



Laboratory Evaluation of Mobile Device Acceleration Sensors for Structural Damage Detection



Samuel Lozano, EIT, Graduate Student, Civil Engineering, Oregon Institute of Technology
 Jason Millar, EIT, Graduate Student, Civil Engineering, Oregon Institute of Technology
 Charles Riley, PhD, PE, Associate Professor, Oregon Institute of Technology

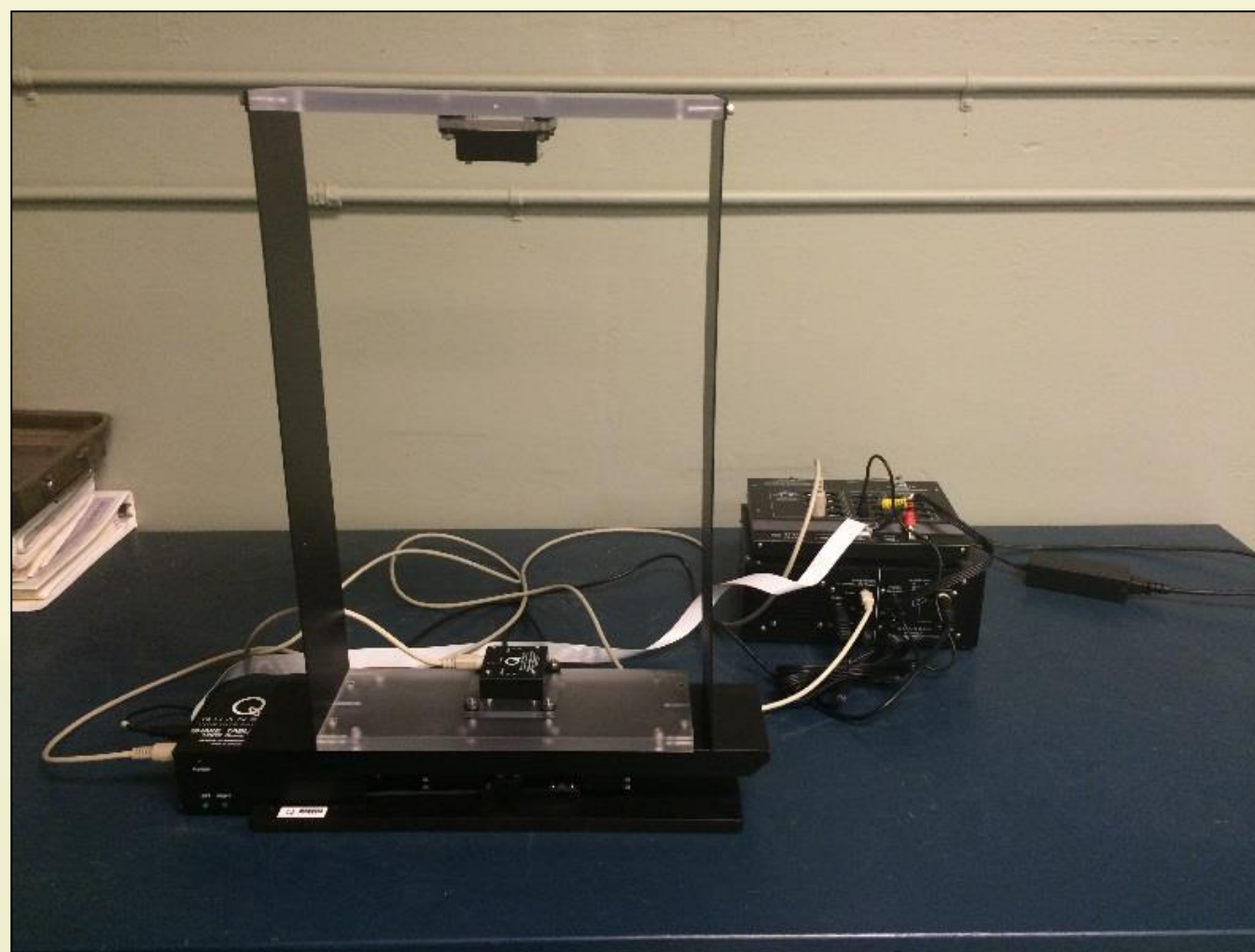
TESTING METHODS

Sensor Devices

1. Quanser 2-Axis Accelerometer
2. Apple iPod with 3-Axis MEMS accelerometer
3. TI Multi-standard SensorTag 2.0 with IvenSense 9-Axis MotionTracking device

Testing Device

- Quanser Shake Table I-40 (single-axis simulator)

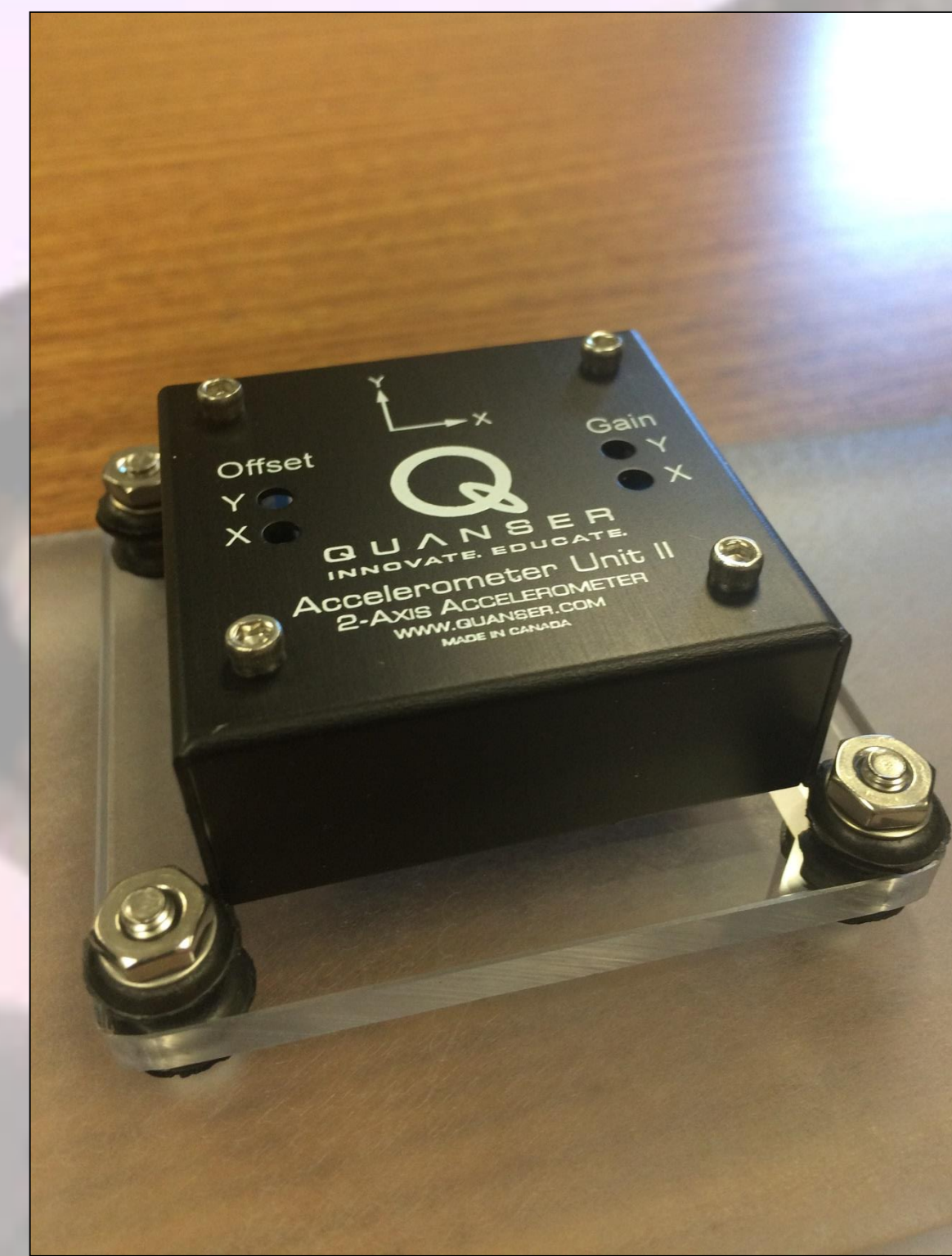


Methodology

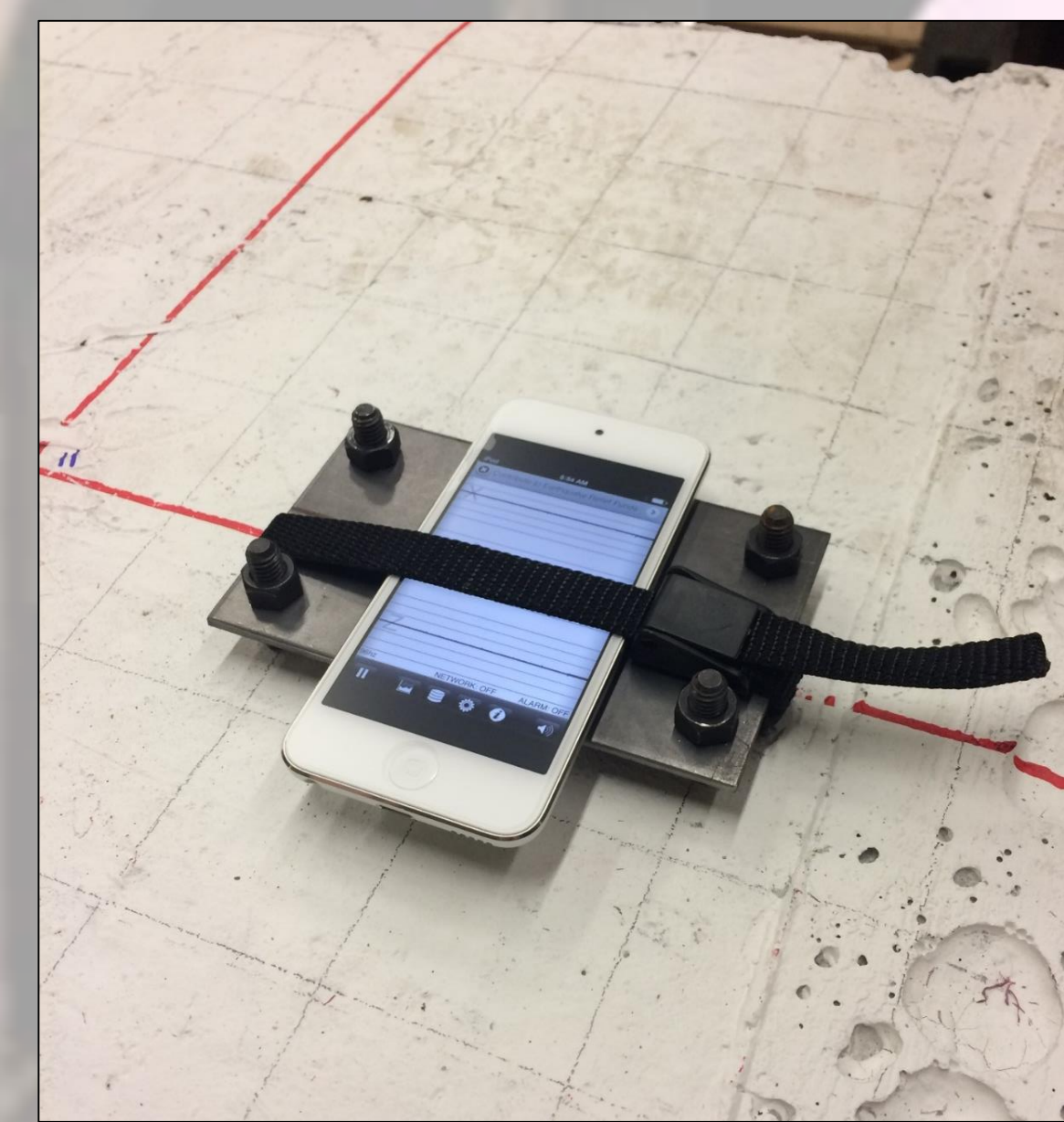
- Each sensor run through a range of acceleration frequencies to find the usable range

INTRODUCTION

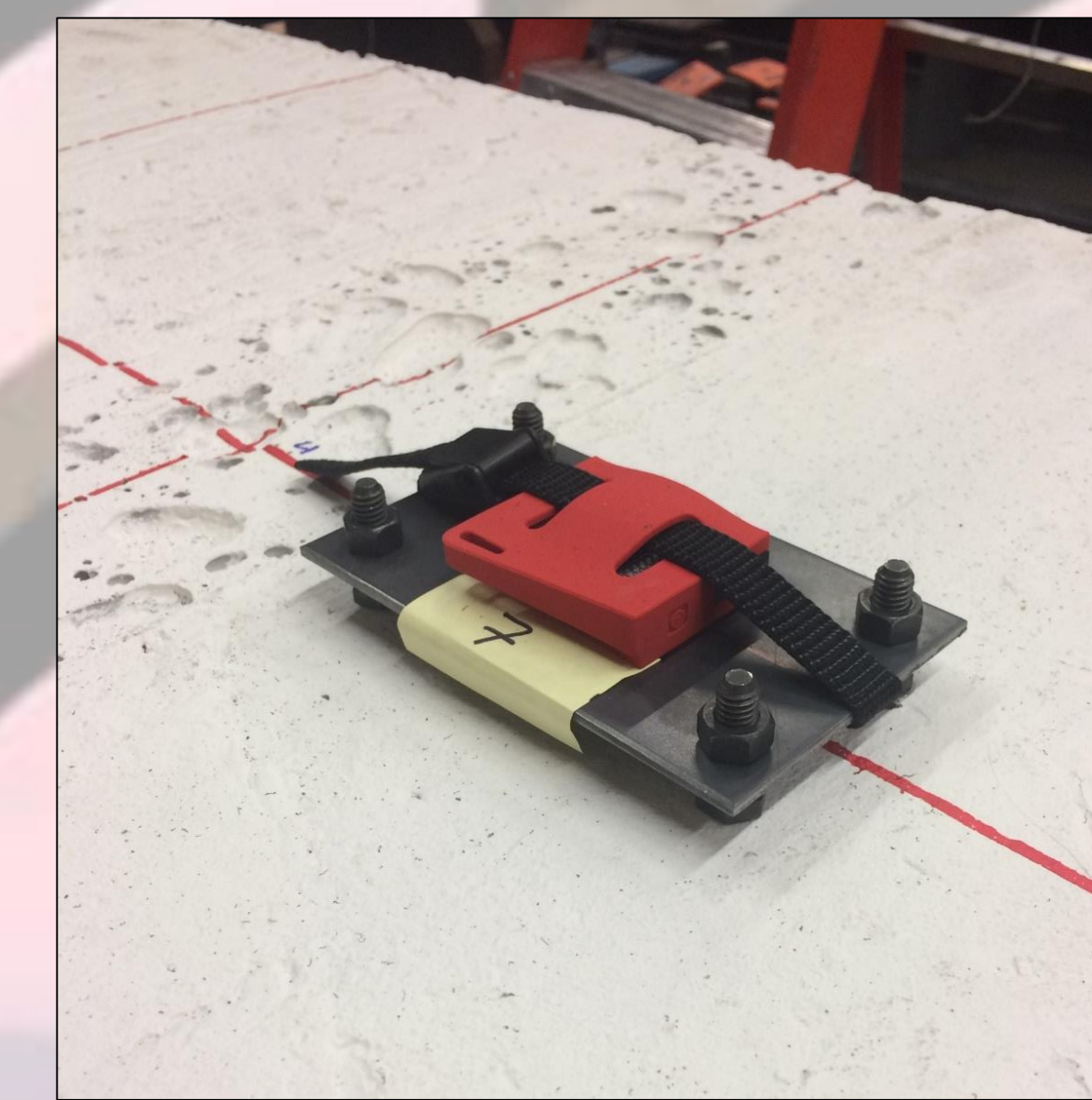
Purpose built accelerometer systems are a commonly used method of structural health monitoring (SHM). They are, however, costly and time consuming to use. By making use of hardware and software available to the general public, an accelerometer-based SHM system can be made both inexpensive and easy to use, with a minimum loss of accuracy in results.



Quanser Accelerometer



Apple iPod



TI SensorTag



FUTURE WORK

- Develop data gathering and processing abilities to form a Rapidly Deployable Structural Evaluation Toolkit
- Compare frequency range of different sensor devices, and their ease of use
- Field test a small bridge structure using a linear motion oscillator

CONCLUSIONS

- Using wirelessly connected mobile devices to conduct SHM tests is not only possible, but can be inexpensive and quick to implement as well.
- The system envisioned here will be suitable for smaller, single-span, bridge structures, where permanent and more expensive SHM systems are cost prohibitive.

PURPOSE

Accuracy

- Compare three different accelerometer systems and their maximum effective frequency range

Feasibility

- Determine the most effective way to mount accelerometer sensors to a structure and gather results
- Develop a system for field implementation based on lab results

TEST RESULTS

