Motivation
Too much information can be overwhelming, and needs to be presented with respect for a user’s overall attentional load.

We propose that user attention can be conserved by managing sensory modality and salience of incoming information.

To this end, our research program is exploring how to deliver information haptically with minimal attentional load.

One Mechanism: Haptic Icons
Haptic icons are brief tangible stimuli with associated meanings, composed by varying the control parameters of given haptic display.

Transparent haptic icons convey information without grabbing your attention, unless it’s needed.

Example of icons used in a protocol to mediate turn-taking in distributed collaboration (Chan et al 05, 08)

- events • function identity • content identity • media browsing

Designing Transparent Haptic Icons
Sets of haptic icons must:
• be distinguishable
• make efficient use of limited expressiveness of today’s displays
• have salience appropriate within the set and for the context

A proposed iterative design process (Chan ’08) incorporates perceptual adjustment and “stress testing” to predict behavior in real environment:

Perceptual Optimization of Icon Sets
In Perceptual MultiDimensional Scaling (MDS), stimulus dissimilarity data allows efficient visualization of how users mentally organize the stimuli, and helps create icon sets that are distinguishable and cognitively easier to learn.

Iterative rapid prototyping: These two maps plot perceived relative location of 30-36 stimuli. Each required only ~5 hours of user data. The right one was produced by adjusting stimulus design parameters after reviewing the left one.

How Many Haptic Icons Can We Learn?
Current work is investigating acquisition over time of up to 84, and we believe the answer is hardware- not human-limited.

Towards Transparency in Pervasive Information Display: Possibilities for Attentionally Managed Tactile Signals

Karon MacLean • • • Department of Computer Science • • • University of British Columbia • • • Canada