Rigid Motions in the Cubic Grid: A Discussion on Topological Issues

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Abstract

Rigid motions on 2D digital images were recently investigated with the purpose of preserving geometric and topological properties. From the application point of view, such properties are crucial in image processing tasks, for instance image registration. The known ideas behind preserving geometry and topology rely on connections between the 2D continuous and 2D digital geometries that were established via multiple notions of regularity on digital and continuous sets. We start by recalling these results; then we discuss the difficulties that arise when extending them from Z^2 to Z^3 . On the one hand, we aim to provide a discussion on strategies that prove to be successful in Z^2 and remain valid in Z^3 ; on the other hand, we explain why certain strategies cannot be extended to the 3D framework of digitized rigid motions. We also emphasize the relationships that may exist between certain concepts initially proposed in Z^2 . Overall, our objective is to initiate an investigation about the most promising approaches for extending the 2D results to higher dimensions.

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