Kansei the robot looks angry, but don’t worry, a few seconds later he is smiling… then sad, then surprised, then hateful and now afraid. The disembodied robotic head on a desktop at Meiji University has been designed to produce an “emotional” reaction to human language and has thirty-six discrete expressions at his disposal. Make an input from Kansei’s 500,000-word vocabulary and his software trawls 100 randomly selected Internet pages for common associations. Then nineteen hidden wires under his rubbery yellow polyurethane skin analyze the results to produce an appropriate expression.

Linked to the enormous real-time database that is the Internet, Kansei can produce a crude snapshot of the world’s collective consciousness. For example, top associations for “baby” and “good” are “cute,” so the robot smiles. Input “ghost” and his brows furrow as “dark” and “dead” come top of the list. Interestingly, few words are unequivocally positive or negative. The word “war,” for example, gives a mixture of good and bad associations. The Internet has both warmongers and pacifists.

Kansei takes his name from a Japanese word meaning feeling or emotion. Roboticists first started using the term about fifteen years ago to denote technologies for smooth robot-human interaction, namely those that help robots understand human emotions and imitate them. They include electronic eyes that monitor human expressions and gestures, sound sensors that pick up on voice intonation as well as special sensors worn by humans to inform robots of their owners’ pulse rate and perspiration.

A big reason for interest in kansei technology is the much heralded advent of “service” robots. The International Federation of Robotics reports there were 31,600 service robots for professional use at the end of 2005, as well as 2.9 million toy and household service robots. Such robots are expected to become far more numerous and interact with humans much more closely than their assembly line counterparts. For that Kansei technology could be invaluable.

With the proportion of elderly to working age citizens in Japan predicted to increase dramatically in coming decades, research on caregiver service robots is already underway. “A lot of people have said that [our] robot is unpleasant or frightening,” comments Kansei’s creator, Takeno Junichi of Meiji University’s Laboratory of Robots and Science, “but they still want it to become a reality quickly for the sake of elderly people.”

Takeno suggests that talking robots in care-homes could use kansei technology to tactfully avoid topics such as old age and disease.

Therapeutic Robotics
Not that service robots would necessarily have to be in human form to provide mental care. One of the most successful interactive robots of recent years comes in the shape of a baby harp seal. Paro (short in the Japanese for “personal robot”) is a 57-cm-long fluffy white animatronic animal that can remember its name and react to how it is treated. It weighs 2,700 grams, about the same as a newborn baby. Around 1,000 of the 350,000-yen (3,100-dollar) robots have been made. Most have gone to private owners, but many are in use at care homes for the elderly and hospitals. In

If robots want to work with people, they need to be a bit more human, say scientists. Tony McNicol investigates “kansei” robotics.
2004 the Guinness Book of Records recognized the robot as the “most therapeutic in the world.”

“Paro is not simply a toy,” says Shibata Takanori, Paro’s creator and a senior research scientist at the National Institute of Advanced Industrial Science and Technology (AIST). “Paro has to be accepted as a member of the family, a friend or companion.”

Paro’s interactive technology is relatively simple as kansei goes: sensors for touch, light, posture, sound and temperature. But nonetheless it is effective. “Users interact with Paro almost every day,” says Shibata—even after owning the robot for several years. Some older Paro users are reminded of past interaction with babies or pets, he says. For the senile or infirm there is particular therapeutic value in caring for something themselves rather than just being looked after all the time. “We don’t force people to interpret Paro’s behavior in any way,” he says. “Paro is a kind of trigger to provoke something in the mind of the owner.”

Learning to Trust

But how soon might we see more sophisticated applications of kansei technology? One rather obvious problem is that human emotions are not exactly easy to understand, even for other humans. “It is easy for [a robot’s vision sensors] to recognize a smile, but how do they know it is sincere?” asks Hashimoto Shuji, an expert in kansei technology and director of the Humanoid Robotics Institute at Waseda University. The demands on robotic intelligence would be huge. Some scientists even argue that just appearing to comprehend and react isn’t enough. “We believe that artificial consciousness is necessary,” says Takeno. “Robots will understand others and be self-aware.”

One solution might be to give robots the capacity to learn, although by extension, we might also have to accept they will make mistakes, and that’s not something that humans are used to allowing robots to do, says Hashimoto. “If a dog does what you say five times out of ten, people think it is a very clever dog,” he points out. “If a machine doesn’t do what you say one time out of ten, it’s no good at all.”

All sorts of other changes would also be necessary for robots to become part of everyday life. For example, unlike in the United States, Japanese regulations don’t allow medical robots to perform operations. Nor can security robots arrest people, although Robocop hasn’t reached the United States either.

“Humans and robots won’t be able to live together until the laws and regulations are changed,” says Hamada Shoichi, general manager of the Japan Robot Association’s Technical Department. In a sense it is a chicken and egg situation. Hamada gives the example of the road system. People didn’t realize the real advantages of cars until there were roads and traffic laws. Of course, without plenty of cars, who would build highways?

Perhaps that all sounds a bit too much like science fiction, but the day when robots enter our daily lives may still come sooner than we realize. A 2004 Ministry of Economy, Trade and Industry (METI) white paper on the future of the Japanese economy predicts the Japanese robot market to grow from 1.8 trillion yen (16 billion dollars) in 2010 to 6.2 trillion yen (55 billion dollars) in 2025. By then, it is predicted that three quarters of the market will be for service robots, robots that will work in homes and all kinds of workplaces, not just factories. Japan would become even more reliant on robot friends. “Kansei is about making robots that people can trust,” says Professor Hashimoto.