RED-ACT Report

Real-time Earthquake Damage Assessment using City-scale Time-history analysis

Apr. 24, M4.8 New Zealand Dannevirke Earthquake

Research group of Xinzheng Lu at Tsinghua University (luxz@tsinghua.edu.cn)

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Acknowledgments and Disclaimer

The authors are grateful for the data provided by GeoNet. This analysis is for research only. The actual damage resulting from the earthquake should be determined according to the site investigation.

Scientific background of this report can be found at:

http://www.luxinzheng.net/software/Real-Time_Report.pdf

1. Introduction to the earthquake event

At Apr 24 2019 4:37 (Local Time), an M 4.8 (GeoNet) earthquake occurred in New Zealand Dannevirke. The epicenter was located at 175.97 -40.26, with a depth of 25.0 km.

2. Recorded ground motions

33 ground motions near to epicenter of this earthquake were analyzed. The names and locations of the stations can be found Table 1. The maximal recorded peak ground acceleration (PGA) is 42 cm/s/s. The corresponding response spectra in comparison with the design spectra specified in the Chinese Code for Seismic Design of Buildings are shown in Figure 1.

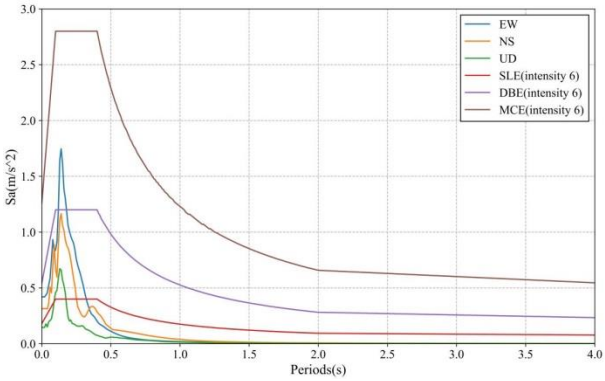

Figure 1 Response spectra of the recorded ground motions with maximal PGA

3. Damage analysis of the target region subjected to the recorded ground motions

Using the real-time ground motions obtained from the strong motion networks and the **city-scale nonlinear time-history analysis (see the Appendix of this report),** the damage ratios of buildings located in different places can be obtained. The building damage distribution and the human uncomfortableness distribution near to different stations is shown in Figure 2 and Figure 3, respectively. These outcomes can provide a reference for post-earthquake rescue work.

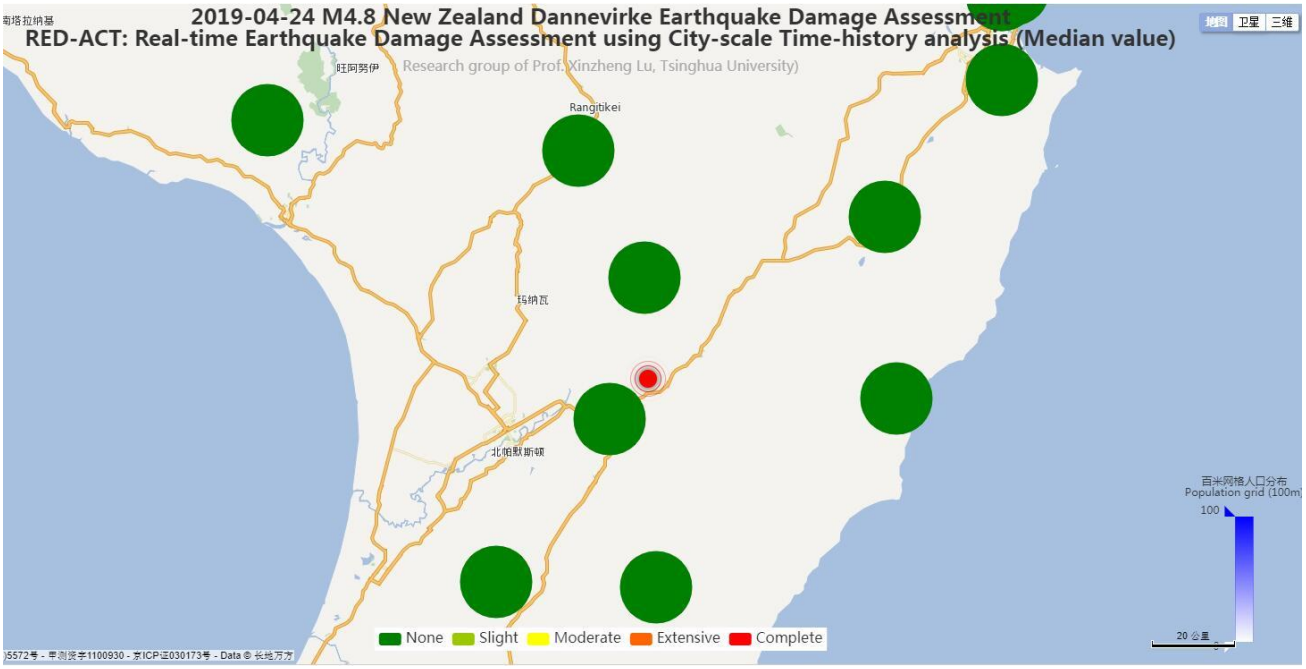

Figure 2 Damage ratio distribution of the buildings near to different stations

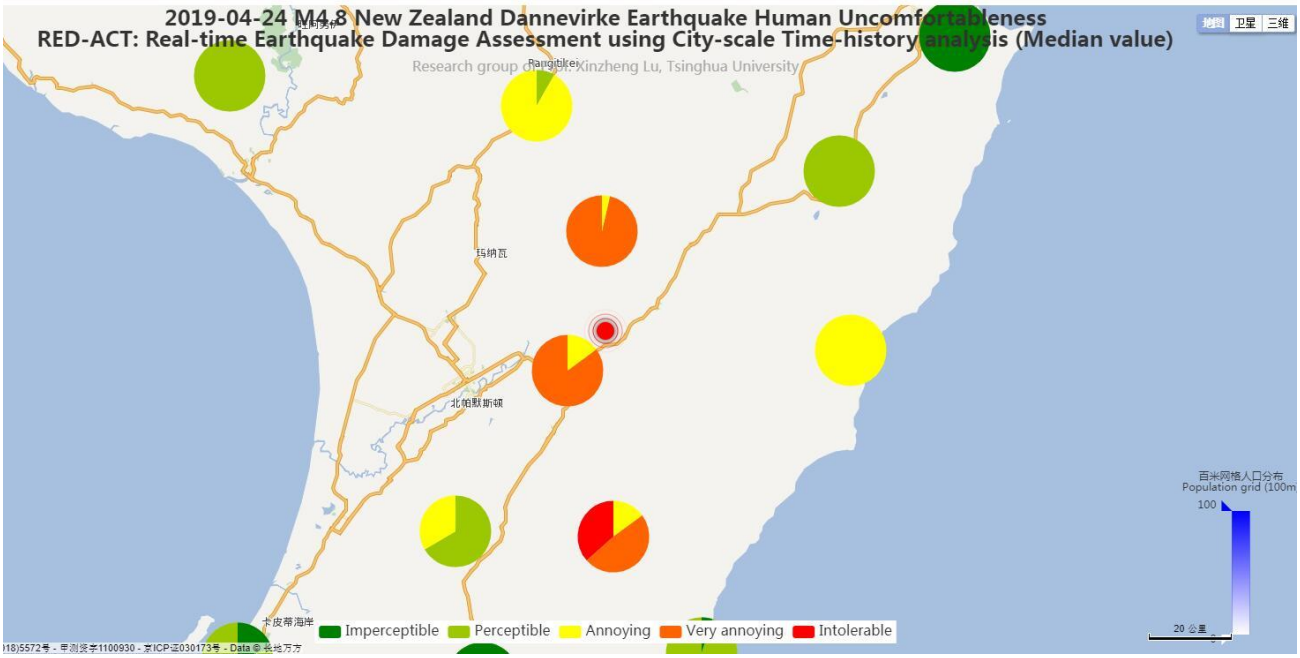

Figure 3 Human uncomfortableness distribution near to different stations

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Table 1 Names and locations of the strong motion stations

No.	Station Name	Longitude	Latitude
1	20190423_163716_TSZ_20	175.9611	-40.0586
2	20190423_163716_WDPS_20	175.8697	-40.3383

3	20190423_163720_MNGS_20	175.7908	-39.8078
4	20190423_163720_TRMS_20	175.9911	-40.6714
5	20190423_163721_MRZ_20	175.5786	-40.6606
6	20190423_163721_PGFS_20	176.6117	-40.3022
7	20190423_163722_WPWS_20	176.5844	-39.9439
8	20190423_163724_CPFS_20	176.2208	-40.8989
9	20190423_163725_WRCS_20	175.6478	-40.9503
10	20190423_163726_WCDS_20	175.0481	-39.9336
11	20190423_163728_HNPS_20	176.88	-39.6711
12	20190423_163728_PAPS_20	175.005	-40.9144
13	20190423_163728_WAZ_20	174.9856	-39.7547
14	20190423_163729_UHCS_20	175.0408	-41.1269
15	20190423_163730_NGHS_20	176.915	-39.4858
16	20190423_163731_BMTS_20	174.9261	-41.1914
17	20190423_163731_INSS_20	174.9211	-41.2336
18	20190423_163731_PHHS_20	174.9042	-41.2522
19	20190423_163731_WANS_20	174.9311	-41.2311
20	20190423_163732_PTOS_20	174.8603	-41.2231
21	20190423_163732_SOMS_20	174.865	-41.2575
22	20190423_163733_MISS_20	174.8183	-41.315
23	20190423_163733_POTS_20	174.7747	-41.2722
24	20190423_163733_WDAS_20	174.9483	-41.2575
25	20190423_163733_WEL_20	174.7681	-41.2842
26	20190423_163733_WEMS_20	174.7792	-41.2742
27	20190423_163735_PWES_20	174.8258	-41.1275
28	20190423_163740_MTHZ_20	176.8411	-38.8522
29	20190423_163741_TEPS_20	174.7811	-41.2906
30	20190423_163741_TPPS_21	176.0675	-38.6864
31	20190423_163743_RTZ_20	176.9806	-38.6156
32	20190423_163747_NCDS_20	176.8761	-39.4983
33	20190423_163749_TLZ_20	175.5381	-38.3294