

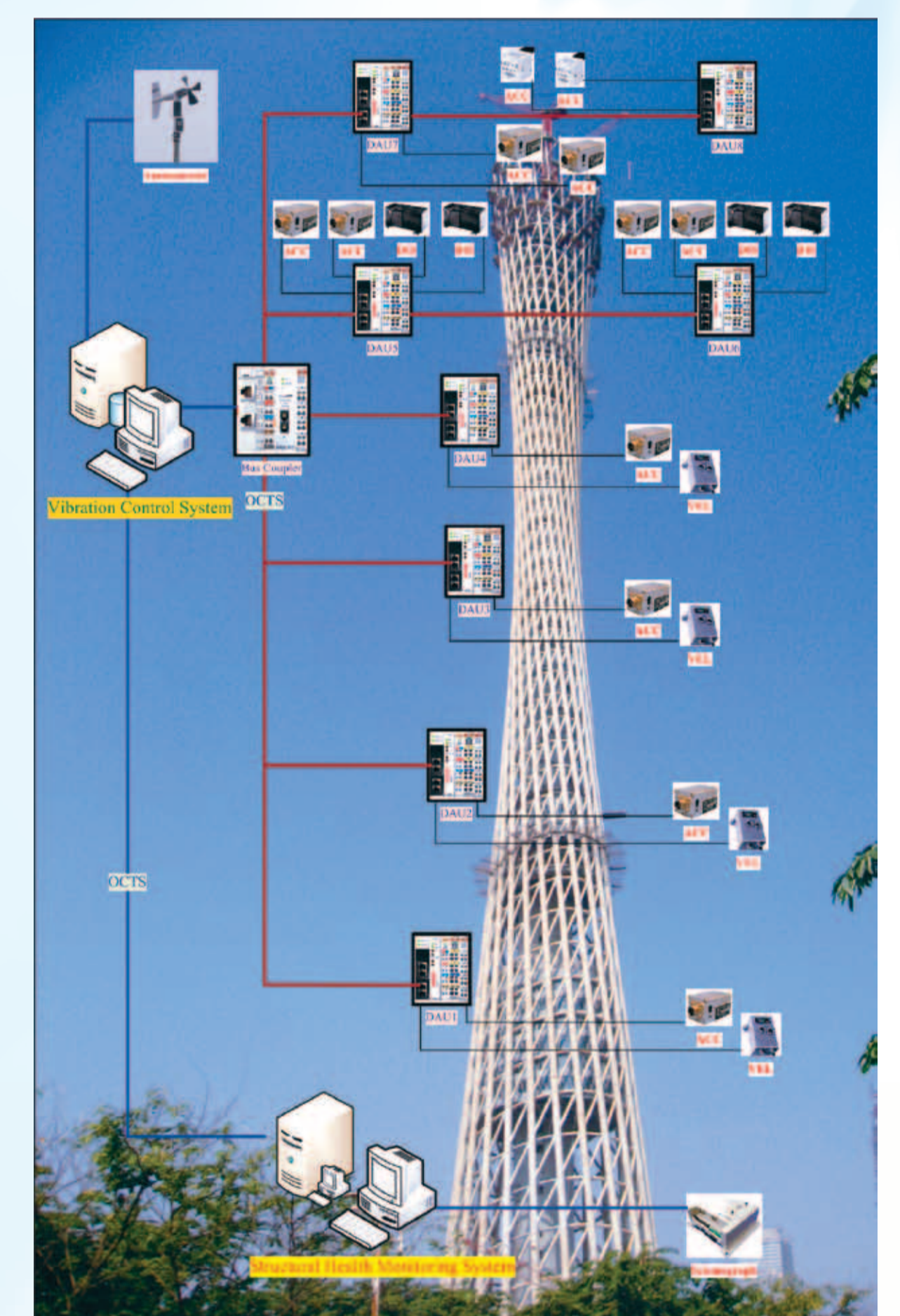
Mega-structure Diagnostic and Prognostic System 大型結構診斷與預測系統

Current challenges

We should be proud of the mega-structures and skyscrapers around us as they are the symbols of modernization and urbanization. However, they pose a lot of safety issues which remain unsolved for many years, including:

- Potential dangers in architecture with irregular form and geometry
- Catastrophic structural failure
- Wear and tear of structural components and connectors
- Difficulty in assessing thoroughly the effectiveness of repair and maintenance work
- Structural deterioration and damage in areas that are inaccessible, invisible, concealed by paint or beyond the façade

So, how can we avoid these potential threats?



Our solutions

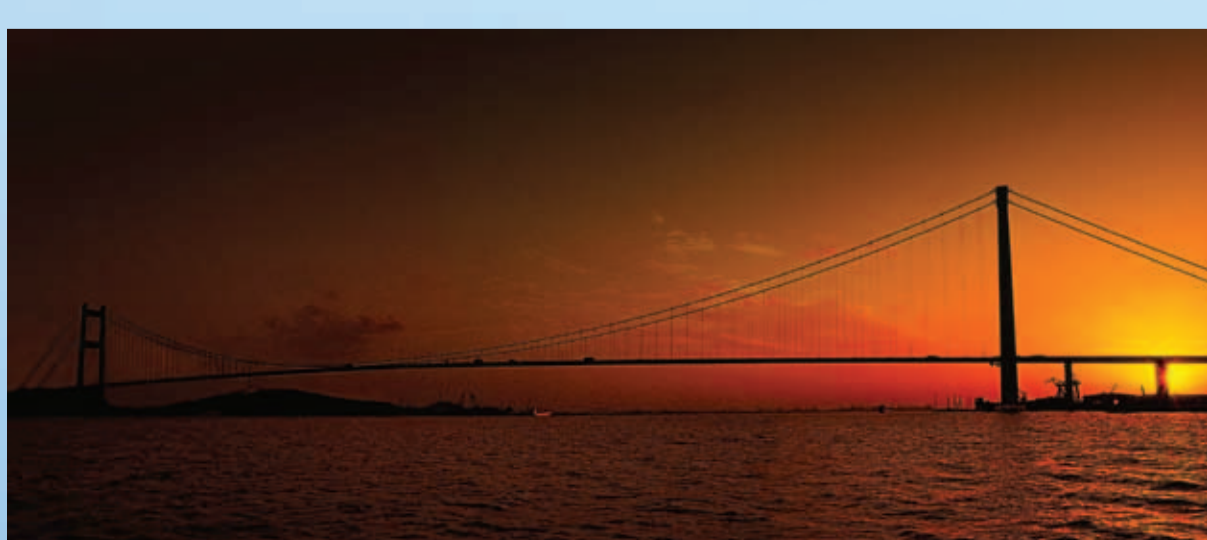
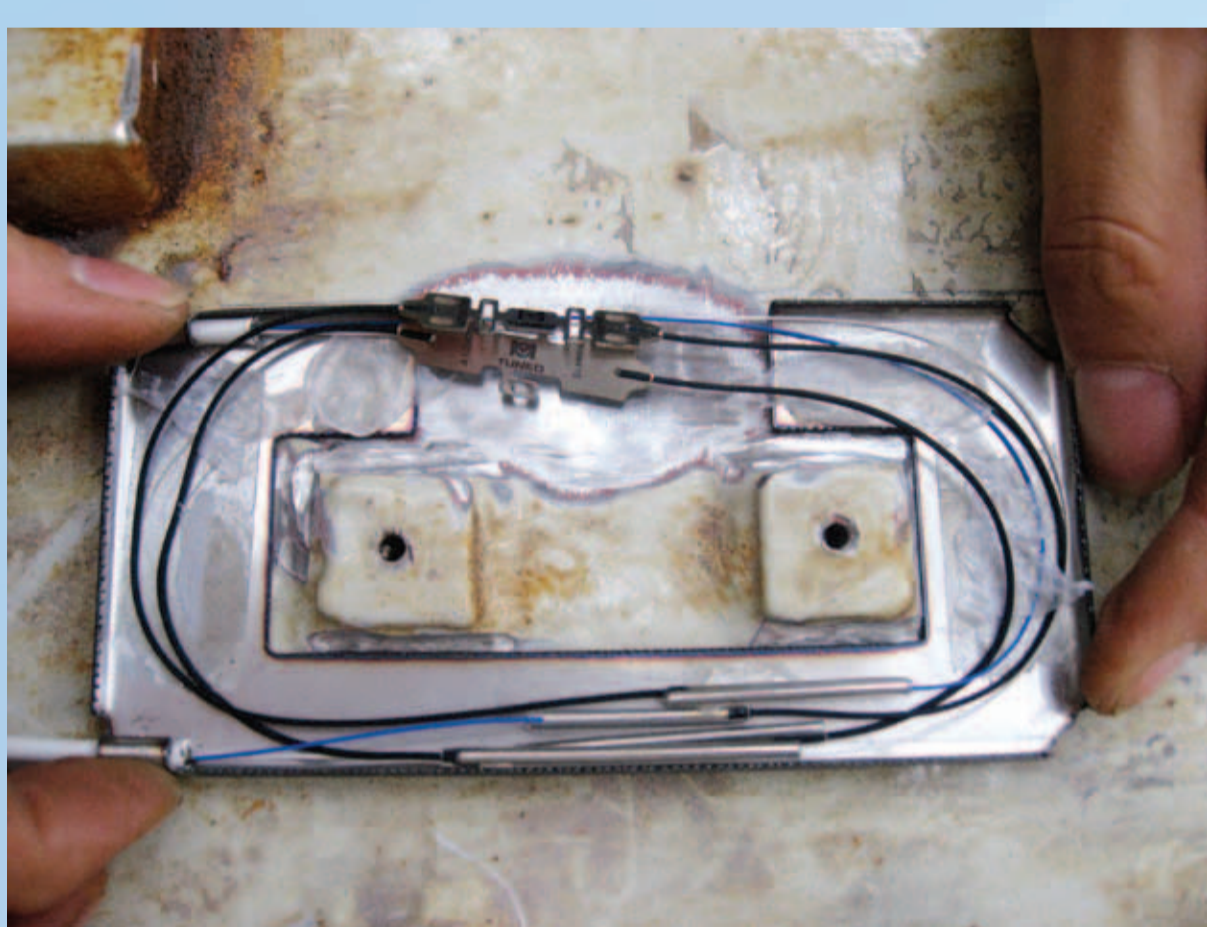
Making use of the fusion of technologies from different disciplines, PolyU's Mega-structure Diagnostic and Prognostic System performs a complete and non-destructive health monitoring and assessment throughout the structure's life-cycle. Similar to the human nervous system, the monitoring system is equipped with different types of sensors for continuous measurement of structural responses and applied loadings. Data will then be transmitted to the Data Processing and Control System for processing and analysis on a real-time basis.

This system is composed of the following six modules:

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|---|---|
| 1. Sensory System | 4. Structural Health Data Management System |
| 2. Data Acquisition and Transmission System | 5. Structural Health Evaluation System |
| 3. Data Processing and Control System | 6. Inspection and Maintenance System |

Impact to the world

This comprehensive health monitoring system provides life-cycle real-time screening for mega-structure's safety. Not only can it issue early warnings on damage or deterioration to avoid catastrophic structural failure, but it can also assess structural safety immediately after unexpected disasters, thus securing the well-being of people, protecting the vast investments, as well as supporting the vitality of economy.



目前之挑戰

都市人無時無刻都生活在高樓大廈群中，這些大型建設代表了一個城市的現代化，雖然它們令居民引以為傲，但如果沒有謹慎管理監測建築物的結構健康，當中可隱藏了不少的危機：

- 全新設計或不規則建築結構的潛在危險
- 災難性和極端事故對內部結構的破壞
- 結構組件和接合點的自然損耗
- 難以全面評估維修、保養工程的成效
- 嚴重損壞可能出現於一些處理不到、肉眼看不見，或隱藏於油漆或大廈表面的地方

在這些隱藏的威脅下，我們怎樣才可以避免橋樑、大廈和隧道等建築倒塌？

理大之解決方案

理大的大型結構診斷與預測系統綜合利用了多領域的科技，實現了結構全壽命期的、無損的健康監測和評估。該系統仿如人體身上密密麻麻的神經系統，利用多種先進的感測器，即時連續測量大型結構每時每刻的變化，並把資料即時連續地傳送到系統的「大腦」（數據處理與控制系統）進行綜合分析處理。

該系統包括以下六個模組：

- | | | |
|--------------|---------------|-------------|
| 1. 傳感器系統 | 3. 數據處理與控制系統 | 5. 結構健康評價系統 |
| 2. 數據採集與傳輸系統 | 4. 結構健康數據管理系統 | 6. 檢查與維護系統 |

對世界之影響

理大的系統為大型結構提供全壽命期的實時安全掃描。它不但可以儘早發現隨時間累積的結構退化和損傷以避免災難性的結構破壞，還可以在不可預見性災難發生後的第一時間評估結構安全，保障市民生命財產，及支持經濟活動的發展。

