Bivariate phase-rectified signal averaging (PRSA) was shown to be a powerful tool for the study of quasi-periodic oscillations and nonlinear effects in non-stationary signals. Here we present a bivariate PRSA technique for the study of the inter-relationship between two simultaneous data recordings. Its performance is compared with traditional cross-correlation analysis, which, however, does not work well for non-stationary data and cannot distinguish the coupling directions in complex nonlinear situations. We show that bivariate PRSA allows the analysis of events in one signal when the other signal is in a certain phase or state; it is stable in the presence of noise and impassible to non-stationarities. (C) 2008 Elsevier B.V. All rights reserved.
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