

IoTによる都市・建物の防災・避災・減災の高度化に向けた実用化研究

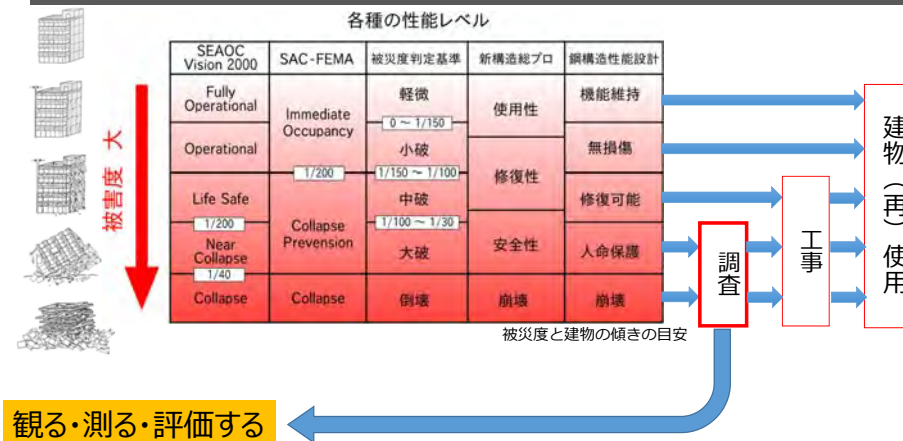


東京理科大学

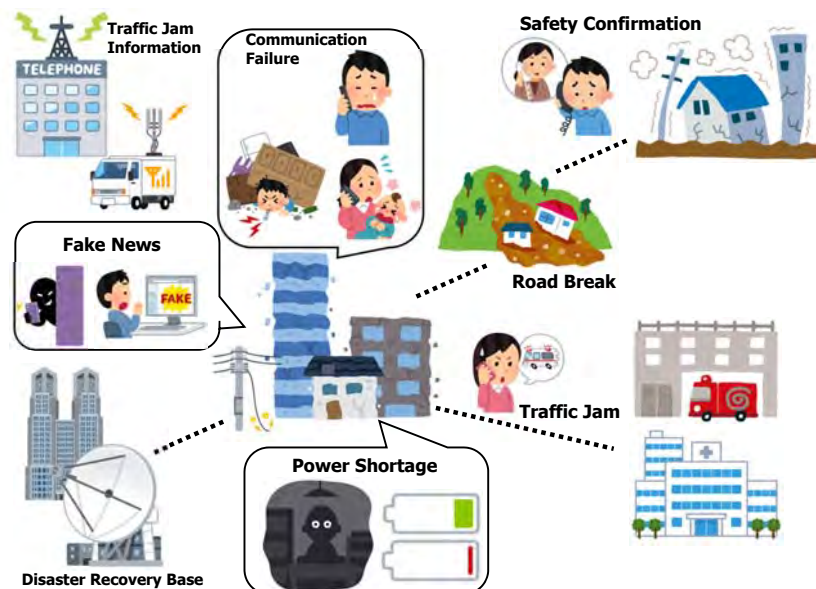
工学部建築学科・教授 伊藤拓海（研究代表）

元・工学部建築学科・助教 崔彰訓、工学部教養・教授 山本貴博
理学部応用物理学科・准教授 中嶋宇史、工学部電気工学科・教授 河原尊之
理学部応用物理学科・講師 橋爪洋一郎、工学部電気工学科・教授 長谷川幹雄

震災後からの動き



被災都市の状況



従来技術と本研究開発の目標 ～震災建物モニタリングの課題～

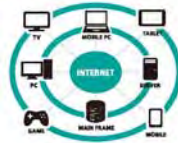
- ✓ 人・モノ・車両の不足
- ✓ 諸活動（救助・復旧・復興）のための電気不足
- ✓ 都市の動き（交通・通信・物流）の停滞

Internet of Information
(few decades ago)



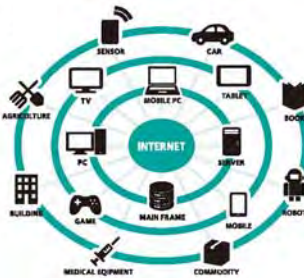
WEB computing

Internet for People
(ten years ago)



Ubiquitous network

Internet of Things
(today)



IoT society

✓ 環境発電・小型センサー

✓ 機械学習・AI

✓ 省電力無線通信

Issues

Under the seismic disaster cities

Power Shortage



Traffic Jam
Information



Complex
Events



Communication
Failure



Information
Safety



IoT Solution

Solution

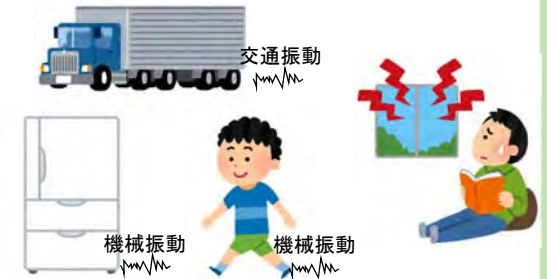
Energy
Harvesting

Big-data,
AI

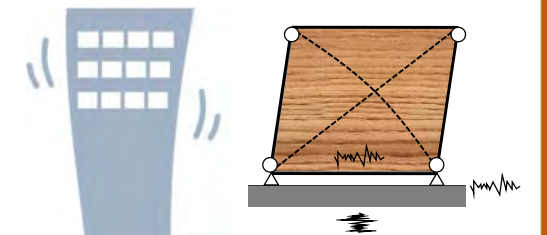
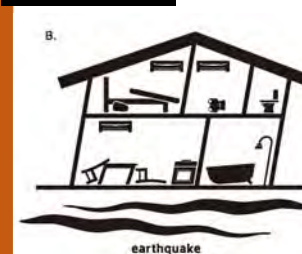
Optimization
Communication

Data
Security

日常時の振動

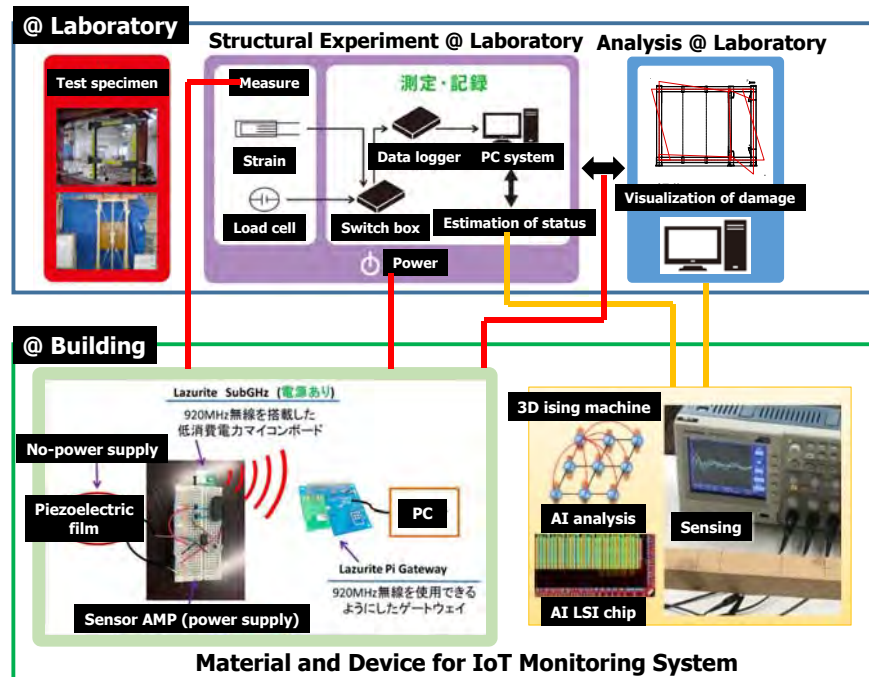
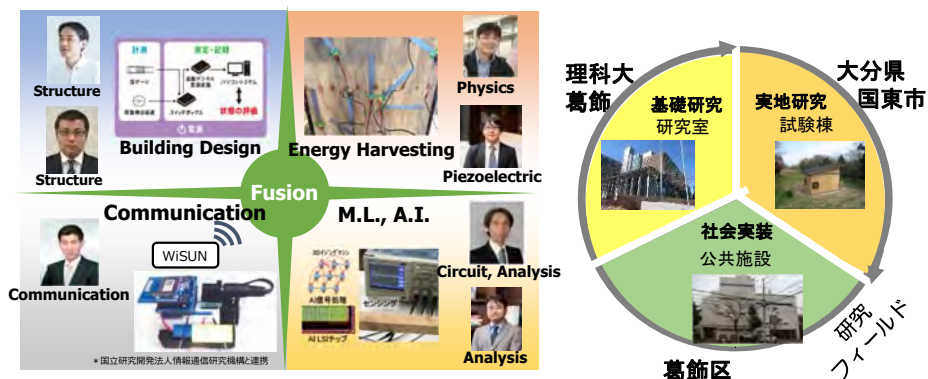


災害時の振動

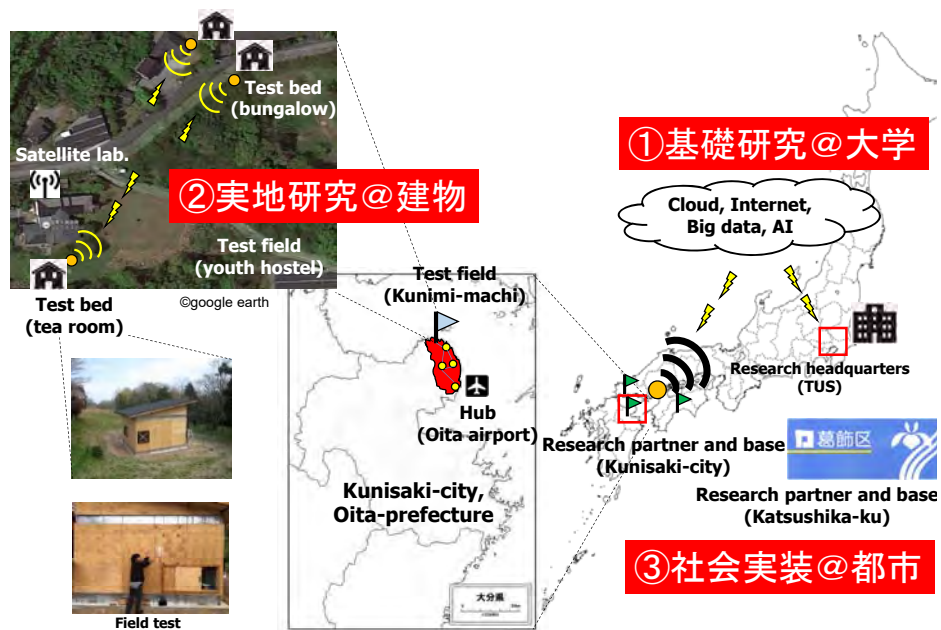


Elementally Technology and Architect of System

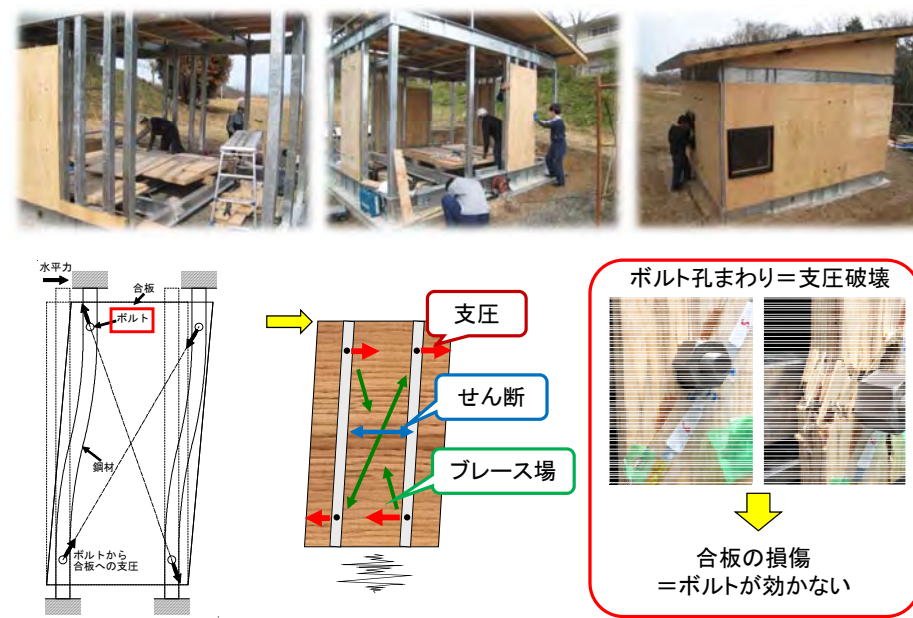
Interdisciplinary Research Team



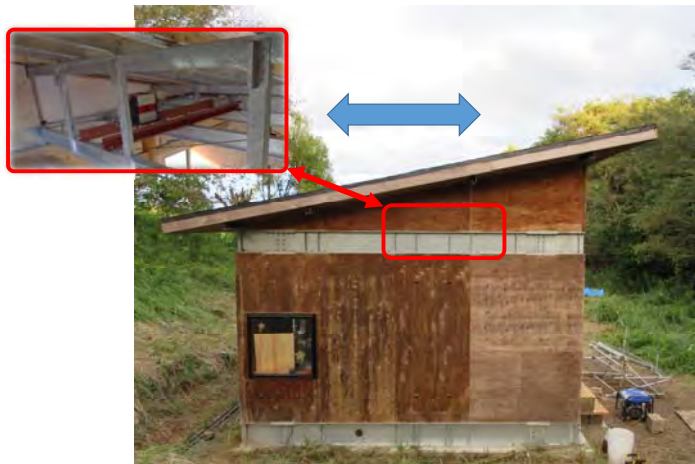
研究フィールド



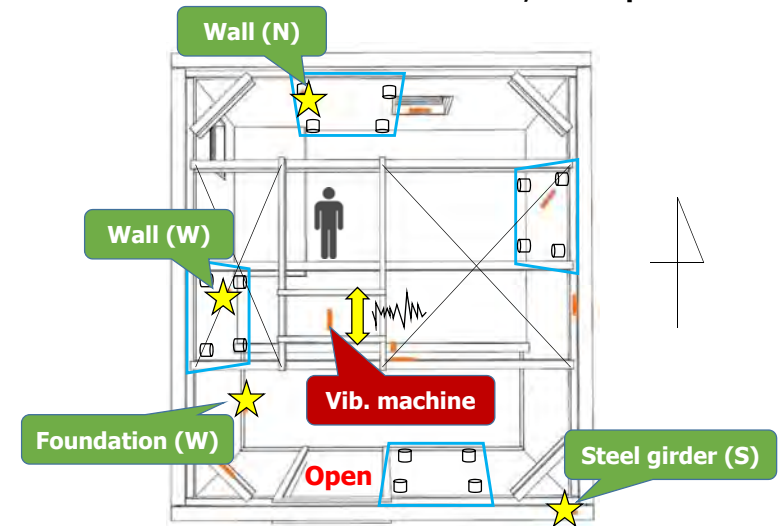
テストベッドの建設 ~合成耐力壁~



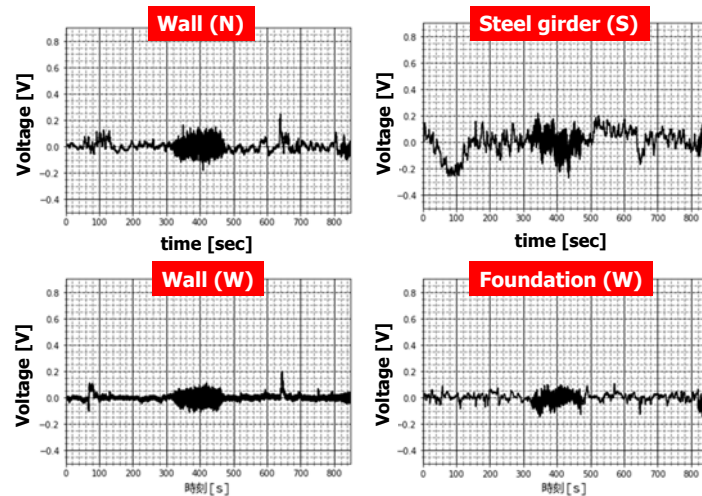
Forced vibration experiment, Mar. & Oct. 2018



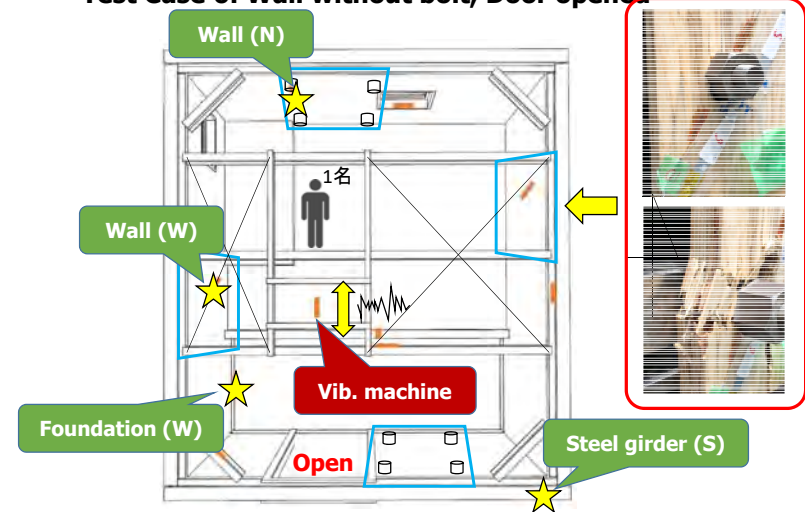
Test Case 1: Wall with bolt fastened, Door opened



Test Case 1: Wall with bolt fastened, Door opened

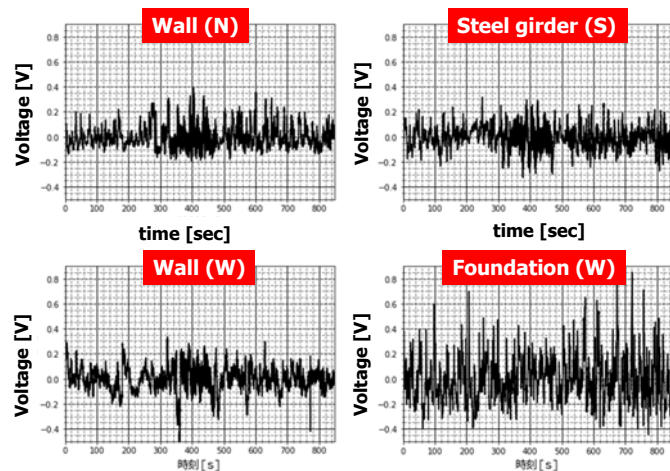


Test Case 6: Wall without bolt, Door opened



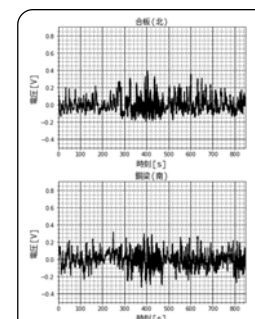
Field Research on Test Bed with Shaking

Test Case 6: Wall without bolt, Door opened



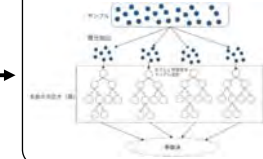
Machine Learning / AI

Shaking Test

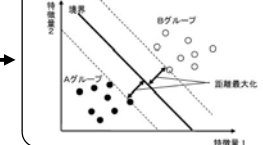


Test Results of Vibration

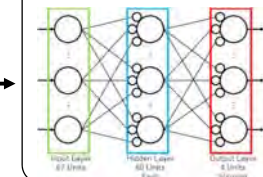
A.I. (1) ~Decision Tree~



A.I. (2) ~Support Vec. Mac.~



A.I. (3) ~N.N.~



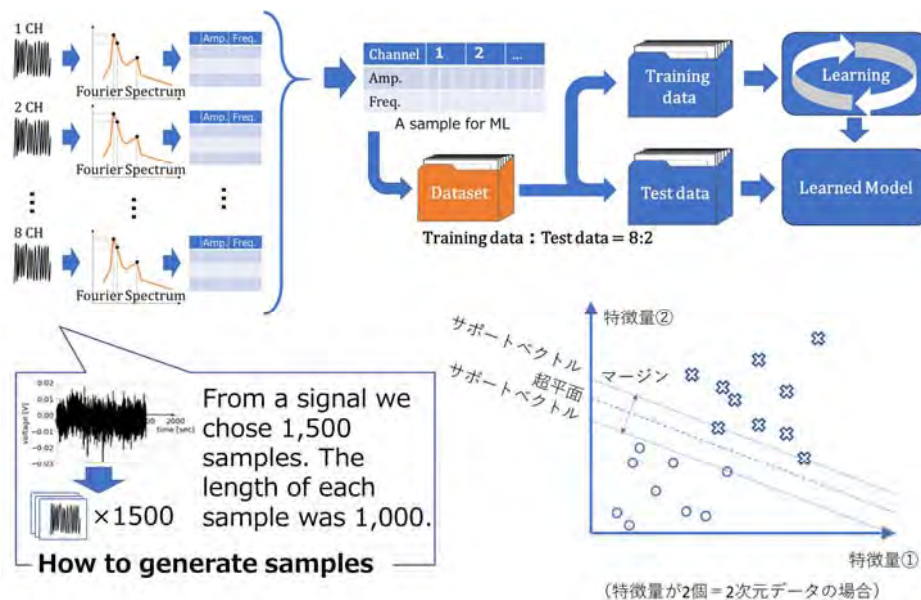
Sensor + AI



Decision Possible

- ✓ Build. Status (Damage, Door)
- ✓ Stay person

実地研究② ～機械学習による解析2～



社会実装実験 ～都市・建物へのIoTシステムの実装～

