

◆ **How important is 3D information for haptic object recognition?**

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Raised, 2D line drawings of familiar objects are extremely difficult to identify using active touch. In contrast, haptically explored, real, 3D objects are usually recognised efficiently (though slower and less accurately than visually presented objects). Real, 3D objects have more depth information than 2D line drawings, but also extra cues to identity (eg, size, texture, compliance). No studies have directly compared 2D to 3D haptic object recognition whilst controlling for other information sources, so the importance of depth for haptic identification has not been assessed. In the present experiments, people named plastic, small-scale models of familiar objects. Five versions of 18 bilaterally symmetrical objects were produced. Versions varied only on the amount of depth information: minimal for raised line drawings and filled-in drawings, partial for squashed objects and half objects split along the plane of symmetry, and accurate for 3D models. Recognition was faster and much more accurate when more depth information was available, whether exploration used both hands or just one finger. Surprisingly, plane misorientation did not impair performance. In contrast to vision, for haptics 3D information seems more important than object orientation for object recognition, independent of other cues to identity and exploration time and exploration mode.

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◆ **Hitting a target is really different from avoiding obstacles**

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To successfully move around, it is important to consider not only the target of our movements but also any other objects in the environment that may act as obstacles. Nevertheless, it seems that targets and obstacles are treated differently when controlling hand movements: in a previous set of experiments we found that the time needed to respond to a change in position was considerably longer for a displacement of an obstacle than for a displacement of the target (Aivar et al, 2008 *Experimental Brain Research* **190** 251-264). However that effect could also be explained in other ways, since in that study the obstacles differed from the target in several respects. In the present study we compared participants' performance in two tasks that were precisely matched in terms of movement requirements: to hit two identical targets sequentially or to hit the second target through a gap that corresponded precisely with the first target. We found that subjects responded much faster to the displacement of the first object when it was a target than when it was a gap between two obstacles. This shows that obstacles are even treated differently than targets when the kinematic requirements they pose are identical.

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◆ **Hand movement investigations inspired by Yarbus**

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Inspired by the work of Yarbus [1967 *Eye movements and vision* (Plenum Press, New York)] on eye movements, we investigated the dependence of hand movements on 'scene' and question about the scene. Our scenes consisted of arrays of 3×3 samples of materials (each sample 10×10 cm), that could differ in material properties, such as roughness or heat conductance, or in orientation of texture. Questions we asked our participants were, for example, "Which of the 9 samples feels coldest?"; "Describe the relief"; "Which sample is the roughest?". We used an Optotrack system to track the position of the index finger of the dominant hand. Our results show that different materials and different questions lead to very distinctive movement patterns, whereas different participants produce remarkably similar movement patterns. We were able to classify the patterns by using algorithms that detected 'roundness', 'straightness' and 'static touch'. Future investigations should lead to a more comprehensive classification. [Supported by EU-project "THE Hand Embodied" (#248587)]

◆ **Noise vs sensory integration: The return of the race model**

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The combination of information from multiple sensory signals usually improves perception. For example, reaction times to two redundant signals (like an auditory and a visual stimulus) are typically faster than reaction times to either of the single signals. In analogy to a higher probability for a 'small number' when playing with two dices and not only one, a speeding-up is expected from a 'race' between two parallel