Automatic first motion focal mechanism determination using a dense low cost seismic network

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A dense low cost seismic network has been installed in Taiwan with about 650 stations. This network also receives 70 broadband seismic signals from Institute of Earth Sciences, Academia Sinica (IESAS) and National Center for Research on Earthquake Engineering (NCREE). It provides a nice stations coverage for the earthquake monitoring of Taiwan region as well as focal mechanism determination. First-motion polarities from this network are used to determine focal mechanism. When an earthquake occurs, automatic picker will determine P arrivals and polarities of the first motion using Central Processing Unit (CPU) parallelization. Then, Equal Differential Time (EDT) surface and grid search methods are used to determine hypocenter location. The OpenACC parallel computing toolkit and Graphic Processing Unit (GPU) are used to reduce processing time. Finally, Genetic Algorithm (GA) method is used to determine focal mechanism. By CPU and GPU parallelization, this system can determine the hypocenter and focal mechanism within 3 to 5 minutes after an earthquake occurrence.

Key words: Earthquake, focal mechanism, parallelization computing