

# **It's all in the eye: multiple orders of motor planning in gaze control**

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**Abstract:** It has been shown that the eyes anticipate the target of the next manual object interaction. Meanwhile, manual interactions anticipate object features for grasp adjustments (first order) and the most convenient end-state in anticipation of subsequent tasks (second order). Moreover, grasping kinematics for the same object can vary depending on the final goal (third order planning). In an eye-tracking experiment we show that these factors can be measured already in eye fixations prior to grasping objects with different orientations (upright vs. inverted) and for different tasks (drink vs. hand over). Fixation measures show significant effects of object, task, and orientation and significant interactions. These results show for the first time end-state comfort effects in the eyes and suggest a tighter coupling of oculo-motor and motor programming than assumed so far. The insights suggest that even more intricate derivations of manipulation intentions can be derived from eye gaze data.