Knowledge Transfer Office
香港城市大學
City University of Hong Kong

New-Gen Anti-Vibration X-Seating Technology

Health & Wellness

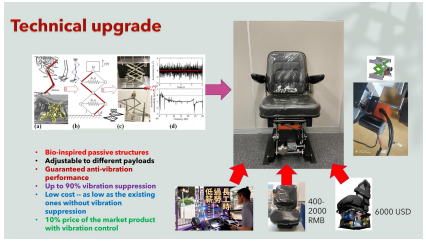
Manufacturing

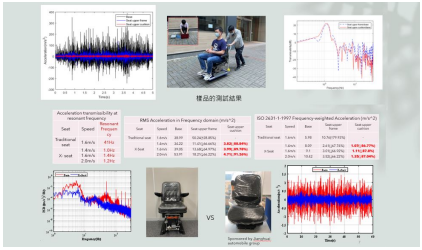
Buildings and Construction Technology

Seat with auto-payload tuning

Seat with sitting gesture monitoring

Testing on vibration platform





Testing results with prototyped seats

Remarks

48th International Exhibition of Inventions Geneva (IEIG) (2023) - Bronze Medal

IP Status

Patent filed

Technology Readiness Level (TRL) 7

Inventor(s)

Prof. JING Xingjian

Enquiry: kto@cityu.edu.hk

Opportunity

Vehicle vibration is the main cause of back pain and other whole-body vibration (WBV) syndrome of professional bus/truck drivers. Except back pain, the WBV syndrome may have a series of consequences, including muscle fatigue, spinal column disease, digestive system diseases and other cardiovascular system effects (hyperventilation, increased heart rate, oxygen intake, pulmonary ventilation and respiratory rate etc). As news reported in HK recently, 94% of professional drivers of land transport suffered from occupational injury and more than 30% have at least one kind of sciatica. Therefore, a cost-effective high-performance anti-vibration seat matters not only to the health of professional drivers but also to the traffic and operation safety. However, existing seating technology has at least one of the following drawbacks: (1) the resonant frequency is much higher than 1 Hz; (2) the tolerant vibration displacement is very small; (3) unsatisfactory damping system is adopted; (3) the cost is expensive. New technical innovation is therefore expected.

Technology

Our invention adopts a cutting-edge nonlinear vibration control theory and method recently developed. The main working part relies only on passive structural designs. The anti-vibration system can achieve a quasi-zero stiffness in the vertical direction such that the seat cushion can be maintained at its stable level with almost no influence from the bottom vibration. The achieved damping effect can be automatically changed with vibration level such that strong vibration from the bottom can be suppressed effectively while high frequency vibration will be completely isolated and not produce a “stiff” effect. When vibration is stronger or payload is bigger, such special nonlinear effects can become even better, demonstrating a completely different and advantageous vibration control performance compared to all market products.

Advantages

- Resonant frequency can be tuned to around or smaller than 1 Hz.
- Vibration isolation can be seen clearly at 2 Hz.
- Very reliable and endurable structural design.
- Very cheap manufacturing cost.
- Better performance with stronger vibration.

Applications

- Long travelling vehicles (driver seats)
- Public traffic vehicles (driver seats)
- SUV, RV
- Heavy-duty excavation vehicles (driver seats)
- Equipment transportation