Quakify: A Low-Cost, Crowdsourced, Real-Time Solution to Earthquake Early Warning

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The goal of this project is to design a low-cost earthquake early warning solution (Quakify) to provide adequate warning prior to hazardous ground shaking in a location. Harnessing the power of MEMS accelerometer technology to enable crowdsourced data collection and analysis in the cloud, the system is characterized by a three-step process: (1) rapid detection, (2) real-time analysis, and (3) timely notification. Arduino microcontrollers and affordable triaxial accelerometers are the key hardware components. Java, SQL, and C programming languages are used for all major software functions, whether reading and visualizing sensor data, performing database functions, or implementing filters and algorithms. A mobile client will accompany the solution in finality. The feasibility and proficiency of MEMS accelerometers in recording earthquakes was assessed and confirmed through a series of research laboratory-based shake table tests that recorded acceleration during various simulated historical earthquake events. The factors measured were raw acceleration in the x, y, and z directions, which were used to compute filtered x, y, and z values, and total acceleration (magnitude of the three-dimensional vector formed by the triaxial acceleration data). The results indicate that a visible threshold exists between standard accelerometer noise and the acceleration of a substantial earthquake. With clear proof that the sensors have the capability to distinguish significant ground shaking, it can be concluded that the MEMS-accelerometer-based earthquake early warning system developed in this project provides a novel, cost-efficient, and easily-scalable method for notifying the public of violent shaking before it happens, minimizing losses and saving lives in the process.

Awards Won:
Second Award of $2,000
Geological Society of America &amp
American Geosciences Institute: Fourth Award of $500