

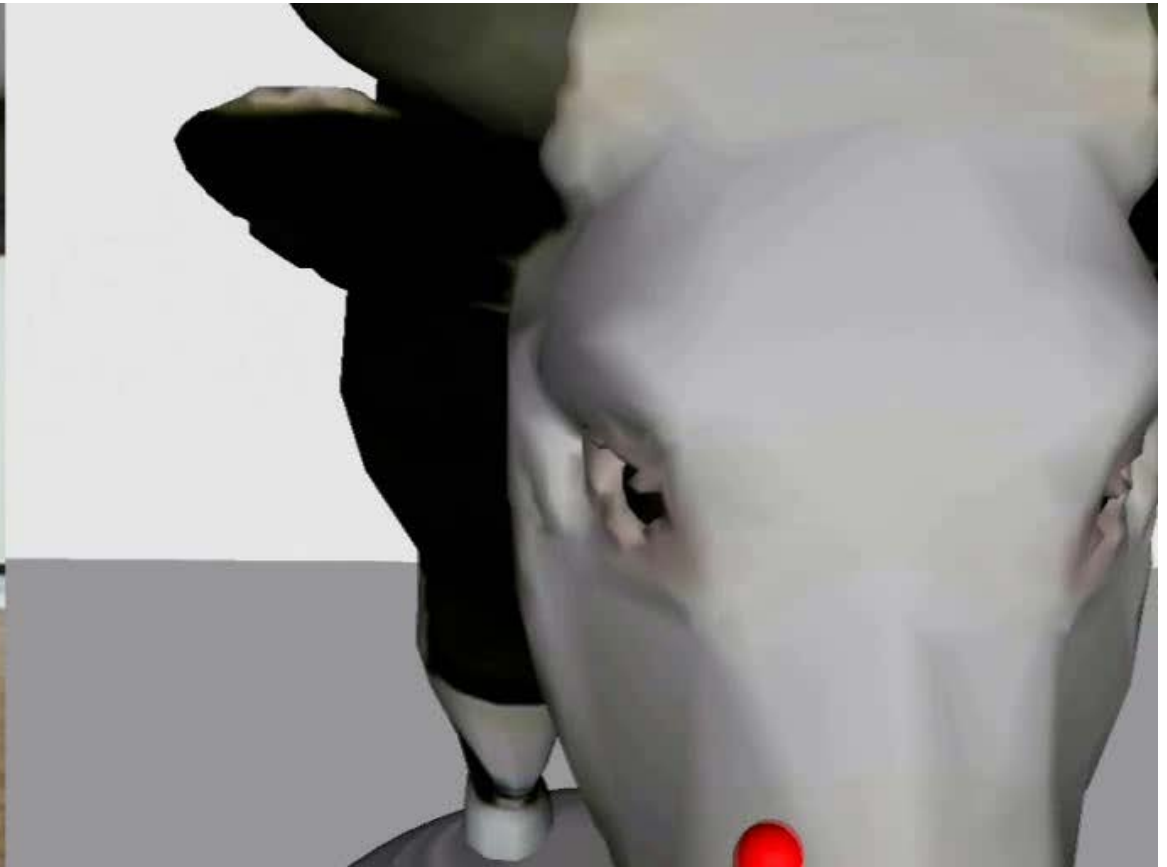
Authoring Tools of Haptic Content

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Motivating Example – Mobile Haptic Interface



Afterthoughts

- ▶ Resources invested to the mobile haptic interface
 - ▶ 0.3 M USD grant
 - ▶ 3 years
 - ▶ 2 professors and 5 graduate RAs
 - ▶ Additional hardware: Intersense tracker (35K USD)
- ▶ What can we do with the cool haptic technology?
- ▶ Haptic contents?

Haptic Technology vs. Haptic Content

- ▶ Chicken and egg problem?
- ▶ We have focused on haptic technology, but what about haptic content?

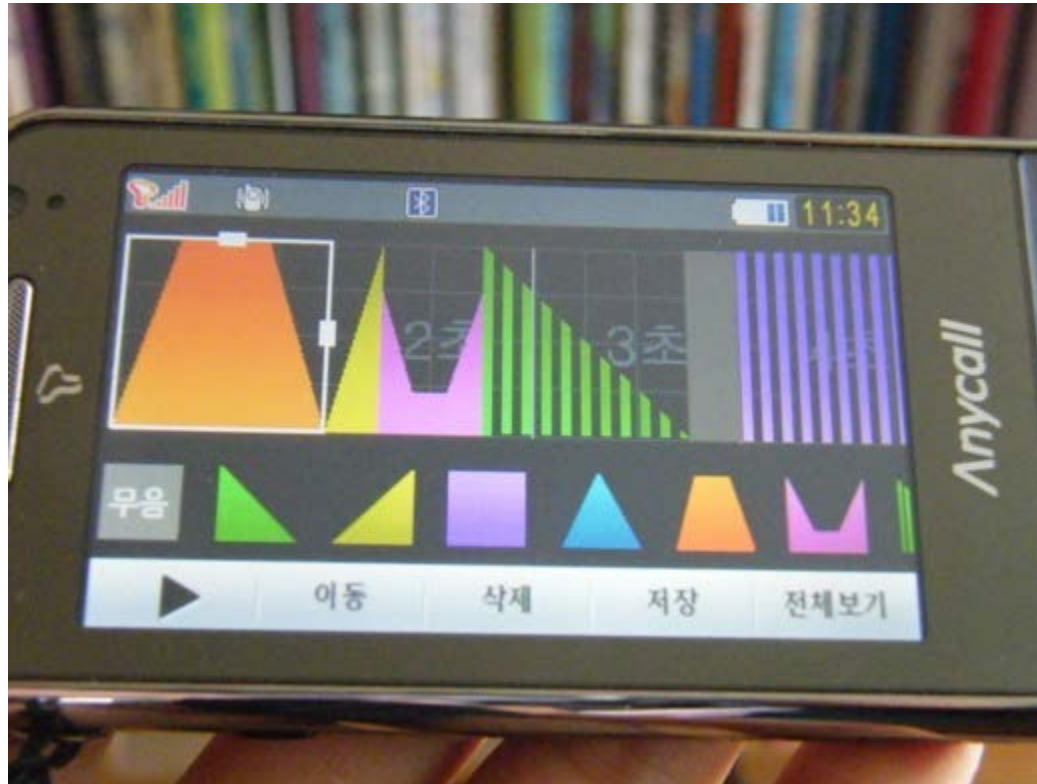


Technology for Content Authoring

Authoring Tools for Haptic Content

- ▶ Systems to help develop the contents that users can experience and enjoy using haptics technology
- ▶ Manual authoring vs. Fully automated
- ▶ The key component of the technology for haptic content creation
- ▶ We focus on those for vibrotactile rendering in this talk.

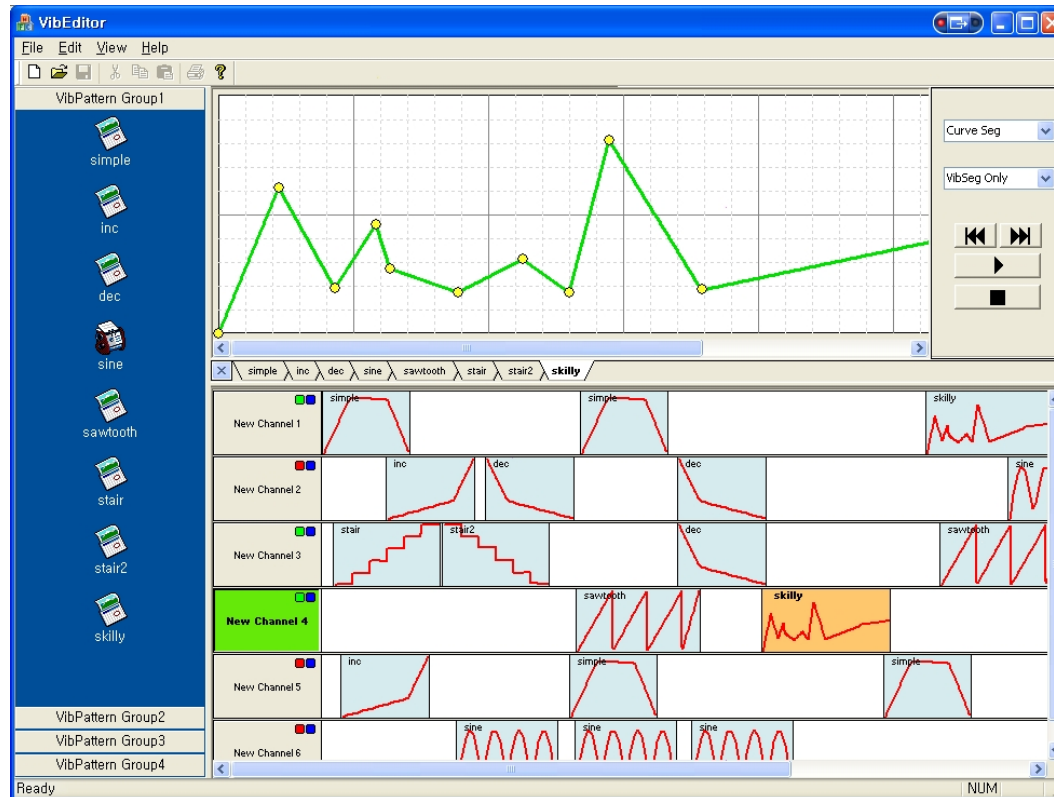
Customizing Vibrotactile Patterns in a Mobile Phone



- ▶ Samsung Electronics, 2009. "My Haptic" in Haptic Phone 2.

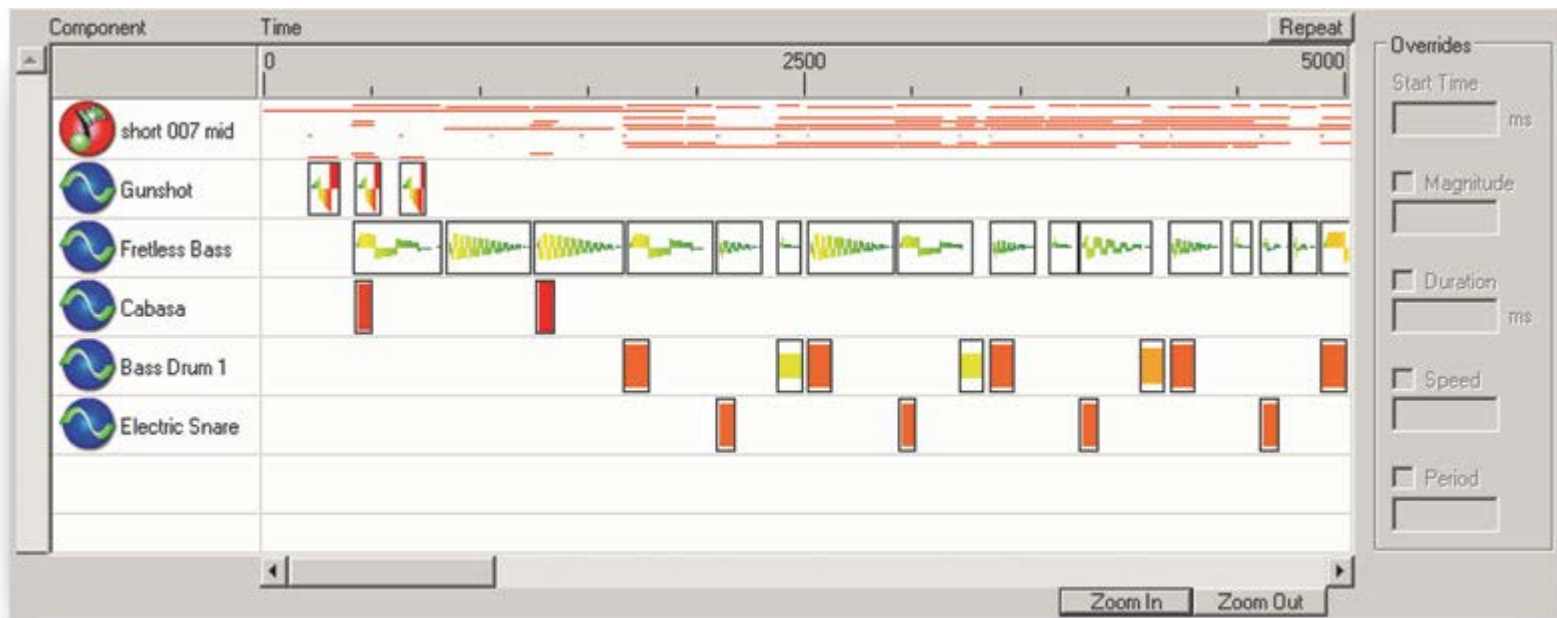
posVibEditor – Waveform Editing

- ▶ Multi-channel support for multiple actuators
- ▶ Automatic compensation for vibration output of linear perceptual strength



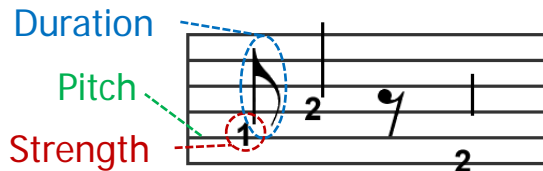
Touchsense Studio

- ▶ Immersion
- ▶ Vibrotactile effect authoring



Vibrotactile Score – Symbolic Design

- ▶ Graphical editor for complex vibrotactile pattern design
- ▶ Allows high-level composition with decoupled signal-level details



Vib Test.xml - VibScoreEditor (a)

Cliefs (b)

Waveform (c)

vibration playback cursor

editing cursor

Total 10 bars, 34/36 symbols (23 notes, 11 rests, 2 blanks) bar 10, symbol 6 OVERWRITE

Jaebong Lee, Jonghyun Ryu, and Seungmoon Choi, "Vibrotactile Score: A Score Metaphor for Designing Vibrotactile Patterns," In Proceedings of World Haptics Conference, pp. 302-307, 2009.

- ▶ 9 Jaebong Lee and Seungmoon Choi, "Evaluation of Vibrotactile Pattern Design Using Vibrotactile Score," To be presented in IEEE Haptics Symposium, 2012.

Touch-based Authoring in iOS5

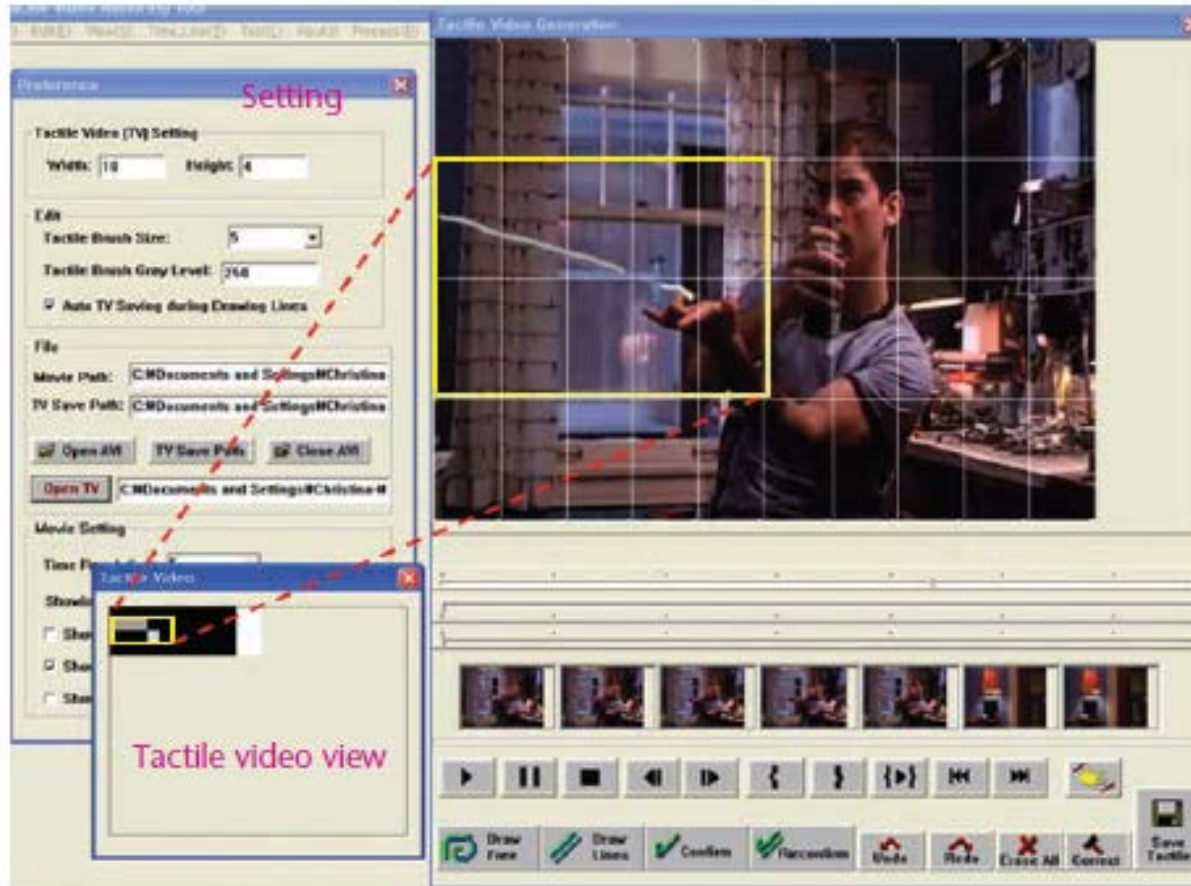
- ▶ By tapping on the screen, you can decide the rhythm of a vibration signal.
- ▶ See video at http://www.youtube.com/watch?feature=player_embedded&v=rK4Cjq2mR3Q



Tactile Effect Authoring from Video

- ▶ Manual authoring of tactile effects for video viewing

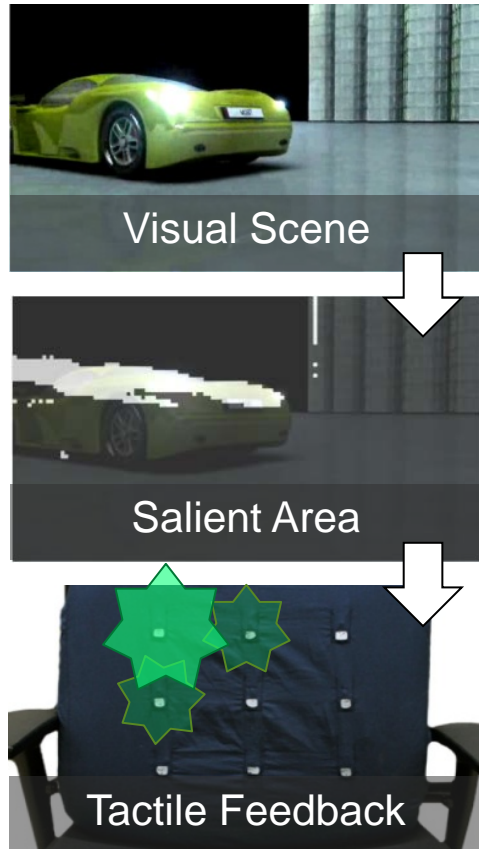
Main frame



Tactile video authoring

Saliency-Driven Tactile Effect Authoring (1)

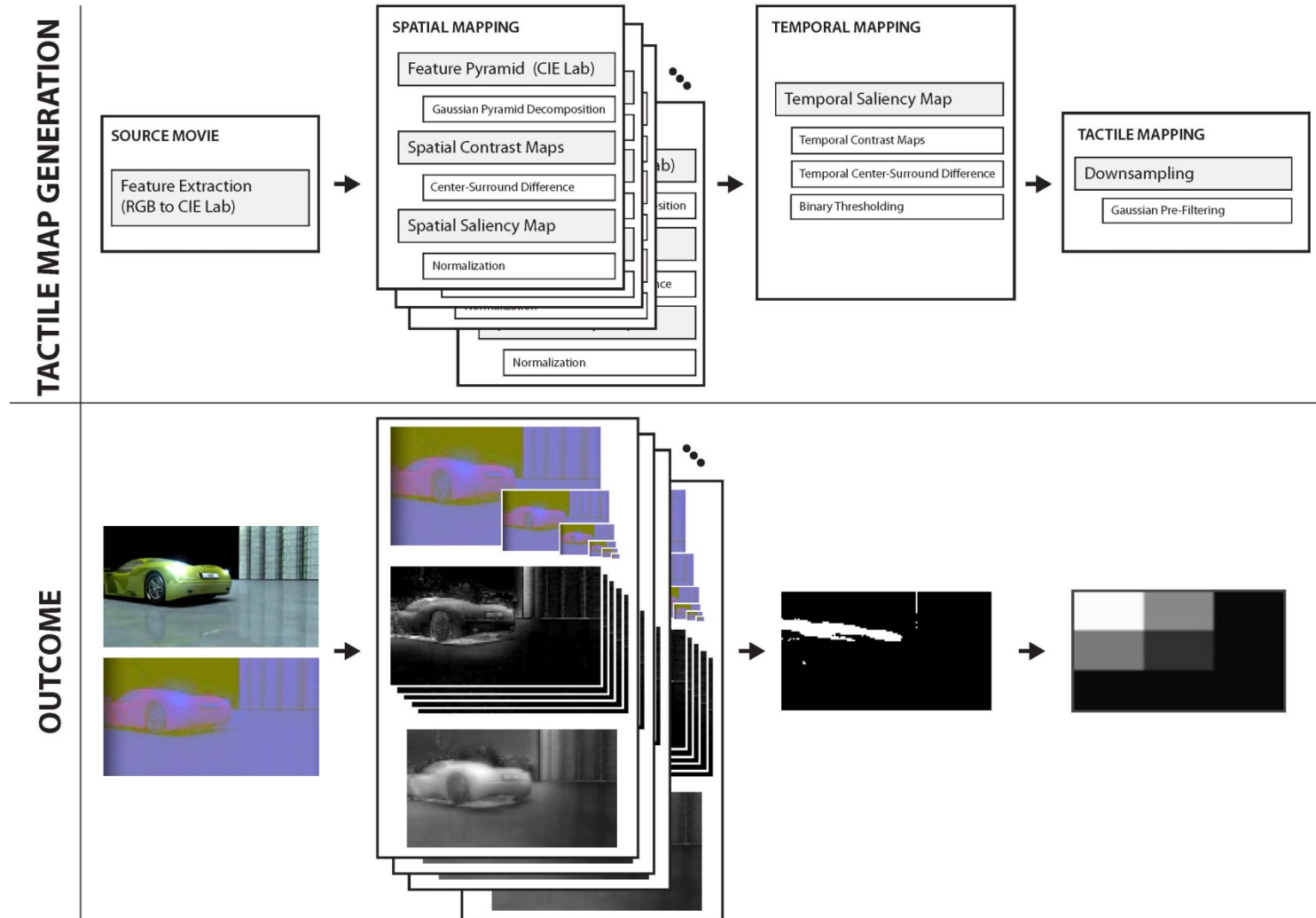
Haptic feedback in harmony with the visual saliency of a scene



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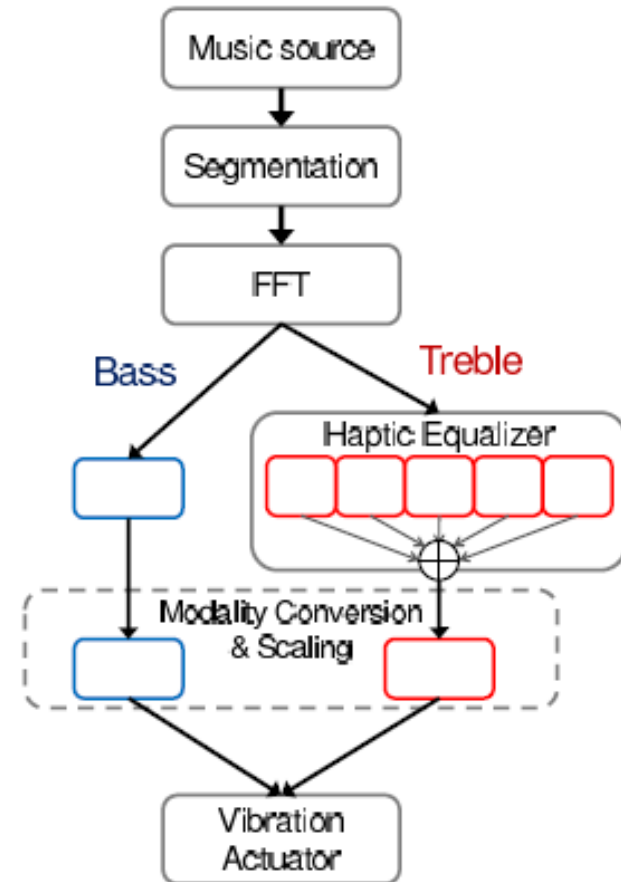
Myongchan Kim, Sungkil Lee, and Seungmoon Choi, "Smart Chair: Automatic Haptic Feedback Authoring System Based on Visual Saliency," Demo in IEEE Haptics Symposium 2012.

Saliency-Driven Tactile Effect Authoring (2)



Real-time Dual-band Haptic Music Player

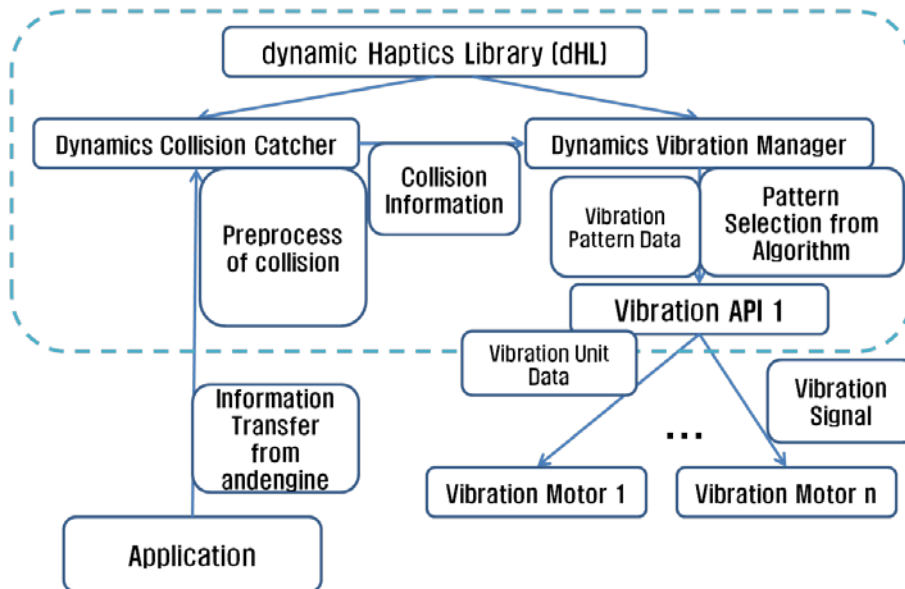
- ▶ DMA
- ▶ Real-time, automatic vibration generation algorithm from music sources
- ▶ Superposed vibration – Beat
- ▶ High frequency vibration – Music Feature
- ▶ Haptic equalizer
 - ▶ Frequency-dependent weighting
 - ▶ Weights depend on the music genre
- ▶ Perception-based modality conversion



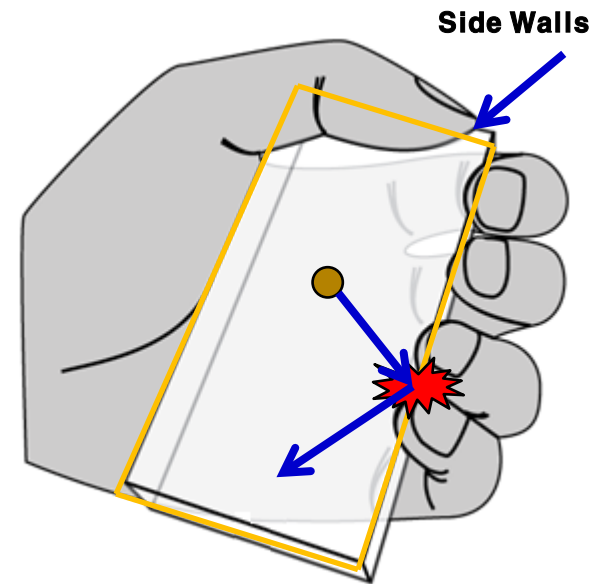
Structure

dynamic Haptics Library (dHL)

- ▶ Physics engine: Physics simulation
- ▶ dynamic Haptics Library: Autonomous tactile effect generation
 - ▶ Reduced development time for vibrotactile effect design
 - ▶ Physics-faithful feedback



Structure of dynamic Haptics Library



Ball-Wall Collision Demo

Conclusions

- ▶ Importance of haptic content is increasing.

- ▶ Technology for supporting convenient haptic content making is essential for the growth of haptics.

Thank you!

- ▶ Questions and comments to: choism@postech.ac.kr