

Practical Hardware and Algorithms for Creating Haptic Musical Instruments

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on New Interfaces for Musical Expression
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Outline

Introduction

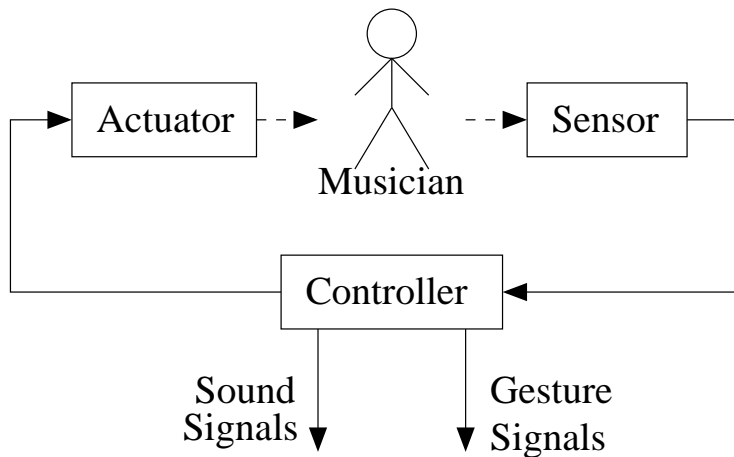
Actuators

Devices

Algorithms



Haptic Musical Instruments



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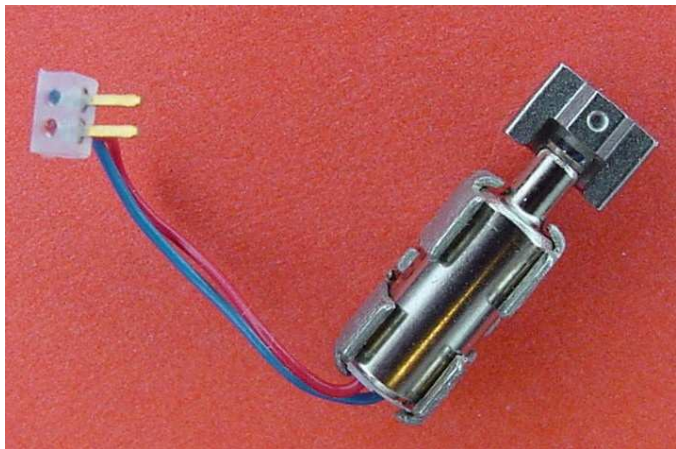
Algorithms



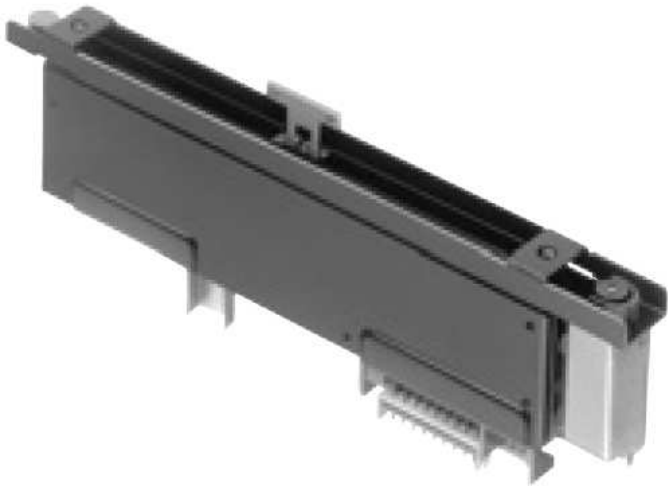
Actuators



Vibrating Motors \$1-\$20



Motorized Faders \$30



Hard Disk Motors



Woofers \$20



Servomotors \$400



- ▶ Surplus: about \$7 each



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Game Controllers \$10 - \$50



NovInt Falcon \$200



Figure: Haptic Interface For Gaming



Robotic Arms



Figure: Omni for \$1000 from SensAble Technologies



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$$F_{spring} = -kx \quad (1)$$



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$$F_{wall} = \begin{cases} -kx & \text{if } x > 0 \\ 0 & \text{otherwise} \end{cases} \quad (2)$$



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$$F_{damping/friction} = -Rv \quad (3)$$



Full Physical Modeling



Full Physical Modeling

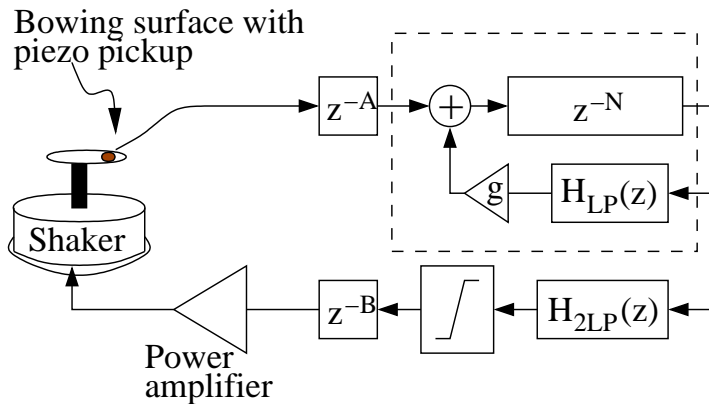


Figure: Cello Block Diagram



Event-Based Haptics

Every time the system detects some event



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► July 7 - July 18



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- ▶ Topics:
 1. Physical Interaction Design



CCRMA Physical Interaction Design Workshop

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- ▶ Topics:
 1. Physical Interaction Design
 2. Sensing



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 4. Microcontroller programming



Thanks!

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<http://homepage.mac.com/coldham/klang/cellomobo.html>
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- ▶ Questions?

