LABORATOIRE D'ELECTROTECHNIQUE ET D'ELECTRONIQUE DE PUISSANCE DE LILLE

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« Adaptive control of load force for Human-in-the-Loop haptic rendering in surface devices»

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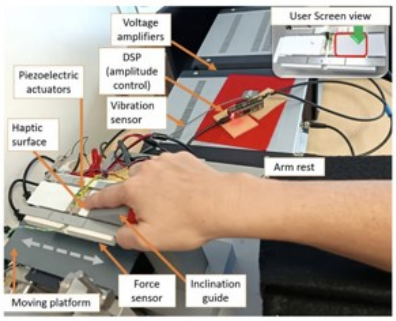
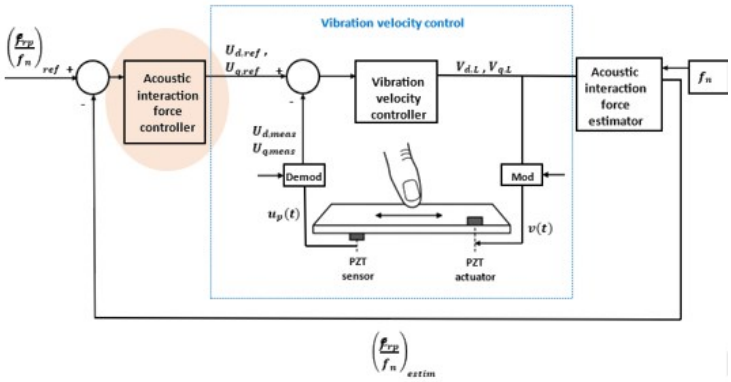
Context

Ultrasonic haptic surfaces modulate friction to render tactile sensations. However, the finger-surface interaction introduces damping of the waves, reducing this effect. Closed-loop vibration control has been proposed, but its performance depends on the complex interaction between the finger and the surface, leading to differences in perception between users. To cope with this issue, a solution would be to perform a closed loop control of the instantaneous friction. However, measuring the friction in real time is difficult. Here we propose another measurement, easier to do: the controller reaction force. Previous results demonstrate a measurable relationship between perception and acoustic interaction force during exploration. We believe that a closed-loop control of this force can help generalize perception results amongst users.

Objective





- Exploit and extend previous results to design an adaptive controller regulating the reaction force during surface exploration. The adaptive controller must operate in the ultrasonic frequency domain, requiring formulation and implementation in the rotational reference frame.
- Validate the controller performance through user studies involving human participants

Key word

Surface haptics, human-in-the-Loop, vibration control, EMR, observer, adaptive control, psychophysical

References

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