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ON THE USE OF INFORMATION THEORY FOR THE GENERATION OF ACCELEROGRAMS COMPATIBLE WITH SPECIFICATIONS

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Abstract. This research concerns the generation of seismic accelerograms compatible with physical properties, a given response spectrum and other design specifications. The accelerogram is modeled by a time series represented by a random vector in high dimension. The specifications related to the accelerograms are directly taken into account in the construction of the probability distribution of this random vector by using the Maximum Entropy (MaxEnt) principle under constraints defined by an appropriate available information. A new algorithm, adapted to the high stochastic dimension, is proposed to identify the Lagrange multipliers introduced in the MaxEnt principle to take into account the constraints. This algorithm is based on (1) the minimization of an appropriate convex functional and (2) the construction of the probability distribution defined as the invariant measure of an Itô Stochastic Differential Equation in order to estimate the integrals in high dimension of the problem. The algorithm is validated through an application for which the available information is related to the envelop of the accelerogram, statistics on the response spectrum, statistics on the Peak Ground Acceleration (PGA), statistics on the Cumulative Absolute Velocity (CAV), statistics on the Arias Intensity (AI), the end-velocity and the end-displacement.