Development of the seismic signal detection method under low SNR condition using an
artificial neural network

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We have developed a community based MEMS sensor network, Citizen Seismic Network (CSN) to obtain
the detailed strong motion data which closely linked to community's life. In this project, we
developed a sensor unit which detects strong motion and process the data. The unit is composed of
12 bit MEMS sensor and Raspberry pi. Since we expect the unit is set under the high noise
environment (e.g. inside of house), it is important to discriminate between the earthquake signal
and the others. However, under the such environment, the conventional method, ratio of short time
average and long time average (STA/LTA) which depends on the amplitude of the signal often mislead
to pick noise as the signal. To overcome this problem, we developed a method to detect and identify
a seismic signal using an artificial neural network (ANN) which utilize a pattern recognition. In
the initial test, we used waveform data recorded at our sensor network as the training data to
detect the other observed data. We found the discrimination was successful. However, at the moment,
since we only have five earthquakes detected in our network, the amount of training data is not
enough. So as the next step, we use the seismic data obtained at the Yokohama strong motion network
and loaded noise obtained by our sensor to the seismic waves. Using the waveforms as training data
we will show the synthetic test to check the ability of our ANN detection algorithm.

Keywords: Seismic signal detection, Neural network, ANN, MEMS