Two-dimensional multiscale entropy analysis: applications to image texture evaluation

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Résumé en anglais	Complexity measures, defined as measures of irregularity over time scales, are the subject of a growing number of studies as the information they reveal can find utility in a large field of applications. One of the most popular complexity measures is the multiscale entropy. Nevertheless, more and more algorithms dedicated to complexity analyses are proposed to improve the existing ones. However, such measures are available only for one-dimensional time series. For bidimensional data (images), no equivalent algorithm has been proposed to analyze irregularity over spatial scales. We herein introduce a new framework that extends the one-dimensional multiscale entropy (MSE1D) to the bidimensional case (MSE2D). Moreover, a variant of MSE2D is also ModMSE2D). The two new algorithms are tested as new texture analysis frameworks. They are applied to simulated and real data. Our results show that, compared with other existing texture analysis algorithms, MSE2D and ModMSE2D are suitable and powerful tools for image analysis and classification according to their texture patterns. While MSE2D is computationally faster than ModMSE2D, ModMSE2D is more robust to small image sizes. The two methods present interesting performances, and can be as useful as their unidimensional versions in two-dimensional applications.
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