is developed to describe geometric transformations used in object modelling and animation.*
Furthermore, Cayley graphs are employed as mathematical tools to represent transformation sequences, and their structural properties are analysed to characterize symmetry and transformation consistency. A computational implementation based on these formulations is presented, and the resulting models demonstrate improved structural coherence in graphical transformations. The proposed framework establishes a mathematically grounded link between abstract group theory and applied geometric computation, illustrating its relevance to transformation modelling and visualization...

Keywords: Group Theory [1], Computer Graphics, Symmetry [1], Cayley Graphs [3], Transformation Groups, SO(3), Animation [2]

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