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How humans perceive arm perturbations in haptic based robotic guiding

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Robot leading has been taken in several physical human robot interactions (HRI) scenarios such as search and rescue, disaster response and human navigation. There are some situations humans have to work with limited perceptions from the environment. In that scenario, it would be interesting to have an intelligent agent like a robot to guide humans when the environment perceptions are limited. When humans interact with robots, it is important to understand how humans perceive their arm perturbations. In this study, we are trying to understand how humans will perceive arm perturbations in haptic based robotic guiding. Then we can design more human aware robotic guidance algorithm to guide humans. To perturb the arm, we implemented a 3rd order predictive guiding control policy extracted from our previous human demonstration experiments on a planar 1-DoF robotic arm. In our previous studies, we found that human use a 3rd order predictive and a 2nd order reactive AR (auto-regressive) models for guiding and following, respectively. In this study, we found that reactive following nature of the humans has been changed to predictive after training. To test the possible causes of the model changes, we presented some behavioral matrices such as rise time (RT), the model order (N) and steady state variability (SSV) in moving leftward and rightward in arm flexion and extension, respectively. The higher RT, consistency of the model order N and low SSV mimic that humans have an intrinsic tendency to be in the predictive nature whenever possible. Our results give as an insight as to how to design human aware haptic-based robotic guiding algorithms for future applications.

Recent Publications

1. Ranasinghe Anuradha, Jacques Penders, Prokar Dasgupta, Kaspar Althoefer and Thrishantha Nanayakkara (2015) Salient feature of haptic based guidance of people in low visibility environments using hard reins. *IEEE Transactions on Systems, Man, and Cybernetics, Part B*; 46(2): 568-79.

2. Ranasinghe Anuradha, Prokar Dasgupta, Kaspar Althoefer and Thrishantha Nanayakkara (2015) Identification of Haptic Based Guiding Using Hard Reins. *PLOS ONE journal;* 10(7): e0132020.

Biography

Anuradha Ranasinghe is currently working as an Assistant Professor (Lecturer) at Liverpool Hope University, UK. She has been awarded her PhD in Robotics from King's College London. Her research focuses on haptics, human-robot interaction and computational motor control and somatosensory feedback of the humans. She has published high impact factor journals and peer reviewed conferences.

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