Engaging the public with a hybrid puppet

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A puppet with robotic features and emotional expressions can make general audiences think about the role of machines in everyday life.

Robots are usually portrayed in fiction as emotionless. Indeed, this quality is often their downfall in science fiction (along with their inability to climb stairs). We humans convey sentiments through gesture and expression, and it is often said that 97% of communication is nonverbal.[1] If robots are to be truly useful, perhaps they should communicate in the same way, so they know without being told when they have done something good or bad. If robots presented an emotional interface, we might believe they had real feelings. How would society change if gadgets seemed to have emotional lives?

Researchers have long debated whether machines could have emotions,[2] and one day this may present a moral dilemma as we wonder whether we can turn them off. Although that day may be distant, machines that seem to have feelings will be with us sooner. One only needs to watch the advertisements on children's television to realize that robots are becoming ubiquitous. If a teddy bear starts to speak and understand our children, what might the consequences be? Will we remain unchanged and are robots ultimately just another technology? Could growing up with such pals change our interactions with each other? Some studies suggest that early interaction with objects that are both alive and not alive could stunt children's social and moral development.[3] We wanted to make the public aware of these questions, to show how gadgets can engage emotions and to talk to people outside of science-themed events. Robotics will soon have a huge impact on our lives, and we want public opinion to guide future development. Therefore, we wanted to avoid normal socioeconomic- and gender-biased robotics-engagement formats.

Heart (♡) Robot[4] is a puppet with robotic features. In the hands of puppeteer David McGoran, Heart comes alive and can dance, walk and look around at the audience (see Figure 1). However, when Heart is passed to the audience, his robotic heritage becomes apparent. He has obvious signifiers of his emotional state, which vary depending on how vigorously people move and interact with him. His hands detect—through

Figure 1. *Heart is a puppet that engages the audience. (Photos by Ben Dowden.)*

capacitive sensors—when another hand approaches, and he responds by gently closing his little fingers around yours. Heart's eyes blink and close and his heartbeat—a pulsing, red-glowing diaphragm in his chest—speeds up and slows down. Accelerometers in his head and chest detect movement and allow him to adjust his responses using a simple algorithm running on communicating microprocessors. In this way, Heart can be 'sleepy,' 'agitated,' 'shocked,' and so on and gradually habituates to stimuli and gets 'bored.'

To respond to the public's questions, we developed a website[5] about the project and the street festivals and cafés where Heart would be appearing. Users can also download a film showing the project and the views of UK robotics experts. The website allowed people to describe their response to meeting Heart. We also employed an external expert, Sarah Jenkins, to evaluate whether we were meeting our objectives. We hoped to stimulate thought about the possible impact of emotional machines with three questions, made deliberately vague to allow people room to explore. These questions were: 'Could you ever ♡ a robot?,' 'Could a robot ever ♡ you?' and 'How will ♡ robots change us?'

The project successfully attracted peoples' attention. When we took Heart to meet the public, he was quickly surrounded by

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Figure 2. Observing Heart's interactions with the public.

Figure 3. Answers to the questions, 'Could you ever ♡ a robot?' and 'Could a robot ever ♡ you?' (based on 398 respondents).

curious people of all ages seeking to interact with him. After an appearance at the Emotibots event at the Science Museum in London, a flurry of worldwide media interest brought many visitors to the website. Seventy-two articles in mainstream newspapers worldwide, more than 2100 blog references, and television features and news in the UK mentioned Heart.

Many website visitors left comments, either by email or by filling out an online questionnaire. Our external evaluator also observed Heart's interactions with the public (see Figure 2) and interviewed over 60 people of all ages after they had interacted with Heart.

Audiences were attracted directly by the performance and indirectly by observing people (mainly children) interacting with Heart. The presence of a second, nonperforming presenter was vitally important. Heart provided a wide range of highly personalized experiences, with typical intimate encounters lasting a few minutes. The reactions of audiences were consistent regardless of the type of encounter. The majority of observed interactions (60–65%) took place with females and most of the audience members were family groups, reflecting the audience makeup at the festivals. Heart's appeal to a high proportion of females is unusual for robotic-themed public-engagement events. In previous festivals the audience has been approximately 45% female. Coupled with Heart's attendance at nonscience festivals and venues, this meant that Heart was able to capture the attention of a wide range of people, including those who might not normally engage with robotics.

Of the people Sarah interviewed, 60% over 12 years old were 'definitely' or 'probably' not previously interested in robots. Over 70% indicated that they would continue to discuss robots after having seen Heart. Over 50%
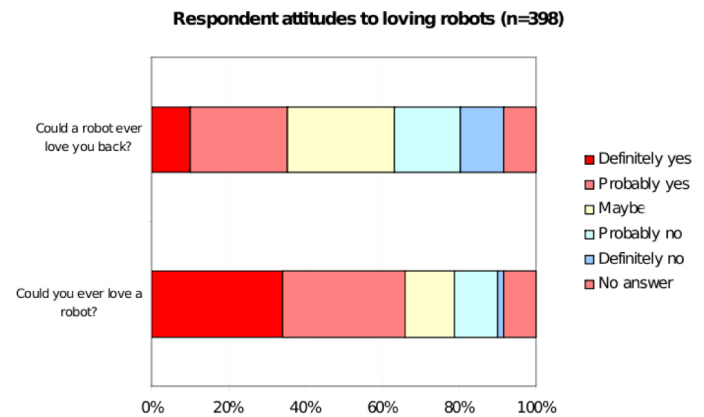
'definitely' or 'probably' believe that robots can have emotions or feelings. The encounter changed feelings about robots in 80% of those over 12 and 70% of those aged 12 and under.

The gender imbalance was maintained in people who responded to the online survey after visiting the website. Of these, 61% were female. Of all online respondents, 54% were aged 18 to 35. Their response to our first two questions is shown in Figure 3.

We gathered some interesting responses to our third question, 'How will ♡ robots change us?' One commenter said, "They could reduce stress for some people and help people with ADHD (attention-deficit hyperactivity disorder) and autism. The robots would help them feel better when with other people." Another worried, "I think there's the danger of people relying on robots to meet emotional needs in the same way that people sometimes rely too heavily on pets or internet communication to feel connected. This can be a substitute for real, human connection." A third person said, "I want one, just to hold. It would be a great stress reliever."

In this project we wanted to speak to people who might not normally engage with robotics. We built a puppet to serve as a proxy to show what future development could be like, which would enable us to leave the sterile conditions of the lab far behind. Heart Robot shows that—with some simple signifiers of emotion—people willingly invest in the belief that the machine's emotions are real. The feedback we received from the public suggests that we have reached people who might not normally attend a robotics demonstration, and that we have started debate about the impact of emotional machines on society. Next, we intend to investigate the psychological impact of such interactions

more vigorously. We must also respond to the many suggestions from people interested in learning more about Heart. Heart will retire from public life soon, but rest assured that his sons (and daughters) may be with you sooner than you think.

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After an industrial career in e-business and telecommunications, Matthew Studley came to BRL in 2002 to do doctoral research in robotics and artificial intelligence. He now leads the BSc robotics programme. His main research interest is how robots can learn and adapt their behaviour to be more useful in a dynamic world. His goal is to communicate why robotics is the most exciting and challenging endeavour mankind has ever been engaged upon.

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Claire Rocks takes lead responsibility for coordinating the Walking with Robots network, providing support for robotics researchers to reach public audiences. She earned a PhD in space robotics and was involved with the Beagle 2 Mars probe. She has extensive experience with different audiences and has organized many activities on the subject of robotics, including a residential training programme for young researchers, a robotics-vision conference and a parliamentary seminar on intelligent robots. She has participated in many science festivals, and given invited talks and masterclasses.

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After graduating from the National Theatre School of Canada in 1993, David McGoran went on to specialize in popular theatre styles such as commedia dell'arte, clown and mime. Having trained as a dancer from a young age, he has continued to develop his work in movement analysis. He has stu-

died Tikedo, contact improvisation, ballet and bhutto. However, puppetry is his area of expertise. Currently he is studying in the robotics BSc programme. He hopes that, as a robotics engineer, he will be able to bring his creative work to life and inspire creativity in the scientific field.

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