

## From Meaningful Robots to Robots that Make us Dream Pet-Type Robots Make Their Appearance

*Here is one scene from the Pet Robot Show that was part of the RoboCup '98 Paris in July of last year.*

*The presenter demonstrating the robot asked a boy from the audience to pat the robot's head.*

*What do you think happened then? The child slowly offered some sweets to the robot.*

### Birth of an Idea

I'd like to create an interesting robot. What came from this vague idea was the Entertainment Robot.

Normally, robot development starts with a purpose and progresses towards the goal of endowing a robot with a particular function. For instance, industrial robots are designed to perform dangerous jobs in place of humans and robot nurses are designed to assist people. The Entertainment Robot however, does not have an explicit goal. Stated plainly, the purpose of this development effort was to create a completely useless robot.

The event that initiated this development effort took place four years ago. Dr. Doi, who is head of the D21 Lab at Sony, saw a six-legged robot that had the shape of an insect at an academic conference. This project started when he asked the staff to think up applications for this robot. The staff thought that the field of entertainment was a great possibility. Two weeks later, the laboratory created their first six-legged robot. We asked Gene Huh of Sony's ER Business Incubation Department about the details of this project, since he has traveled extensively with the pet-type robot, both within Japan and abroad.



Mr. Gene Huh  
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While the robot we created at that time was identical to the six-legged insect-shaped robot presented at the conference, we recognized that a six-legged robot lacked the expressivity needed for entertainment applications, and soon modified the form to the one you see here. In addition to the pet-type robot, since we thought that it would be useful if the form and function of a robot could be modified freely, we developed the 'OPEN-R' standard.

OPEN-R was developed specifically for entertainment robots, and allows the function and form of a robot to be changed by swapping interchangeable hardware modules. Similarly, a robot's action and response patterns can be easily changed by swapping interchangeable software modules.

Such a robot can be used for racing simply by replacing the legs with a wheel base, and can be used for two-robot battle games by replacing the arms. Pairs of robots can also be set up to communicate between themselves by installing communication modules. If pet-type robots become available as commercial products, customers will first purchase a basic model and then add software for other animals behavior, long necks, powerful legs, and other modules as options.

### Development

Did we have any difficulties? Yes, many. First, it was extremely difficult to get it to walk. General Manager Tadashi Otsuki replied and added that even now it walks unsteadily and is far from perfect. Quite a few electronic devices are required for a pet-type robot similar in size to a kitten. These include a CCD camera, a microphone, a speaker, and a variety of sensors.



Even if one assembles a team with specialists for each specific part, it is still difficult to assemble everything into a single robot.

Furthermore, the mere ability to move is not enough. A pet-type robot must also move smoothly.

Gene Huh added: It is difficult to operate the software for all the corresponding components at the same time. Even if it has legs, it is still a computer. Our engineers work overtime until 11 or 12 every night. I guess they all joined the project because they really want to develop robots. They really seem to be having fun.

Formally speaking, these pet-type robots are actually four-legged autonomous walking robots. The term 'autonomous' actually has two meanings. The first is that it is not operated by a remote control, but rather moves on its own accord. The second meaning is that it has a learning function and can, to a certain extent, make decisions on its own.

While there is software for the pet-type robot that sings, if this software is used continuously, the robot will get bored and fall asleep. This itself is also adorable. However, this means that the robot sometimes stops listening to commands during demonstrations, making demonstration quite difficult. Even though it should move, it just doesn't. I guess this is, in some sense, just like a real pet.

Images from the RoboCup '98 Paris



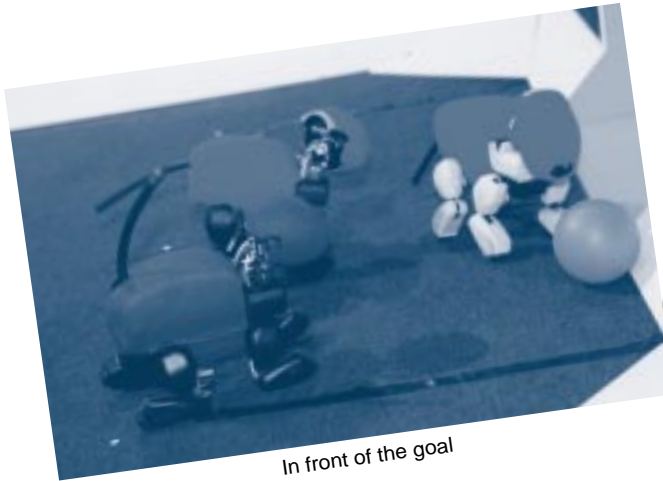
Osaka University vs. Carnegie Mellon



Stylishly outfitted with a hat



With the wheel base module attached



In front of the goal



Popular with children

## The Future

Some issues for the future are improvements in the voice and image recognition capabilities. Another would be to have the robot learn the layout of the room it is in, or to have its character develop differently depending on how it was raised, e.g. either by punishment or rewards, as in the toys in which the user raises a virtual pet. There are many ways to play with this Entertainment Robot.

If the owner registers an image of his or her face, the robot would only respond to



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commands from that person. For example, if the wife takes care of the pet-type robot, it could ignore the husband when he comes home and only respond to the wife. This would be really adorable.

Striving for an even more 'adorable' pet-type robot is another issue.

What is it that makes something 'adorable?' For example, even if one owns a real cat, one does not spend all the time playing with it. Cats act on their own, sleeping when they please, sometimes rubbing up against their owner. We see that as one example of 'adorable'. I sometimes can't sleep at night thinking about how to make the pet-type robot more pet like.

In a certain sense, the pet-type robot is somewhat like a game, Noritoshi Inoue, a manager in this group continued: Although the PlayStation fighting games have a good sense of reality, they are still played in what is really only a virtual space. Cats and dogs are not virtual, but real. They are real animals in the real world.

Parents would like their children not to be limited to the worlds within games, but to also experience the real world. Parents also want their children to develop emotionally as well. These desires are incorporated in the pet-type robot.

From virtual worlds to the real world. For Sony, the Entertainment Robot is just the first step. However, we feel that this first step is an important step towards the future, and towards our dreams.

You can find out the latest information concerning pet-type robots and see movies of them in action on Sony's web site at the following URL.

<http://www.sony.co.jp/soj/robot/>

