



<i>Project Title:</i>	Smartphone as Next-generation Monitoring Devices for Construction-induced Vibrations and Noise
<i>Principal Investigator:</i>	Dr. Songye ZHU
<i>Project ID:</i>	CICR/03/18
<i>Research Institution:</i>	The Hong Kong Polytechnic University
<i>Subject Area:</i>	Construction Productivity
<i>Durations:</i>	24 months

## Background

Construction activities often generate excessive ground-borne vibrations associated with noise pollution. The vibration and noise pollution becomes a more severe problem in metropolitan cities (such as Hong Kong), where the shortage of land supply results in many new construction projects located in high density areas with very small separation distances from existing structures.

In view of their environmental impact, construction-induced ground-borne vibrations have been routinely monitored on sites as a common practice. Traditional vibration monitoring uses portable seismographs consisting of recording units, triaxial geophones, and connecting cables. In Hong Kong, there is mandatory guidance for using portable seismographs on construction sites. However, such a vibration monitoring practice is associated with several apparent deficiencies, such as the incapability of providing multiple vibration indices, fixed range, no real-time display, difficulty in long-term measurement, separate units for vibration and noise measurements, bulky size, high cost, etc. The manual retrieval of stored data afterwards is very time-consuming.

Considering the rapid development of smartphones in recent years, an alternative for both vibration and noise monitoring is presented, featured by powerful computing, various types of sensors, versatile functions and easy access to the Internet. This project aims to develop a next-generation smartphone-based monitoring device for assessing the impact of construction-induced vibration and noise. The smartphone App to be developed will enable vibration and noise monitoring, and analysis with respect to multiple vibration and noise indices.

## Objectives

### Phase 1

- To examine the sensor sensitivity of smartphones through laboratory experiments;
- To validate the sensor sensitivity of smartphones through field implementations on construction sites.

### Phase 2

- To develop the first smartphone application for real-time monitoring and assessment of construction-induced vibration and noise;
- To establish a standard monitoring process, including the selection of phone models, the standard installation accessories and process, and a user operation manual; and
- To promote the developed monitoring approach to the local construction industry.



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## **Key Deliverables**

- ◆ Validated performance of sensors of different models of smartphones, including sensitivity, measurement range, operational conditions, etc.
- ◆ A smartphone App for real-time monitoring and assessment of construction-induced vibration and noise impact;
- ◆ An online system with the functions of data storage, sharing and report generation;
- ◆ A user operation guideline for installation and operation.

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