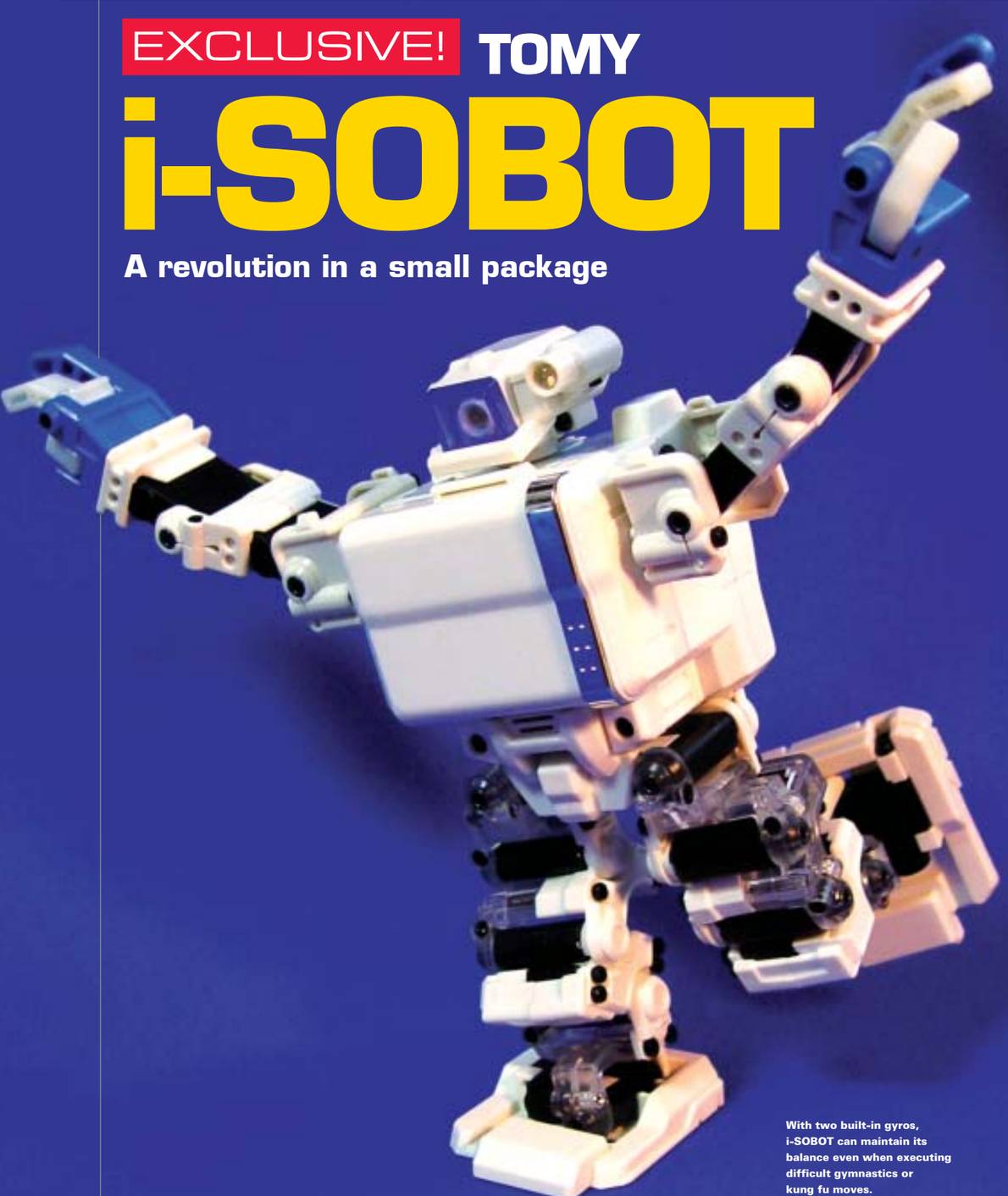
by Lem Fugitt

EXCLUSIVE! TOMY i-SOBOT

A revolution in a small package



With two built-in gyros, i-SOBOT can maintain its balance even when executing difficult gymnastics or kung fu moves.

At only 6.5 inches tall, literally small enough to hold in the palm of your hand, yet capable of performance exceeding robots that cost three or four times its price, the TOMY i-SOBOT humanoid robot is destined to dramatically change the toy and hobby robot market completely when it hits store shelves in the U.S. this October—just in time for Christmas.

We had the exclusive opportunity to exhaustively test one of the final pre-production i-SOBOT robots outside the TOMY labs for several days in mid-June, and we came away totally impressed. Our evaluation sample was fully configured for the U.S. market and contained the latest firmware, including English language voice recognition. The TOMY engineers indicated that there may still be some minor firmware changes based on their beta testing, but confirmed that the unit we tested faithfully represents the robots set to invade the U.S. this fall.

BUCKING THE TREND

The accepted humanoid robot development trend has been to keep adding more and more features and functionality while raising the price at the same time. Unfortunately, the result has been that fewer and fewer people could enjoy the humanoid robot experience. The current price for a midrange robot kit with 17 degrees of freedom starts at just under $1,000 and climbs to approximately $3,500 or more for some of the advanced kits. Their performance is awesome and usually includes karate moves, soccer kicks, and even all out gymnastics. But the cost and user expertise required to assemble and get them operating correctly often puts the robots out of reach for most people.

TOMY, with decades of experience as one of the world's top toy designers, realized it was possible to create a fully functional humanoid robot, ready to operate right out of the box, at just $350. Their development target, which seemed daunting three years ago when the project first started, was to create a preassembled, preprogrammed humanoid robot with 17 degrees of freedom, capable of user programmable kung fu and gymnastic moves, with a strong yet engaging personality, sound effects, background music and advanced voice command recognition.

There were several key factors that made it possible for them to achieve their goal and give birth to the innovative i-SOBOT robot.

The most important factor was reducing the size, something that Japanese toy manufacturers have traditionally excelled at. By making the robot considerably smaller than other humanoids on the market, the required servo torque and power consumption, as well as the overall robot material and assembly costs, were dramatically reduced.

At the same time, TOMY was able to take advantage of their accumulated knowledge of miniature motor, clutch, and servo design as well as high-volume/low-cost product manufacturing and distribution. The history of TOMY sheds light on this reservoir of knowledge.

Tomy, originally established in 1924, merged with Takara – another Japanese toy giant – in early 2006. While the two companies merged the i-SOBOT project was temporarily put on hold, but the engineering team, lead by Kimi Watanabe – the division general manager, and Yosuke Yoneda—the deputy manager and chief engineer, never lost faith in the robot. As it turned out, the merger brought even more strength and robot know-how into play. Takara brought their robot design expertise based on numerous popular robot related toys including Transformers, Microman, Battle Beasts, and Walkie Bits. Merging their knowledge with TOMY's successful Zoids (1982), OMNIBOT robot series (1985), and the TXR-002 remote controlled mobile robot, resulted in a development team unique in the world.

QUICK SPECS

ROBOT: TOMY i-SOBOT

DIMENSIONS: 165mm x 96mm x 67mm

WEIGHT: 350 grams

SERVOS: (17) high quality custom-designed servo motors with built-in clutches and dedicated cpu controllers

CPUS: (19) 1 central, 1 voice recognition and 17 servo controllers

SENSORS: (2) gyro sensors for balance

REMOTE CONTROL: IR

OPERATING MODES: (4) Remote control, Program, Special Action (8 preinstalled complex actions), Voice recognition with 10 preprogrammed voice commands

BATTERIES: 3 AAA eneloop Nickel Hydride rechargeable included, or 3 AAA alkaline for robot and 3 AAA for controller

NOTES: Assembled and RTR out of the box; 180+ preprogrammed actions that can be sequenced in Program Mode. Release date in U.S.: October 2007. Sales target worldwide: 300,000.

Yosuke Yoneda, deputy manager, started the original i-SOBOT development project in 2001, and never lost faith in the project, even when it was put on hold for a year and a half during the merger.

The robot's power and control channel selection switches are located on the back of the robot's body. The wire seen hanging down was for a last minute firmware change and will not be present in the production model.

i-SOBOT is equipped with two head mounted LEDs that indicate his operating modes and his moods. Many of the robot's actions are soccer moves, including nice goal kicks by each foot. Notice how the robot shifts its center of gravity over the left foot during the kicking motion using the gyro feedback to maintain perfect balance.

ADVANCED FUNCTIONALITY

Today's complex electronic equipment typically requires the user to memorize and punch in long, involved command sequences, often with no apparent logic behind them, into a remote control. If you're an experienced video game fanatic, used to hammering quickly through five or 10 keys at a time, that might not be a problem, but for most of us mere mortals it can rapidly become an exercise in frustration, and quickly spoils our passion for using a product.

An advanced robot like i-SOBOT is no different. The TOMY engineers knew that for the product to be a success they would have to focus a lot of attention on the design of the remote control to make it as easy and pleasurable for the customer as possible. Their solution was to add a small LCD screen to the remote control giving immediate feedback to the user. That makes it easy to see what buttons have been pushed, or to scan through program sequences, or to immediately confirm the remote control status. It puts the users' focus and attention on playing with the robot instead of trying to struggle with the remote.

FOUR MODES

i-SOBOT has four basic operating modes that you access in sequence by pressing the MODE button.

The RC-MODE (Remote Control Mode) is where you directly control the robot's actions using the joysticks and remote control keys. The two joysticks, used in conjunction with buttons on the front of the control, allow you to have the robot walk forward, backward, left/right, turn, control his arms, and a myriad of other moves. You can also key in command codes on the keys that map to over 180 preprogrammed actions.

Using the P-MODE (Program Mode), you can create and edit long sequences of actions to be executed on command. This is very useful for constructing mini comic routines, your own music videos, or short dramas.

The SA-MODE (Special Action Mode), as the name implies, contains a series of special action sequences like forward rolls, backward rolls, playing an air drum, and some totally hilarious animal imitations. There's even one where the tiny i-SOBOT does a great imitation of Giant Robot.

The VC-MODE (Voice Control Mode) allows you to command the robot verbally, telling it to go forward, go backward, tell you what's up, and seven other interesting voice commands.

One good example of TOMY's attention to detail is the way the remote control's go button was designed to double as a replay button. Say you want to have the robot do a soccer kick. You press 2, 2, 3, B on the remote control keyboard, and he kicks – but perhaps you didn't have the ball in quite the right position in front of his foot. Instead of having to key in the whole sequence again, with i-SOBOT all you have to do is press go and the robot automatically repeats the last command. It's a small touch, but one that definitely improves the quality of play and enjoyment of the robot.

SPEAK TO ME!

The i-SOBOT has a built-in microphone along with a CPU chip dedicated to voice recognition. Our evaluation beta unit had 10 English voice commands preprogrammed and had no trouble recognizing our voice as long as we spoke slowly and clearly, fairly close to the robot. For some of the commands there was a slight delay while the robot processed the voice command, but it didn't detract from the performance at all.

When the robot's microphone was blocked by its head, or we stood back away from it quite a ways, it sometimes failed to recognize our voice command. The first few times it doesn't catch what you are saying, it will verbally tell you, then the next time it will flash one of its LED indicators instead of constantly repeating the same message. Tomy is currently evaluating repositioning the microphone slightly to improve voice capture and recognition.

i-SOBOT's hands have two adjustable fingers, and the whole hand can be rotated around the primary arm axis. It's a good idea to check the finger positions before executing new actions to avoid running the hands into other body parts and potentially damaging the robot.

The battery cover is held in place with two screws. For power, the robot uses three AAA eneloop rechargable batteries, or standard AAA alkaline batteries. The speaker is mounted in a cavity directly below the batteries and provides surprisingly good sound quality.

i-SOBOT stands next to a KONDO KHR-1, the original humanoid robot kit first offered for sale three years ago. Both robots feature 17 degrees of freedom, and note the significant difference in size.

LET'S PLAY!

It's a lot of fun to run i-SOBOT through its preprogrammed actions, which you can do immediately after removing it from the box since it comes fully assembled and ready to go. We started by using the joysticks to drive it around the table top, then, moved on to keying in actions using the remote control. Each action is unique, and often surprising. For example, the first time we keyed in 1, 2, 4, A and the robot started imitating Borat we almost fell off our chairs laughing. By coincidence, i-SOBOT also does an extremely funny imitation of a certain popular red puppet character that's famous for falling down laughing. Kind of a "Tickle Me, i-SOBOT!" routine.

i-SOBOT AT YOUR COMMAND

In remote control mode it's ready for competition with other family members or friends. The robot and IR remote supports two separate control channels – selected via a switch on the back of the robot. With its extensive selection of kung fu, karate and soccer moves, staging local i-SOBOT contests is sure to become popular.

In the limited time we had access to the robot we had a lot of fun playing a mini version of kick-the-can with a pair of small plastic dice, and controlling it through a maze we laid out on the top of our desk.

We had just one i-SOBOT to play with, but it was easy to imagine how much fun it would be to race two i-SOBOTs against each other. Or, mark out a square on the table, put one of the dice in the middle, then have two opposing i-SOBOTs try to kick it across the other robot's goal. The possibilities are endless.

i-SOBOT is about much more than just passive entertainment. The robot is engaging and challenges you to add your creativity to its abilities. Using the remote control in program mode, you can create long program sequences of actions, one after another, to have the robot execute a dance sequence, or put on a mini-play.

We were pleasantly surprised at the robots' run time. The set of fully charged Eneloop nickel hydride batteries that came with i-SOBOT lasted for over one hour of continuous operation – and we were probably working it harder for our evaluation than any normal use. We also tested the robot with several sets of AAA alkaline batteries and consistently achieved around 40 minutes of operation under difficult testing conditions.

ALIGNMENT AND ADJUSTMENT

Under normal use i-SOBOT shouldn't need to be adjusted, other than to replace and recharge the batteries. I-SOBOT only requires a single tool – an included hex driver to undo the two screws that hold the battery cover in place.

In the rare case when the robot's servos need to be realigned, the manual includes a short procedure that covers adjusting the servo brackets using the hex tool with the robot in its alignment position.

WORLD'S SMALLEST WALKING HUMANOID ROBOT?

The i-SOBOT is unquestionably the world's smallest commercial humanoid robot in volume production. The i-SOBOT will likely set a new price/performance standard for commercial humanoid robots that will be tough to match for years to come.

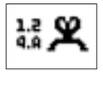
WISH LIST

We don't want this review to sound like a total i-SOBOT love fest. As much as we are really excited about the robot, like all new products there is always some room for improvement and some aspects we didn't like. Fortunately in this case all of the negatives were relatively minor.

For example, the remote control packaging is really boxy and doesn't seem to match the high tech i-SOBOT image and style. Some of the buttons on the remote tended to stick from time to time, but TOMY is aware of the problem and expects to have it fixed before shipments start. Also, the wording on the home/cancel button was small enough to require reading glasses for those who use them.

Another issue for us is that after each action the robot has to return to its standing home position stance. If it's already standing it isn't much of a problem and

The i-SOBOT remote control has great functionality. The LCD display is invaluable when creating complex programs for the robot.



Remote control icon for the Borat imitation— "Is nice, you like?"

only takes a fraction of a second. But, if it's lying down or in some other non-standing pose, it can take a while for it to go through all the motions to stand back up again.

A FEW CAUTIONS

It's important to keep i-SOBOT away from table edges. It has no built-in edge detection, and some of the actions cause it to move in unexpected directions. For example, if you leave it alone for a couple minutes it will get bored and try to lie down. If it happens near the edge of a table, it could fall off.

The remote control uses standard IR technology – similar to your television and stereo system remotes, but with slightly different codes to avoid any interference. The remote will work well in standard size offices or rooms at home, but won't work outside since the flood of IR in sunlight will swamp out its control signals. The same thing may happen occasionally near large picture windows or other IR sources.

Like all humanoid robots, i-SOBOT likes a smooth, level surface to play on. It doesn't weigh enough to compress carpets or rugs the way humans do, so it's better to use it on a flat floor or table top. If it seems to keep falling over in the same direction all the time, chances are that the surface is tilted in that direction.

TOMY has gone to great lengths to make i-SOBOT as durable and reliable as possible, but it's important to keep in mind that it is a small, somewhat delicate device. Treat it gently and with respect and it will provide you with hundreds of hours of fun for years to come.

Kimi Watanabe, general manager of the Seeds Product Development Group, is really excited about bringing the i-SOBOT and follow-on products to market. His wife is creating special costumes for the robot.

WHY "I-SOBOT"?

In Japanese the word for love is "ai" which is pronounced "I," and robot fans are going to love i-SOBOT – at least that's what TOMY hopes and expects. The Japanese word for play is "asobu," which could be pronounced "i-sobu," and they wanted to give the feeling of animation and exercise, so the i-SOBOT has the feeling of doing isometric exercises. More than anything, they want i-SOBOT to be a lovely, friendly robot for people everywhere to enjoy and make an active part of their life.

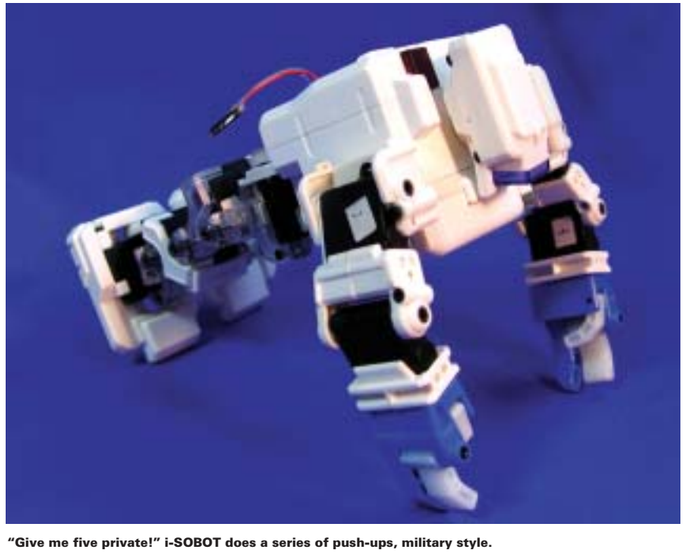
WHAT'S NEXT?

There's no committed release date yet, nor price, but the next addition to the i-SOBOT family will feature a head mounted video camera complete with 60-degree pan capability and a wireless LAN connection.

At that point you'll be able to remotely see what the next generation i-SOBOT sees and control it's movements via your PC or mobile phone. Battery limitations may put some restrictions on how useful the robot would be as a home security monitor – besides, what burglar would run in fear from a tiny robot no matter how loud it shouts at them? Still, it would be a lot of fun to experiment with, not to mention terrorizing the family cat or dog. We can hardly wait!

Visit www.robots-dreams.com for videos of i-SOBOT in action.

—the editors



"Give me five private!" i-SOBOT does a series of push-ups, military style.

Links

Robots-Dreams,
www.robots-dreams.com

TOMY Corp., www.tomy.com,
(949) 955-1030

For more information, please see our source guide on pg. 97.