

Haptics in automotive applications and active safety

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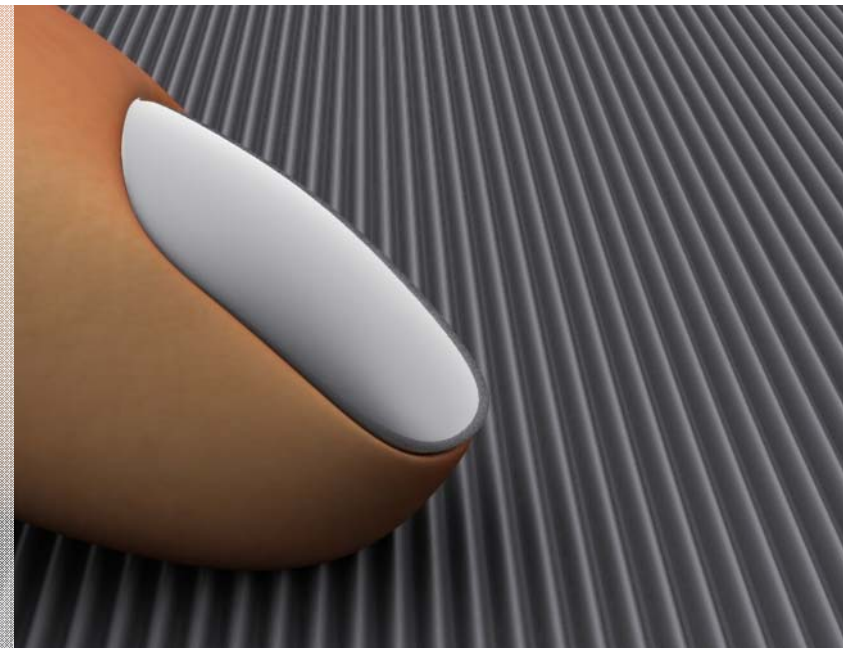
The Sense of Touch

- Tactile (mechanoreceptors in the skin)
 - Pressure
 - Shear
 - Slip
 - Vibration
 - Temperature
 - Contact location
- Kinesthetic (receptors in muscles, joints and tendons)
 - Position
 - Orientation
 - Force



Haptics

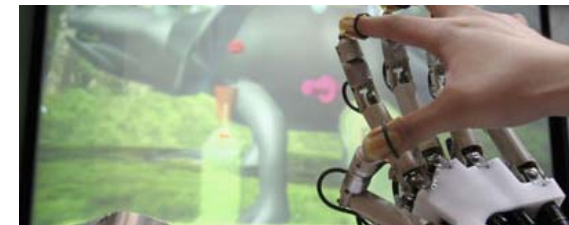
- **Haptics** is any form of interaction involving active touch
- **Haptic perception - active exploration of surfaces and objects**
- Haptic technology - technology that interfaces with the user through the sense of touch



Haptic technology

- Provides haptic feedback to the user
 - Vibrations
 - Force feedback
 - Friction feedback
 - Temperature

- Examples:
 - Gaming
 - Virtual reality training simulators
 - Tele-robotics and remote surgery



Haptics in the automotive applications

- The haptic impressions influence the customer's purchasing decision.
- Driving is a haptic experience
 - Use of key to unlock the vehicle (full sensory feedback)
 - Operating the door
 - Adjustment of car seat and steering wheel
 - Vehicle controls



Haptics and active safety

- Car active
 - **Vibrations** in the seat or wheel
 - If the vehicle comes too close to crossing the lane, for navigation or if the driver is falling asleep (eye-tracking, loose grip)
- Driver active
 - Feedback from touchscreens (reduce time spent looking away from the road)
 - Climate control
 - Infotainment





Sensory driven product design



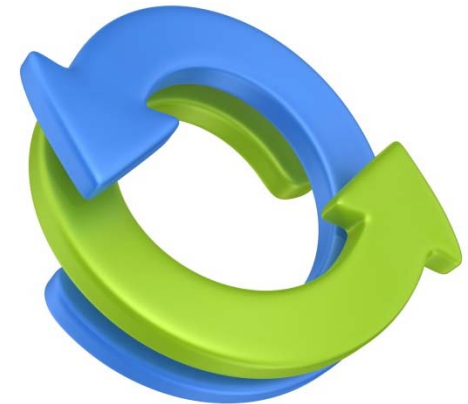
Predictive capacity of sensorial response in the design and development of products/materials/coatings



SP employ psychophysical methods to quantify perception (measured with people) and surface/material properties (measured with instruments) and their relations.



- Predict sensory responses for (new) materials/coatings
- Less use of panel testing and shorter development cycles
- Design materials for perception delivery



Perception study on textured surfaces

- Skedung, Arvidsson et.al (Scientific reports, 3:2617, 2013)
- Systematically varied surface textures (300nm – 90 μ m)
- Similarity scaling

Possible to distinguish surface structures at the nano-scale!

nature.com

12 September 2013

Feeling groovy

The human finger can discriminate between surfaces patterned with ridges as small as 13 nanometres in amplitude and unpatterned surfaces, a *Scientific Reports* paper reveals.

Latest news

- ▶ Taxonomy: The spy who loved frogs
- ▶ Physics: Quantum quest
- ▶ Grey wolves left out in the cold

▶ More news from Nature

Ongoing FFI-project

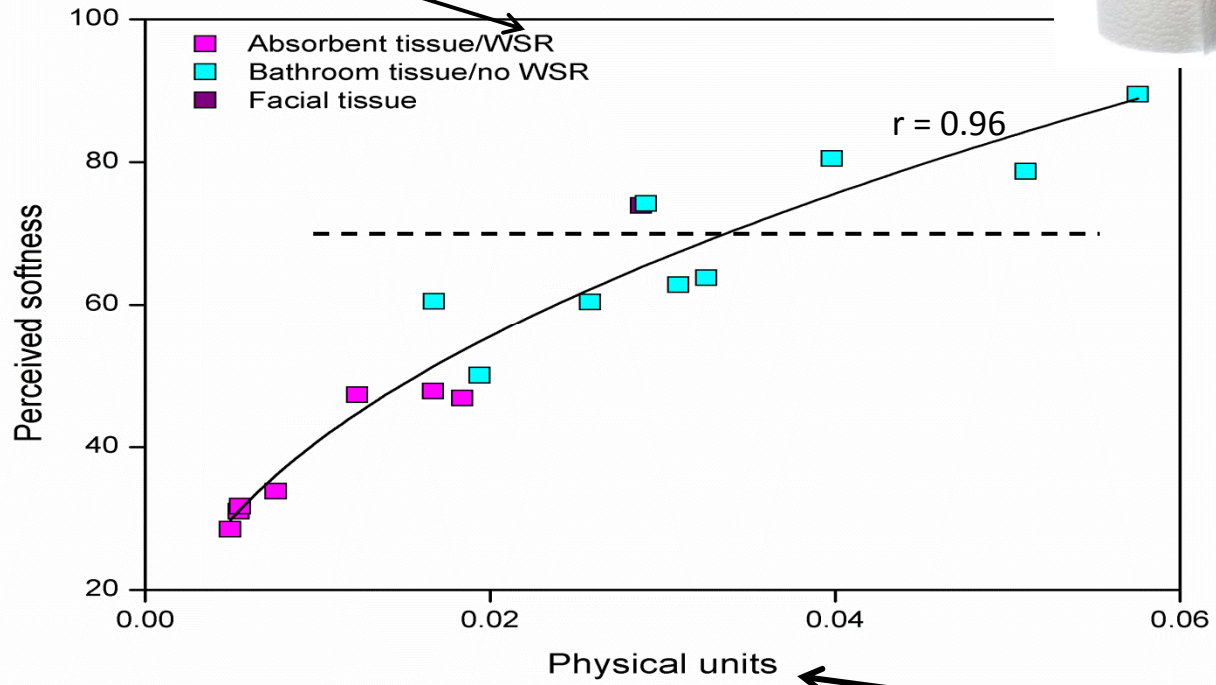
- “Robust manufacturing of plastic parts with attractive aesthetic and haptic properties”
- Volvo Cars, Volvo Truck Corporation, Formteknik i Gislaved, Halmstad University, IAC Group, K.D. Feddersen Norden, Kistler Nordic, Liljas Plast, Polykemi, Polymercentrum Sverige, SABIC, Svensk Industrigravvyr and SP Technical Research Institute of Sweden.





Psychophysical function

WSR = Wet Strength Resin



Smoothness number
Tensile stiffness
Basis weight

Haptic research capabilities at SP

- High control of physical and chemical components as well as human testing
- HIT (Human Interface Technology lab) - simulations of haptic enhancements in a realistic environment with laboratory control
- Live testing at Asta Zero





Summary

- Driving is a haptic activity
 - Haptic properties are important for:
 - Comfort, perceived quality and user experience (current focus)
 - Utilizing haptics to expand the horizon of active safety (emerging focus)
 - Haptic research is an untapped resource for active safety
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