

Abstract

As robots move beyond controlled environments into public and interpersonal settings, they will perform more tasks and interact dynamically with people. However, people often do not treat robots as they treat humans. We usually avoid obstructing human workers in public spaces and, even without being asked, naturally give way. By contrast, people frequently block or bother robots and ignore their direct requests, which hinders operation and can create safety risks. Those situations prevent the robot from doing their job well, and even harm the robot or the public.

We propose authoritative presence is an impression that make people have a respect-based, internally perceived authority, which naturally lead people to cooperate with the robot. This thesis addresses the challenge of designing and understanding authoritative presence in robots. Unlike approaches that rely on coercive-based method or external authority, which could be not sustained or evoke people's negative emotion to make cooperation more reluctant. Thus, we hope with authoritative presence: a sense that can lead to the same outcome of authority, but from presence- the observer's perception, feeling during interactions with the robot, instead of being forced by real authority. Robot could be naturally respected and perceived as worth cooperating, which lacks in current human robot interaction. We construct the concept that arises from the dynamic interplay such as from behavioral cues, social context, operator embodiment or people's prior knowledge. However, a concrete framework of establishing authoritative presence is not understood, so we conduct three studies to realize it.

The first study (Chapter 3) establishes a theoretical and empirical foundation for authoritative presence by identifying, implementing, and validating behavioral and interactional cues that enable autonomous robots to convey inherent authority, independent of explicit human endorsement. The results revealed that despite a decrease in perceived authority, the robot with behaviors that imply authoritative presence had a positive effect on participant compliance.

The second study (Chapter 4) investigates the impact of social factors, specifically gender stereotypes, on the attribution of authority and legitimacy to robots. Through experimental deployment of gendered avatar robots in authority-related scenarios, this work reveals how social norms and stereotypes shape both the bystander's compliance and the operator's perceived self-authority. The results showed the operators perceived their authority to be higher with male avatar robots compared to female ones, regardless of operator gender. We did not detect an effect on observer's perception of the operator's authority between genders. While less than half of participants perceived

authority for reasons related to traditional gender stereotypes, others observed behaviors that did not align with stereotypes. Avatar embodiment may also help operators assert authority safely due to being physically hidden from the customers.

The third study (Chapter 5) examines the operator's perspective, focusing on how different forms of embodiment: avatar, telepresence, and in-person condition affect the operator's comfort, assertiveness, and empower the operator's ability while engaging in social initiation with strangers. Results showed that participants using robot-mediated embodiments (avatar and telepresence robots) exhibited greater social engagement and reported less hesitation, lower state anxiety, and reduced fear of talking to strangers compared to the in-person condition. These findings suggest that teleoperated robots can mitigate psychological barriers in socially demanding tasks, and that embodiment plays a role in shaping operator experience and social outcomes.

In summary, this thesis first tries to establish and design authoritative presence to increase the cooperation of people. Then from the exploration study, we assume it is possible to craft the cues displayed by the robot to help establish authoritative presence, as the embodiment seems to help them become more assertive by themselves without using external or admonishing method. The integration of situational appropriate behavioral cues, sensitivity to social norms, and operator empowerment is potential to gain the understanding of authoritative presence and achieve better relation between human and robot.