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BuruNavi3: tiny but powerful sensation of being pulled

～Asymmetric oscillation induces clear kinesthetic illusion～

Abstract

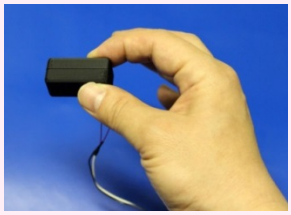
We have succeeded in developing a thumb-sized force display for experiencing a kinesthetic illusory sensation of being continuously pulled. Previous version having a crank-slider mechanism succeeded in producing a similar sensation, but had limitations in its size and weight. We overcame these limitations by using a thumb-sized actuator that oscillates asymmetrically. User quantitative evaluation indicates that specific asymmetrical vibration is effective to create kinesthetic illusory sensation of being pulled. Small and light-weight force display will be useful for a handy somatosensory-based navigation system.

Miniaturization of the force display

1DoF

BuruNavi1

250 g / 56x27x175 mm



19 g / 18x18x37 mm

BuruNavi3

2DoF

BuruNavi2

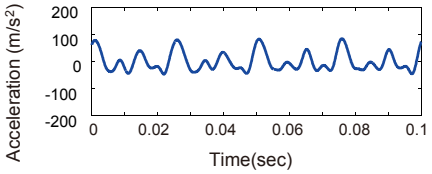
260 g / Φ126x55 mm

42 g / 18x37x74 mm

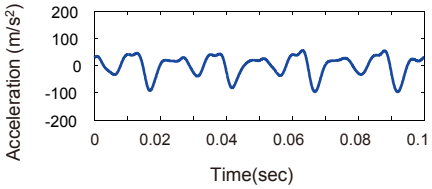
With this tiny and light force display, the force sensation is perceived just as strongly as with the previous prototypes

Asymmetric oscillation by Buru-Navi3

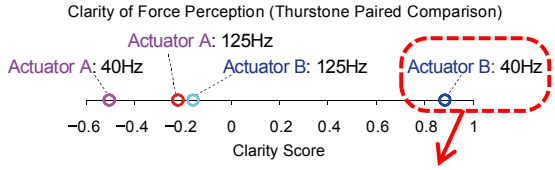
One direction



Opposite direction



Comparison of perceived force clarity



A specific vibrator with a specific pulse induces the sensation most clearly and effectively.

Related work

[1] T. Amemiya, H. Gomi, “Directional torque perception with brief, asymmetric net rotation of a flywheel,” *IEEE Trans. Haptics*, 2013..
[2] T. Amemiya, H. Gomi, “BuruNavi3: Movement instruction using illusory pulled sensation created by thumb-sized vibrator,” in *Proc. ACM SIGGRAPH 2014 Emerging Technologies*, August 2014 (to appear).

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