MyShake
Harnessing Earthquake Early Warning & Distributed Sensor Networks

Richard Allen

Install MyShake on your smartphone
Be Quake Ready
What is earthquake early warning?

Magnitude 8 on the San Andreas
What is earthquake early warning?

MyShake’s goal: Deliver earthquake alerts around the globe

Mexico City
M7.1 - September 19, 2017
An Earthquake Early Warning Platform

MyShake Platform

Earthquake detection
Sensor network
- seismic networks
- smartphones
- internet of things

Decision maker

Alert delivery
Broadcast network
- geotargeted alerts
MyShake 2.0
Be Quake Ready

- Early warning delivery (ShakeAlerts in CA)
- Detailed damage information reported by users
- Preparedness and safety tips
- Realtime earthquake information around the globe
MyShake 2.0 Gov. Newsom release

The New York Times
California Launches Earthquake Early Warning System It Calls Best in World

October 17, 2019
MyShake 2.0
Alert delivery

In specific regions as possible depending on availability
Alerts are available for use...

...by technical and industrial users - Oct 2018

...the public in California - Oct 2019

...the public in Oregon and Washington - Oct 2020
Who could use earthquake early warning?

Reducing Falling hazards

Loma Prieta >50% injuries were linked to falls

if everyone received a few seconds warning
if everyone dropped, took cover, and held on
then early warning could reduce injuries by 50%

Northridge
>50% injuries were non-structural (falling) hazards

Cost of injuries in Northridge: $2-3 billion

Shoaf et al, 1998; Porter et al, 2006
Who could use earthquake early warning?

**Automated control**

- Slowing and stopping trains
- Isolating hazardous machinery and chemicals
- Data security

**Situation awareness**

- Preventing cascading failures
Pilot projects > 50

End users (taking action)

BART + LA Metro: train control
Eugene Water & Electric: water valve control
Menlo Park Fire + NBC Universal: firehouse
Regatta Condominiums: resident alerting
Northridge Hospital Medical Center: alerting
City of Los Angeles: City Hall alerting + ShakeAlertLA app

Many more receiving alerts and considering what actions

Commercial developers = amplifiers

Actuator + alerting: Early Warning Labs, SkyAlert

Mass notification:
Everbridge, Regroup, AtHoc, Global Security Systems, +more

Engineering control: RH2, Varius – Water system control

In summary
• personal notification
• train control
• water system control
• firehouse alerting
MyShake Platform
An Earthquake Early Warning Platform

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Decision maker
**MyShake**: smartphone app

![Diagram showing the integration of MyShake with earthquake detection and alert systems.](image)

- **Earthquake detection and alert**
- **Seismic waveform data**
- **Block-by-block shaking**
- **Response of buildings to shaking**
- **Global event detection**
- **Microseismicity detection and fault monitoring (network-wide recording)**
Distinguishing earthquakes from other shakes on a phone

- Identify key characteristics measured from 2 second windows of data
- Neural Network trained to classify activity

93% success rate on the phone

Then send earthquake trigger into the MyShake cloud

Distinguishing earthquakes from other shakes on a phone

M6 Napa quake: dist 11km with phone noise added

Non-quake data from user phone
Before
MyShake 2.0
Already a global seismic network

MyShake 1.0 downloads: 300,000
MyShake Earthquake detection

Borrego Springs

M5.2
June 10th 2016

triggers with P and S
Alert delivery: **Borrego Springs** re-run using MyShake detections

June 10th 2016

M5.2

Time(UTC) 2016-06-10 08:04:38
Time(Local) 2016-06-10 00:04:38
Triggers 1

M5.2 Borrego_Springs
Depth 12.3 km

Re-run: Warning
MyShake simulation
Indonesia – M7.5 – September 28, 2018
Earthquake and tsunami - 2,200 casualties - smartphone penetration: 40%
Structural Health Monitoring
With a dense in-building seismic network

Sarina Patel, BSL
Selim Gunay, PEER
Berkeley
Structural Health Monitoring

Modal frequencies tell us about structural integrity

24 story residential building in Oakland

CESMD data

2018 M4.4 Berkeley quake
Structural Health Monitoring

Modal frequencies tell us about structural integrity

8 story residential building in Oakland

MyShake data

2018 M4.4 Berkeley quake

…monitoring structural health of cities
California’s goal:
4 million downloads

Our goal?

Gavin Newsom
@GavinNewsom

30 years ago today a portion of the Bay Bridge collapsed.

Today, I’m proud to stand here and announce that CA is the first state in the nation to launch an earthquake early warning app.

Be prepared. Download the app now! -->
earthquake.ca.gov/mobile-applica...
MyShake
A virtuous circle?

- block-by-block shaking
- earthquake rupture physics
- microseismicity
- fault detection
- shallow basin structure
- building response

societal engagement

earthquake awareness, education and preparedness

Citizen science

Scientific discovery

User application

Hazard reduction

...that we hope will grow