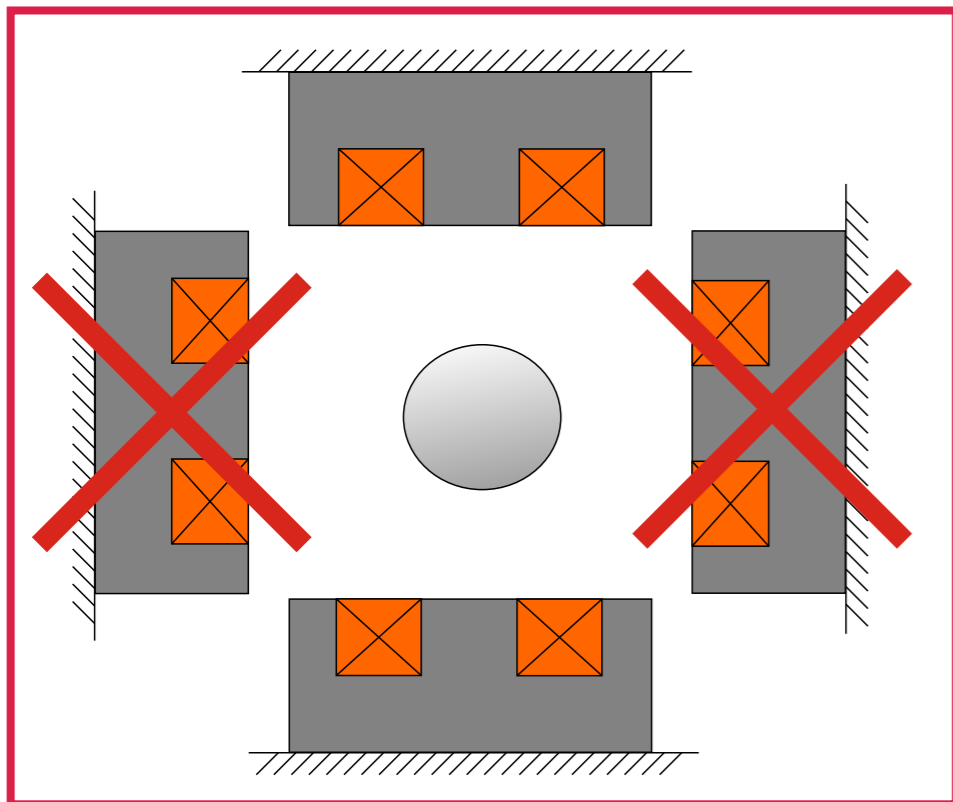


Lateral Vibration Control by Varying Stiffness in Magnetic Suspension System

Control Engineering Laboratory

Graduate School of Science & Engineering, Saitama University

Introduction

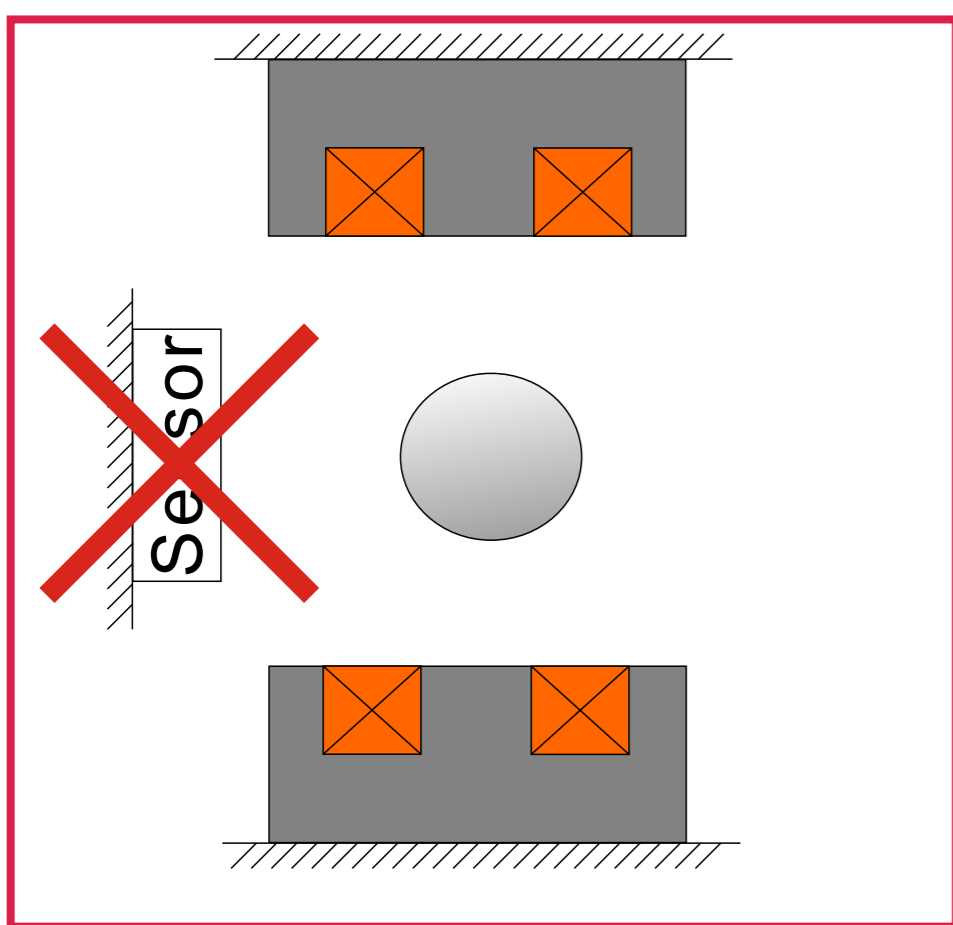


Removal of Electromagnets and sensors from lateral directions **reduces cost & space**

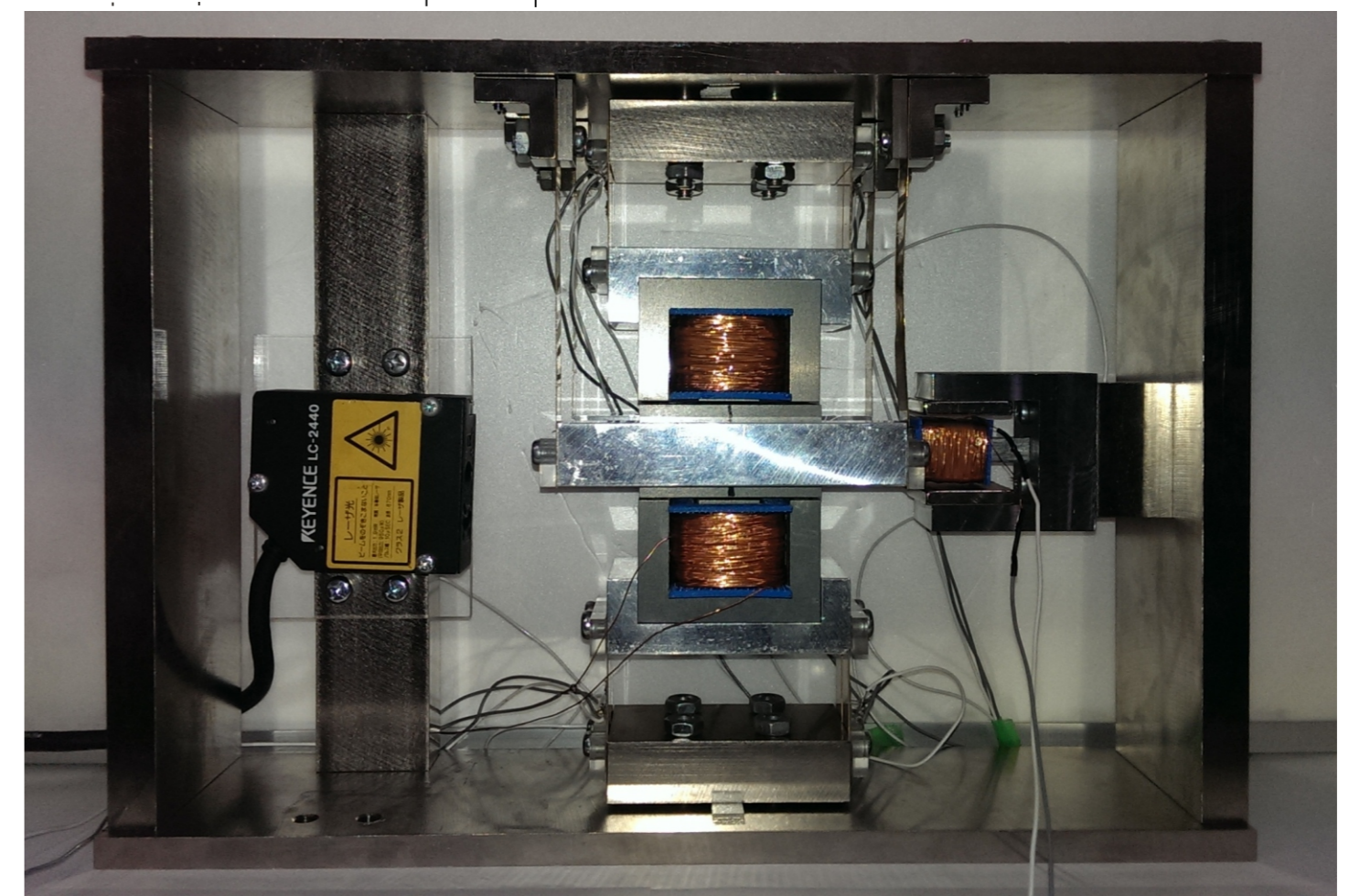
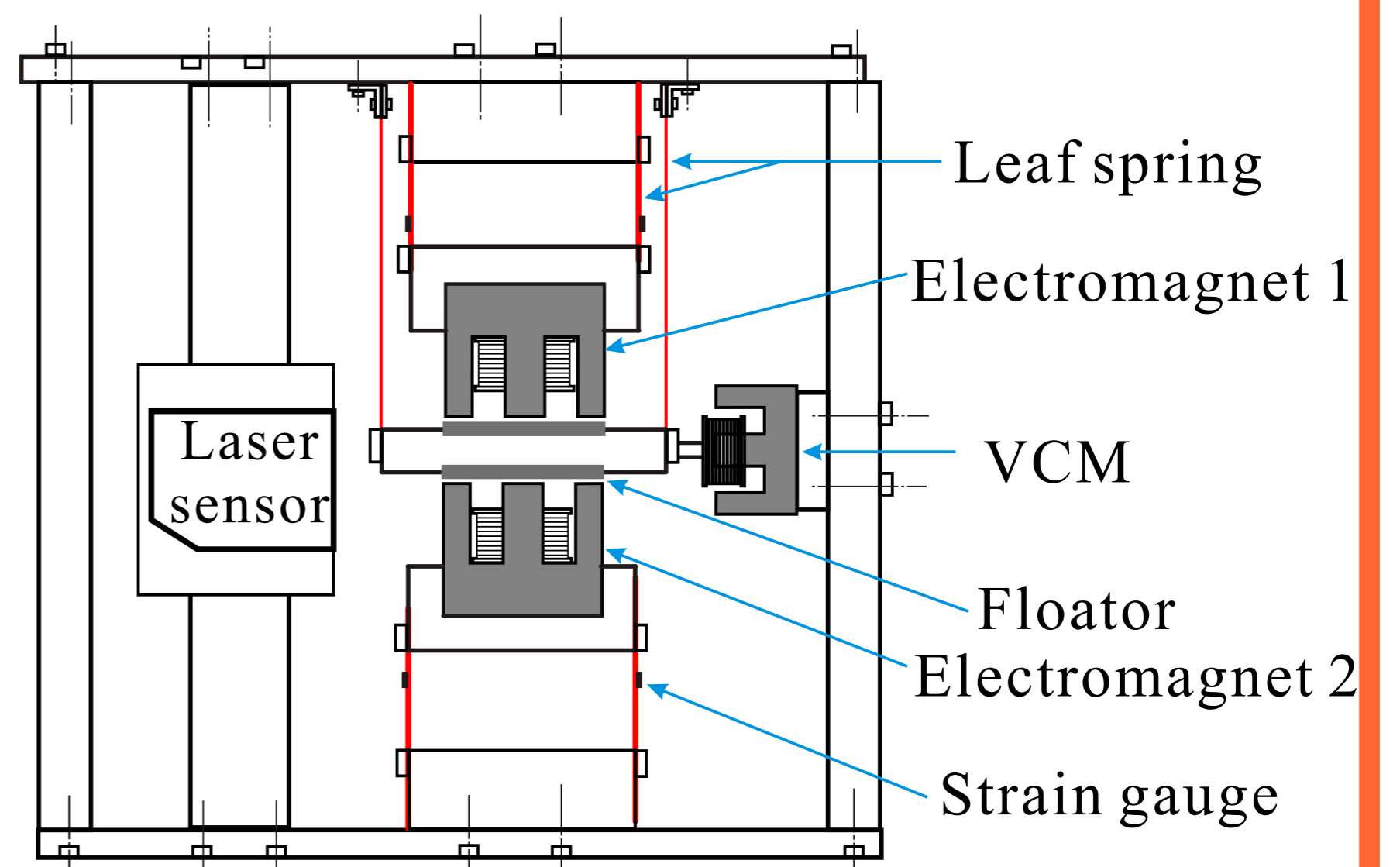
Problem
Induced vibration in lateral directions & detection of lateral displacement

Proposal
Edge effect & Varying stiffness control

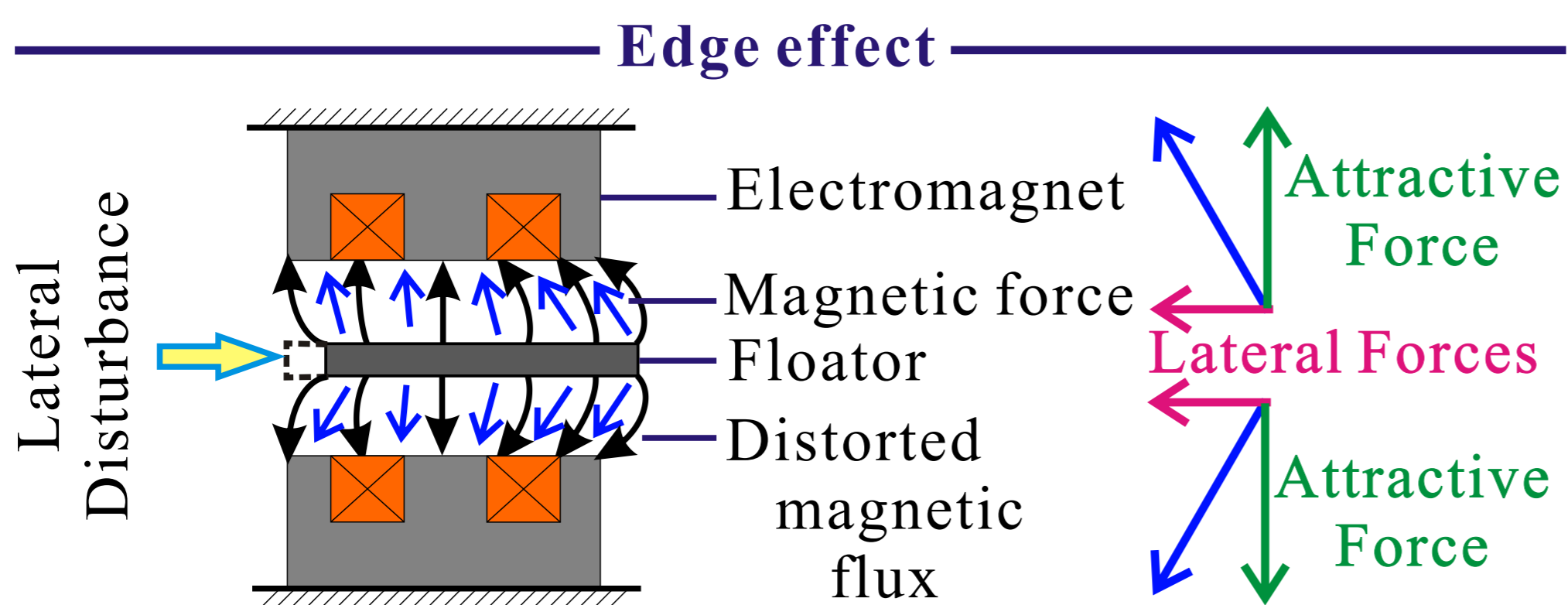
Application
Magnetic bearing



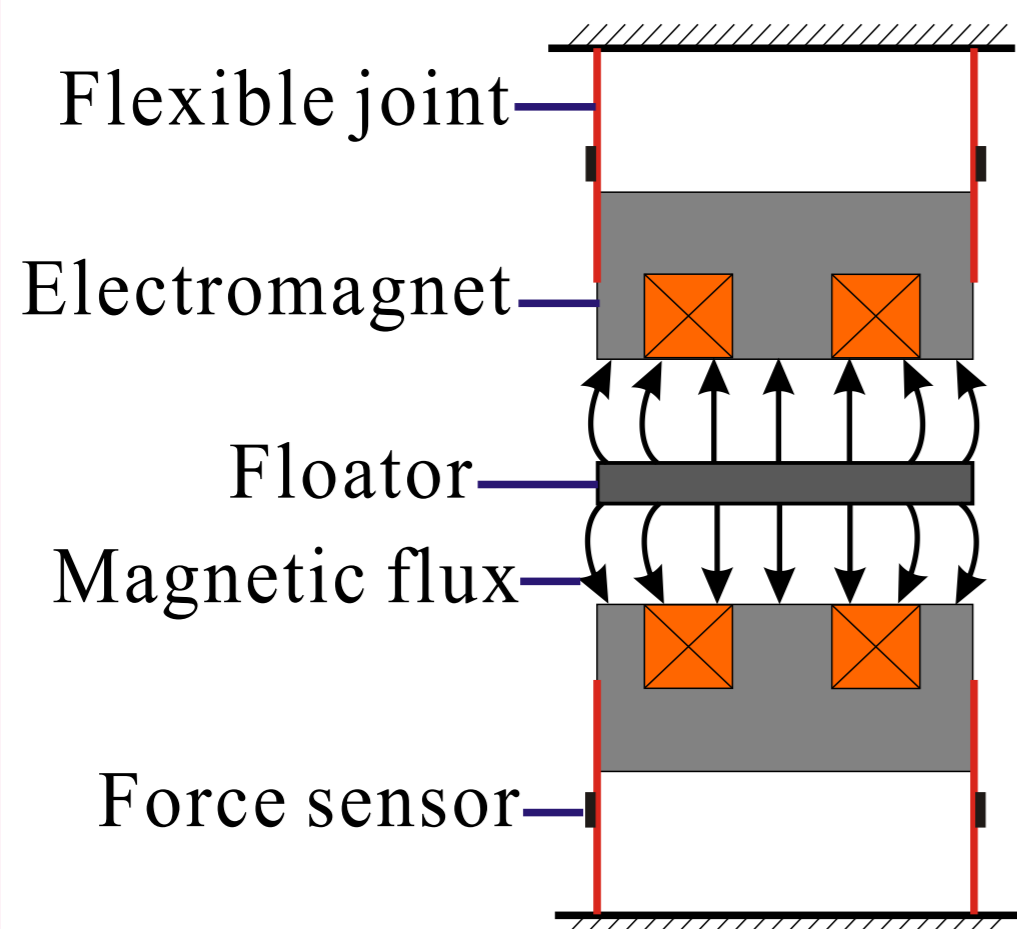
Experimental apparatus



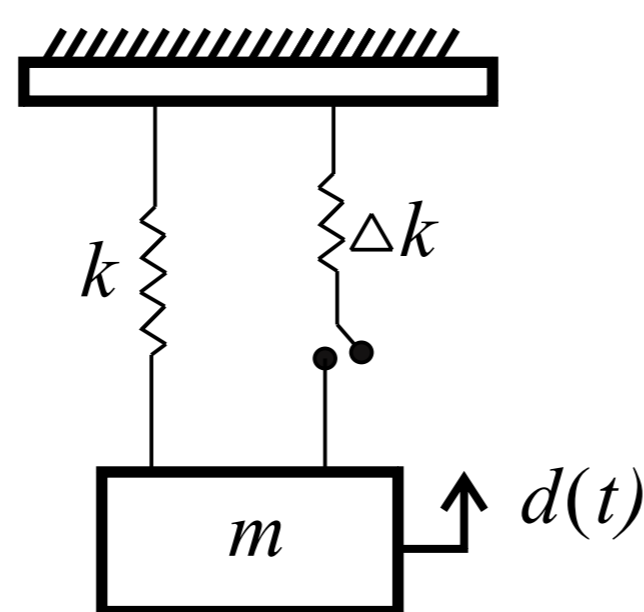
Principle



Detection of lateral displacement



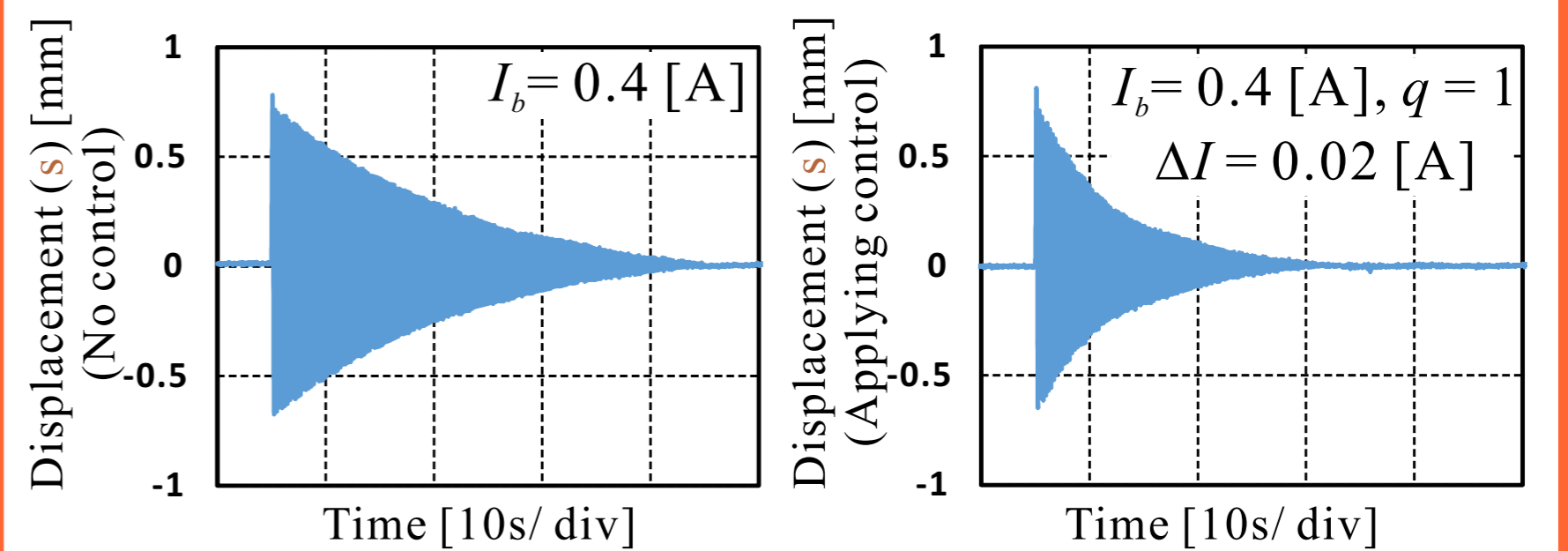
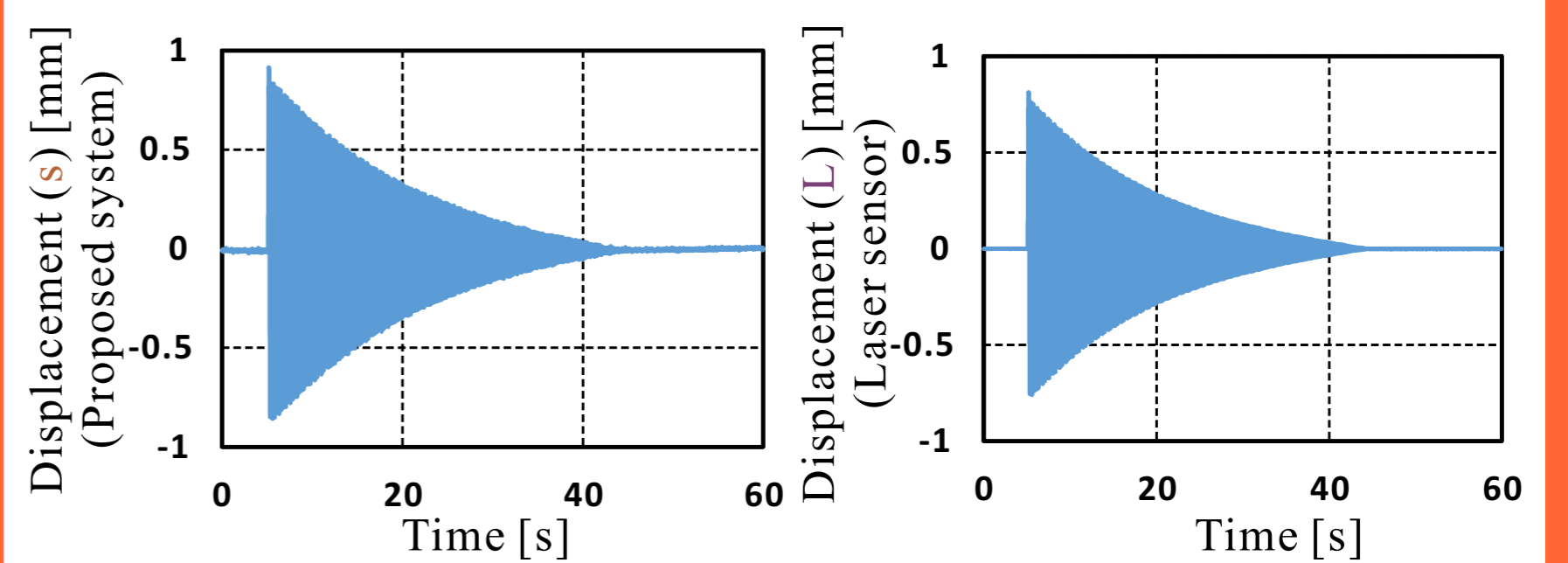
Varying stiffness control



$$k = \begin{cases} k_0 + \Delta k & \dot{d} \geq 0 \\ k_0 & \dot{d} < 0 \end{cases}$$

$$I = I_b + \Delta I \frac{2}{\pi} \tan^{-1}(q \dot{d})$$

Experimental result



Conclusion

- Lateral displacement was estimated by the proposed novel method.
- Lateral vibration was attenuated by varying stiffness control.