

A new Chi-Square based Test Statistic for the Detection of Seismic Events and HOS based Pickers' Evaluation

by

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Abstract

Automatic P-phase onset identification problem involves the solution of two well defined sub-problems; the detection and the picking. Regarding the first one we propose a new parameter free Chi-Square based statistic and its use in a sequential hypothesis testing framework. The main theoretical aspects concerning the proposed detector and its important features are also presented. Among them, the fact that its performance does not depend on the Gaussian noise assumption, as the majority of existing detection schemes do, is pointed out. Furthermore, we compare the performance of the proposed detector against the well known STA/LTA detector, by applying the rivals in a large number of manually identified seismic events. In most cases the proposed detector outperforms its rival. Regarding the picking sub-problem, using the above mentioned dataset, we evaluate the performance of a number of well known Higher Order Statistics (HOS) based pickers in terms of their accuracy in picking the correct P-onset time. Several issues concerning the performance of the above mentioned pickers are discussed and alternative solutions are proposed.