Human and robotic goal oriented actions evoke motor resonance – a gaze behavior study

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Motor resonance, which can be defined as the automatic activation of motor control systems during action perception, is a central phenomenon in understanding social behaviors (Chaminade and Cheng 2009) and seems to have a physiological basis in the mirror neurons, cells which are activated both during action execution and action observation (Rizzolatti et al. 1996). A common behavior which is thought to be associated with motor resonance is proactive gaze. When subjects observe an object manipulation task, their gaze predicts forthcoming events rather than reactively tracking actor’s movement (Flanagan and Johansson 2003). Interestingly, when an object performs the same predictable movement by itself the gaze tends to exhibit much less prediction (Falck-Ytter et al. 2006). In our study we investigated whether goal-oriented robotic actions can induce motor resonance, by measuring the appearance of proactive gaze during action observation.

Can uncommon motion characteristics reduce gaze predictivity?

Setup and procedure

Observation of a task starting task (as in Flanagan and Johansson 2003). Both reaching and transporting actions.

Anticipation is present both during action and action observation

Single subjects

Average Anticipation

Short Medium Long

Reach Transport

Average Prop. Anticip (Nat)

Reach Transport

Average Prop. Anticip (tool)

Reach Transport

Normalized Anticipation map

Short Medium Long

Reach Transport

Normalized Anticipation map

Short bibliography


Anticipation is robust to unnatural speed-distance couplings

Motor resonance can be evoked also by goal-oriented actions realized by humanoid robots, at least in the case of the adoption of biological speed profiles

Gaze proactivity can be also extended to the observation of robotic devices.

Robots can become useful tools to study motion resonance:
- Understanding of the brain (wide range of possible manipulations)
- Better future human-robot interactions.

Short bibliography