UCSD ERC
Touch Workshop

Opening session
LPP
45 rue des Saints Pères
salle H432

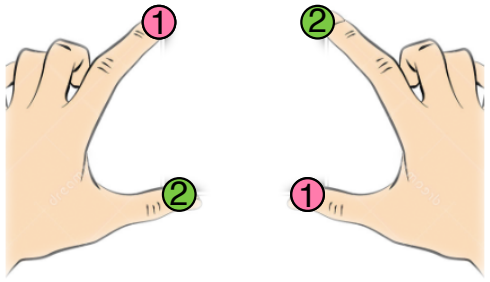
lundi 7 mars / Monday March 7

Heure/Time	Présentations
16H00	Patrick Cavanagh: Introduction
16H10	Stuart Anstis: Tactile location
16H25	Tanja Seizova-Cajic: Tactile motion as an organizer of tactile location
16H40	Vincent Hayward. Sensing object displacement through remote touch
16H55	Pause café / Coffee Break
17H10	Patrick Cavanagh: Tactile motion and location
17H15	Hannah Krüger: Do eye movements affect the apparent location of touch
17H20	Tanja Seizova-Cajic: Reafference and self touch
17H25	Mark Wexler: Do displaced tactile locations affect vision
17H30	Sae Kaneko: Tactile vection.
17H35	Tanja Seizova-Cajic: Neck proprioception and visual location
17H40	Neal Dykmans: Tactile induced motion. Tactile Duncker illusion
17H45	Tanja Seizova-Cajic: Tactile motion capture
17H50	HiJee Kang: Memory of temporal patterns in touch and vision
17H55	Pause café / Coffee Break
18H10	Any others who wish to describe a project
18H25	Choosing your projects to join
19H35	Dinner at Aux Prés des Clercs

ERC UCSD Touch Workshop
Provisional Project List

1. Tactile location – is it in body coordinates or world coordinates. *Stuart Anstis presents. 15 minutes*

Apparent motion of touch stimuli: what space determines matching in ambiguous quartets? This uses 4 Tactors to stimulate the skin, activated alternately in pairs (1, 1, then 2, 2, then repeat). Locations can be anywhere that induce impressions of apparent motion. Change position of hands until motion reorganizes top-down vs left-right. Then move hands so one is further away, etc. Find if location for equal up-down vs right-left is determined in body coordinates or spatial coordinates. Tanja is bringing a fancy four location stimulator that also stretches the skin to increase the impression of movement.



2. Tactile motion as an organizer of tactile location. *Tatjana Seizova-Cajic. 15 minutes*

Tactile *motion* patterns that suggest arrangements of the receptor surface different to its real layout are presented to healthy humans. With the assumption that tactile motion should be linear and contiguous, the sensed location of touch then reorganizes. Non-linear patterns to use: Abridging (leaving a gap in stimulation) and Scrambling (order is non-linear), others can be added. Patterns create an immediate illusion but eventually, a plastic change. Or so we think. Re-organizing effects so far found in touch. Do they also occur in vision (especially in the periphery) such as filling in of motion gaps or regularization of a scrambled order. Or combined, tactile taps and lights: attach LEDs to tactors, stimulate vision and touch together.

3. Sensing object displacement through remote touch. *Vincent Hayward. 15 minutes*

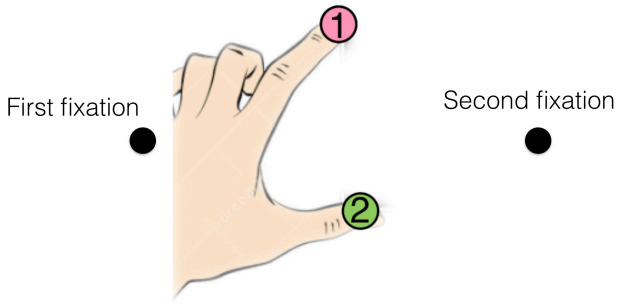
Vincent reports that, in the absence of visual and auditory inputs, the tactile feel of an object rolling on an inclined, rough surface elicits a spontaneous sensation of the object's displacement if the hand actively controls the inclination of the surface. The sensation is highly robust and is experienced by all observers to date as long as the rolling noise (tactile feel) satisfies the universal laws of movement of objects that are subject to the ambient Earth gravity field (Yao and Hayward 2006). We also observed that if an object slides on a viscous surface under the influence of gravity, people spontaneously interpret the tactile input as caused by the movement of an object over considerable distances, viz one or two meters, when the object moves only a fraction of that distance.

4. Tactile motion and location – are felt locations extrapolated forward for a stimulus in motion (equivalents of Fröhlich, and flash grab visual effects). *Patrick Cavanagh, 5 minutes*

Move stimuli on the skin with a paint brush. Estimate the physical extent of a repeating back and forth motion on the skin (trajectory shortening). Drag paint brush along a ruler with end stops to guide paint brush. Put a bump on the ruler and estimate location of jog in trajectory for version of flash drag. In both cases, respond by pointing to skin at end points or bump point.

5. Do eye movements affect the apparent location of touch. Touch version of Szinte and Cavanagh (vision) and Krüger et al (audition). *Hannah Krüger, 5 minutes*

Saccade back and forth between the two fixations. The one finger location is buzzed just before and the other just after the saccade. Rotate hand so the two buzzed location appear vertically aligned. Other modalities show that saccade produces a location bias against the direction the saccade. Make judgments in dark with only the fixations alternately illuminated.



6.. Re-afference and self-touch as determinants of perceived position in touch (similar to saccades in vision) *Tatjana Seizova-Cajic, 5 minutes*

The association between the motor command and expected sensory effect of movement informs us about locations and allows (re)calibration. Thus re-afference could potentially re-map the skin. Self-touch is re-afference x 2. It also underpins the feeling of ownership, informs about body configuration and potentially length of body parts. Hands facing down in free space (not near or touching anything), one tactor on each fingertip. On cue, participant moves the designated finger down (e.g., index finger). Finger movement triggers a signal, which in turn activates the tactor on a neighbouring finger (scrambled). After many repetitions, touch may be assigned to the wrong finger. Test using a weak stimulus. Perception tests: Tap one finger once, ask which finger was tapped. Tap two neighbouring fingers, direction of motion? Test of perception-action link: Tap a finger, ask subjecct to move the same finger.

7. Displaced locations: Can displaced body parts displace the perceived location of lights stuck on those parts (e.g. Jim Lackner)? *Mark Wexler, 5 minutes*

Displace the felt hand locations with tendon vibration or rubber hands or prisms, then put lights on them in the dark and judge light location. Or test with tactile apparent motion quartets to see if displaced locations affect quartet pairing.

8. Tactile vection. *Sae Kaneko, 5 minutes*

Put lots of buzzers all around O's body and buzz in rotary sequence. Do they report that their body is rotating? Tanja says that Lackner did something similar (induced tactile vection): participants were standing in a middle of a rotating cylinder, holding lightly onto the railings attached to the wall. As the wall and railings rotated (the subjects didn't, they stood on a separate platform), the railing run across their palms; it induced vection.

9. Neck proprioception and visual localization. *Tatjana Seizova-Cajic, 5 minutes*

Neck proprioception indicates head movement so similar issues arise about integration with retinal input as for saccades, just one level down. Neck muscle vibration sets up illusory head rotation. If visual target is present, neck vibration creates illusory target motion consistent with illusory head turn, and MAE when vibrator stops. One unresolved question: why is there no MAE if neck vibrated in darkness, target presented immediately after?

10. Tactile induced movement. Tactile Dunker illusion. *Neal Dykmans, Mark Wexler, 5 minutes*

Control: Blindfolded O moves right index finger toward and away from body while attached to moving Latero pad. As the hand moves outward, the Latero adds a leftward motion; as the hand moves back, the Latero adds a rightward motion. *Possible result*: Hand movement is perceived as oblique rather than straight out and back. Ask for apparent direction or point to end point of trajectory with other hand's index finger.

11. Tactile motion capture (local by global). *Tatjana Seizova-Cajic , 5 minutes*

Fingers of one hand appear to touch an 'object' that moves along the other forearm. Index and middle finger of one hand have one tactor each. The two are a part of a linear array of 8-10 tactors running along the forearm. Their position within the array varies (1 & 2 or 2 & 3 or 3 & 4 …). Smooth motion runs along the forearm array, but reverses direction on the two middle finger tactors. Report direction of motion on the two fingers. Expect capture by global motion. Also finger-only version where fingers from both hands touch the same moving 'object'.

12. Memory of temporal patterns in touch and vision. *HiJee Kang, 5 minutes*

It is unknown whether the memory of time interval distributions is modality specific. To investigate this with vision and touch, randomly produced stimulus trains with Poisson-distributed inter-stimulus intervals will be presented on red LEDs or on a vibrating plate. The task will be given to detect a repeated random pattern for vision or touch within and across modalities.

Others: these can be presented if anyone choses to do so.

O1. Time compression during hand movements. *Andrea Desantis*. Is time shortened during a directed action as is the case for an eye movement or a blink?

O2. The cutaneous rabbit. *Patrick Cavanagh*. See description at this Wikipedia page. https://en.wikipedia.org/wiki/Cutaneous_rabbit_illusion

O3. Brandishing to change apparent location. *Stuart Anstis*. Use rods of different length, wielding or brandishing them gives a sense of their length. Now adapt by brandished one rod in each hand in the dark, a short rod in their left hand and a long one in their right. Drop these then pick up two rods of medium length, one in each hand. The medium rod in the left hand feels long, and the one in the right hand short. Put LEDs on the two medium rods, does the length aftereffect change the apparent location of the LEDs? Adjust rods vertically until they appear to aligned horizontally.

O4. Barber-pole illusion for the arm (not about position), *Tanja*
Wrap two spiral brushes (or arrange many tactors) around the arm, facing opposite ways, each ending at the elbow (could paste such brushes on the inside a cylinder so that the arm could be inserted in the middle). When rotating the whole cylinder, the brushes rotate but since they are oriented opposite ways, they will both produce waves travelling towards the elbow (or away, when rotation of the cylinder revereses). (To eliminate the orthogonal component of motion, create travelling edges: have an occluder running along the side of the arm - but for some reason I think it may not be necessary…) The arm might undergo dynamic length change (elongate out during motion, or compress towards the elbow, depending on direction of rotation.

O5. Judgments of separation. *Sae Kaneko*. Weinstein produced a two-point discrimination map for the whole body. How about estimates of two-point separations? Does a pair of blunt dividers with a 2cm separation appear to have the same separation on the fingertip as on the arm, where acuity is lower? (hence fewer jnd's within 2cm). There may be no strong effect --- after all, disks do not appear to change size much when viewed by the fovea of the periphery. Tanja points out that Weber had a demo where legs of a calipers, fixed width, run along the fingers and then forearm; should feel closer together on the forearm, and did so; also, running sideways across the face, feel closer together near the earlobe then around lips. Also anisotropy: Longo, M. R., & Haggard, P. (2011). Weber's illusion and body shape: anisotropy of tactile size perception on the hand. Journal of Experimental Psychology. Human Perception and Performance, 37(3), 720–6. http://doi.org/10.1037/a0021921

O6. 3-D Craik illusions. *Stuart Anstis*
Kenneth Craik discovered that if he ran his fingers back and forth along a tapered wooden wedge, a parallel beam of wood then felt tapered in the opposite direction. So there is a contingency or correlation between arm position and finger position. Or between motion direction on the skin and grasp change direction.