People Meeting Robots in the Workplace

Jeanne Dietsch

Today, people treat most robots in the workplace like wild lions: caged and approached only by trained staff. Commercial and industrial service robots are more like workhorses. They toil for people and need some social presence, but they remain primarily functional. As a result, best practices for such robots differ from those for industrial arms or social–robot pets.

Early research by Nourbakhsh et al. found that people responded to Mobot museum guides both as beings and as machinery. Robot designers now know how to tip the scales to elicit nurturing responses from people. They study magnetic resonance image tracings of the fusiform gyrus, the uncanny valley response to near-human faces, and even Disney animation manuals, to create robots like Paro, the infantile seal that stimulates emotional attachment in elderly people, and Nexi, Massachusetts Institute of Technology's charming humanoid. Compelling proof that robots naturally engender nurturance comes from Kacie Kinzer's Tweenbots. Kinzer releases these knee-high, smiley-faced, motorized toys onto urban sidewalks, holding only a flag with their desired destination:

> [T]hroughout numerous missions, the Tweenbots were successful in rolling from their start point to their far-away destination assisted only by strangers. Every time the robot got stuck . . . some passerby would always rescue it . . . One man turned the robot back . . . saying . . . "You can't go that way, it's toward the road."

But how much sociability and nurturance is appropriate for robotic workhorses? When should robots emphasize civility and when should they focus on functional goals?

Mutlu and Forlizzi's study of hospital robots hints at the balance between social and functional goals. They found diametrically different responses to the same robots in different departments of the same hospital. Both departments manually load Aethon Tugs with laundry from patients' rooms. In one ward, housekeepers leisurely serve their postpartum patients and happily stop to load a robot whenever it arrives. They appreciate its calling them by name; if a robot is sent for repairs, they yearn for its return.
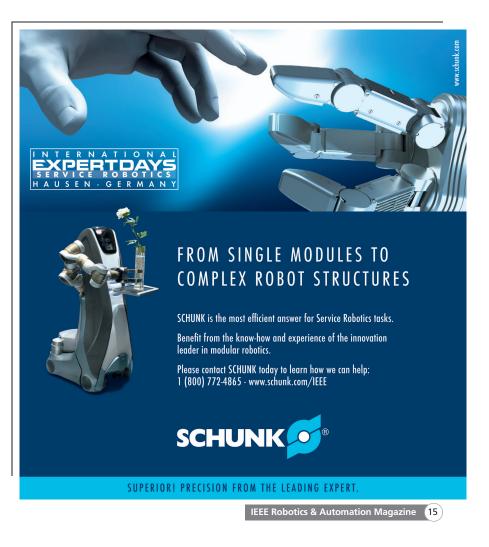
Cancer ward staff feel differently. When a robot arrives, housekeepers may be consoling terminal patients, pushing their gurneys to testing or rushing them to the emergency room. Staff resent the robot's impoliteness:

> I . . . find it insulting that I stand out of the way for patients or a gurney . . . , but [the robot]—just barrels right on . . .

People require acknowledgment from other beings; robots that do not acknowledge people are perceived as rude. According to psychologist Phillipe Rochat, the discrepancy between one's internal self view and perceived third-party views drives much social behavior. When people, pets, and social robots respond in ways that affirm one's value, first-person and third-party views become more reconciled. Robots that wait patiently for people's schedules are affirming. Robots that demand people meet their schedules are not. Robots that greet, mirror, or compliment people may be affirming, provided users deem their actions genuine and appropriate.

But how do people decide whether affirmation is genuine? People tend to judge other beings' actions as intentional, but an

object's actions as designed. Since people view robots as both people and objects, how will they interpret robot actions?

M.K. Lee's recent study of roboreceptionist, the greeter at CMU's robotics building, suggests that application designers may be able to discriminate those who objectify versus those who anthropomorphize robots. Lee found that about half of the roboreceptionist users begin with a greeting. Greeters were significantly more likely to treat the robot as a being. Nongreeters tended to engage in verbless, pragmatic inquiries. Nongreeters were much more likely to become aggressive. Nongreeters might feel sociability interferes with their need for information or fails to acknowledge their understanding of the robot designer's craft.

If someone takes time to say hello to a robot, application designers can probably assume a more social stance. If not, perhaps the robot should stick to its job without risking, insulting the user or arousing aggression.

But even purely functional workhorse robots behave in a social context: whether they give way to others or barge forward; whether they insist that staff attend to them immediately or wait quietly. Social context is one reason MobileRobots added the ability to configure robots on-site to their motivity robot autonomy. A robot's personality should conform to the accepted protocols in the workplace, which may be difficult to finalize in advance. For instance, a robot needs to stay on an appropriate side of the corridor normally but know when to make exceptions to reach its goal. It needs to be able to squeeze through tight spaces when a wheelchair is parked in the hallway but generally give people a wide berth. Tweaking field configurations can make the difference between robots that are welcomed versus tolerated.

People like robots that fit their habits. Anthony Diodato of CCS robotics applies this principle. Before installing SpeciMinder, a motivity-based laboratory delivery robot, he observes how nurses perform specimen delivery manually. If they ring a bell to announce the specimen cart's arrival, he records the bell and plays the sound when the robot arrives. He learns the staff's likes and dislikes: a female voice reminds them of a beloved former colleague; rapid bell ringing annoys them. Diodato explains:

[The robot] could be the most reliable thing in the laboratory, but if it is perceived as annoying, people will resist using it. If the robot is considered as part of the team, minor malfunctions are overlooked and, in fact, tended to in a caring manner.

Without appropriate social skills, robots may encounter reactions colored by misconceptions from Hollywood. In a steel factory, an ADAM-intelligent AGV began delivering samples to a quality assurance laboratory. Staff driving an electric cart faced off with the robot in a narrow aisle. Every time they backed up, the robot moved forward. They finally fled in fear and complained to their boss that the robot was chasing them. Management added a speaker so that the motivity-based AGV automatically explained its goals and intentions. Relations between the robot and staff improved considerably.

Of course, the robots must meet their goals reliably. Workhorse robots now drive millions of kilometers per year with as few as one request for human intervention in 60 days. The ultimate social acceptance of robots is management confidence that they can truly support employees in the workplace.

In summary, all service robots demonstrate some social behavior, even if it is only driving courtesy. Robot application designers should watch customer processes as currently performed and understand customer priorities for change. In relaxed situations, designers may respond in a social manner to those who greet the robot but in a utilitarian way to nongreeters. All robots should conform to the atmosphere and protocols of the workplace. People may need the robot to explain its intentions as it works. Robots that can be configured on-site to match people's work habits and support them predictably appear to achieve high acceptance by staff.

References

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People respond to robots both as beings and as machines. They infer beings' actions to be intentional, but objects' actions to be designed. (Photo courtesy of MobileRobots Inc.)

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