P-35

A velocity structure inversion using Neural Networks

°**Moya, A. and K. Irikura**
Strong Motion Seismology
DPRI, Kyoto University.

ABSTRACT

We present a velocity structure inversion approach using neural networks (NN). Four events from the Tottori sequence were selected around station SMNH01 in order to determine a 1D nearby underground velocity structure. A NN was trained for each earthquake-station profile using synthetic data. Upon training, actual observed records of the four events were given as input to the network which tried to predict their corresponding velocity structure. First, simple 1D profiles were obtained individually for each of the events. Then, the validity of each model was tested by analyzing the waveform fitting of different events recorded at SMNH01 and two other nearby stations: TTR007 and TTR009. We also analyzed a 3D case in which the depth and P and S-wave velocities of a basin-like structure were inverted using NN. S-wave velocity is given assuming a constant Poisson ratio. For this test, only the upper layer of the model was inverted using synthetic data. In general, the network was able to predict most of the models accurately. It was observed that as many as 75% of the models were estimated with a goodness-of-fit of 70%.

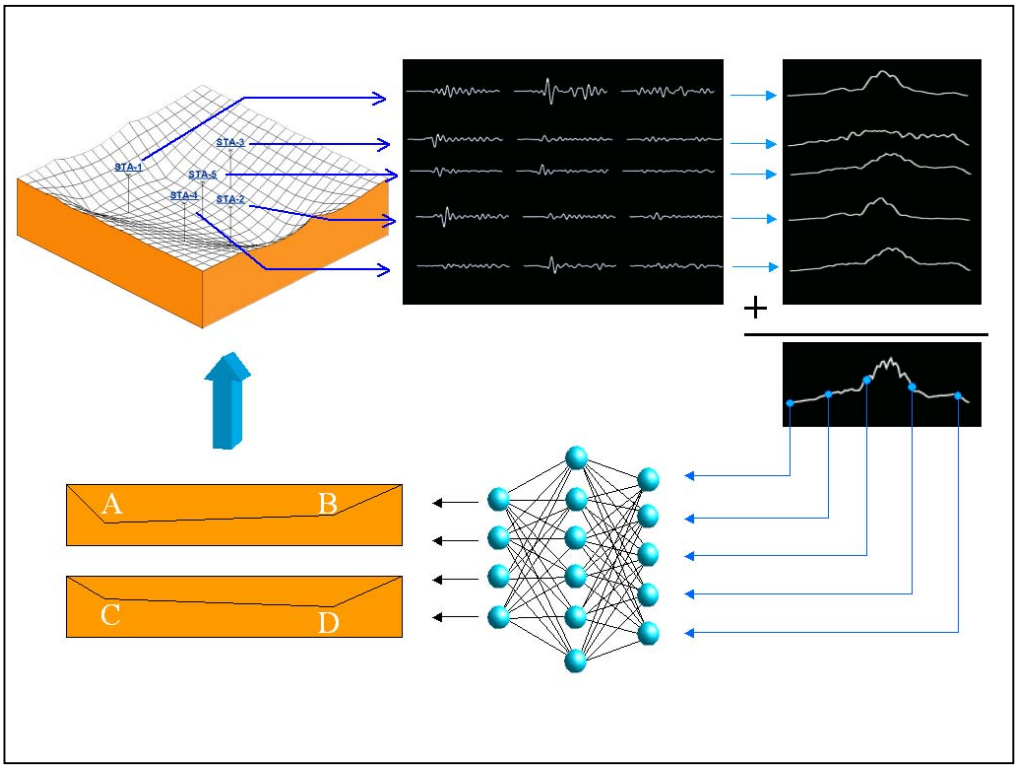

Figure 1. Schematic representation of the learning approach for the NN in the 3D case. The control points (A, B, C, and D) are used to create a basin like structure. Waveforms are computed at each of the five stations for which the vectorial summation of the three components is calculated. Then, those summations are presented to the neural network which tries to associate it to the original control points.