GO robotics book

WARNING:

Use under the direct supervision of an adult when handling parts with sharp points or edges.
Keep away from children under three years of age.
Use only batteries! Never use any other source of electricity. Do not mix old and new batteries.
Do not use rechargeable batteries.

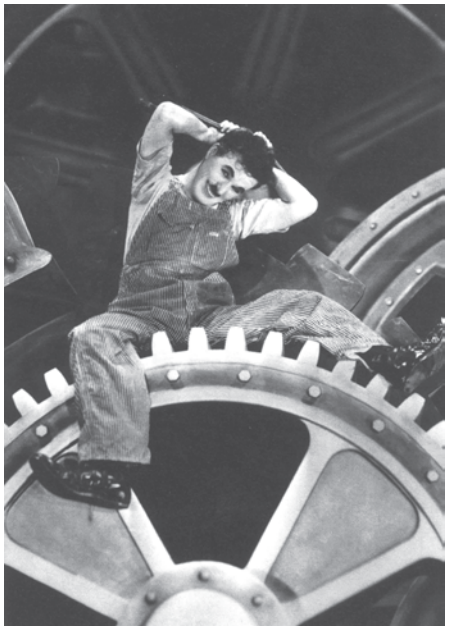
Robot

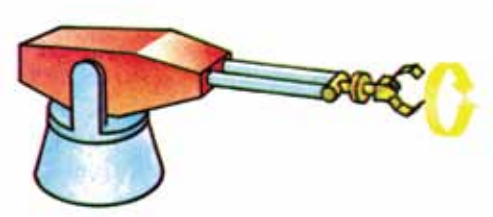
The word Robot is used to describe any automatically
operated machine that replaces the human being.
It does not look like a human being nor does it necessarily
do the same things as human beings.

The origin of the word Robot is from a Czech word, Robota,
meaning " forced Labor " The word was used in a play written in 1920
showing how the industrial revolution created mechanical workers called robots,
which could do all types of physical work.
There is a very old Charlie Chaplin film called "Modern Times",
in which the machine operator behaves like a machine.

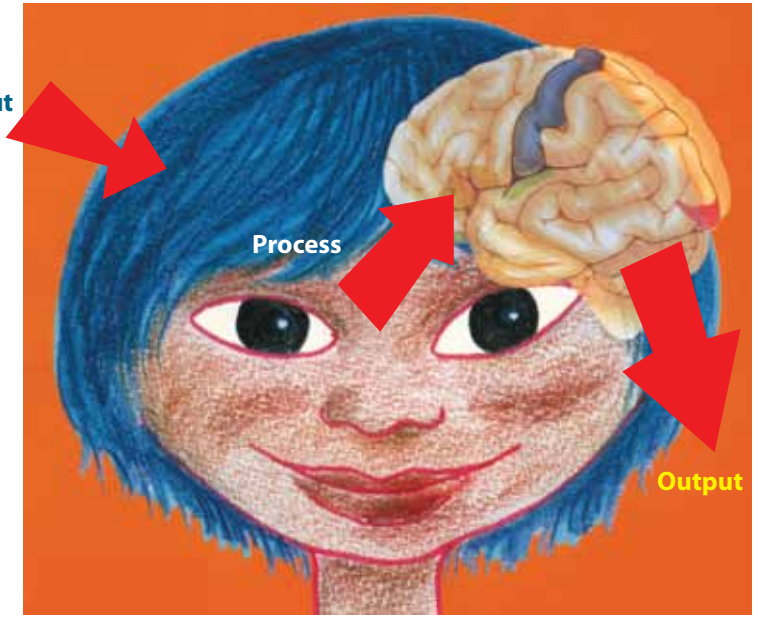
One of the first robot devices was a water clock made by the The Greeks in 250 BC.
From as early as 3rd century BC, during the Han dynasty in China,
a mechanical orchestra was made for the Emperor,
later flying birds, an otter that caught fish and many mechanical dolls were made.
The present day Robots started as mechanical toys and were later
adapted for use in industry and led to the development
of automatic industrial machinery.
One of the most important parts of a Robot are its "arms "or manipulators ,
these usually consist of an arm and body with 3 joints connected
by large links and a wrist consisting of 2 or 3 joints.
Many every day machines are made up of elementary robot mechanisms.
It was only from 1960 that microelectronics were introduced into robots.

The electronic robots in this kit are simple to assemble and operate.
They will show you how larger and more complicated robots function and behave.





How do these Robots " think " ? Everyone has 5 basic senses; you see with your eyes, taste with your tongue, hear with your ears, smell with your nose, and feel with the skin on your fingers.
The information that you get from any of these 5 " sensors " is transmitted to your brain, the brain processes the information and the muscles in your body react.
Let's say you go out in the bright sun, what happens?
You immediately start to squint or shut your eyes completely.
A robot is programmed to operate in the same way, it receives information and reacts accordingly.
The simple robot will receive information from the sensor and will react immediately.
As an example; we will use the robot that moves forward until it meets an object in its way. It receives the information and stops.
We call this an open loop system: it works on the basis of receiving information and reacting.



A more complicated robot could do the following; it receives information that there is an object in its way; it stops and now it can be programmed to reverse, turn to the left, and try to go forward again.
If the object in the way is small, it can now go forward, but if the object is large it will have to reverse and turn further to the left until such time that it will not meet the object when it goes forward.
This robot works on what is called a closed loop system.
It receives information, compares it with what it has been programmed to do, acts, and waits to receive further information before acting again.
To use the same example of the sun in your eyes.
You go out in the bright sun, and you immediately squint, your brain now analyses the information and decides how you react, for example by raising your hand over your eyes to act as a shade or you put on sunglasses.

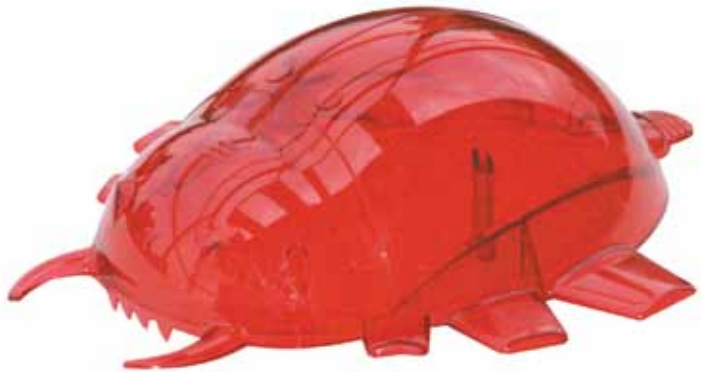
There are three robots in this kit and the three circuit boards have the name of each individual robot printed on them. Now a simple explanation as to how each robot operates.

REMOTE CONTROL ROBOT: This robot operates by flashing an Infra Red beam onto the front of the robot. Using any remote control from a TV or Stereo will start the robot moving. It will work in a range of 2 meters. Surprise your friends by placing the Robot next to the TV: when they use the Remote for the TV, the Robot will start moving towards them.
Adjust the trimmer to make it more sensitive to the IR beam.

WAKE ME ROBOT: This Robot is sensitive to light. As soon as the sensor detects light, natural light or artificial light, it moves forward and makes a noise. You can use this in your room as a Wake Up Alarm. Place the robot next to the window at night, and in the morning when it becomes light, the robot will buzz and move forward. Try putting out the lights in the room and shining a torch on the robot: it will move, it may follow you as you walk. You can make your robot more sensitive to light by adjusting the trimmer.

All the robots operate on two 1.5 AA batteries.

Before you start assembling your robot, make sure that you have recognized all the parts as they appear in the parts list.



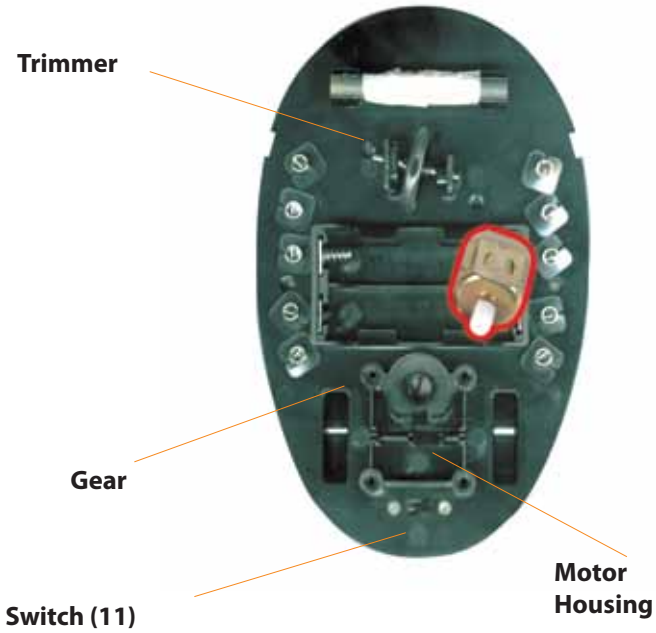
DETECTOR ROBOT: This Robot has a sensor that detects obstacles in its way. As soon as it detects something in front of it, this robot will go backwards to avoid the obstacle. This is something like a guide dog used by the blind.
Try and use this as watchdog for your room or desk. As soon as someone approaches and passes in front of the robot, it will move backwards and buzz. You can adjust the trimmer to increase its sensitivity to obstacles.

How to assemble your Robots.

The first step is to prepare the chassis which will be used for all three robots. All three modules and bodies fit the same chassis. Changing the modules will give you different robots. Changing the bodies gives them a different character. For the assembly you will need to use a very small screwdriver. We suggest that you have this ready before you start.

Step 1

Take the rear wheels (4).
Insert the rear wheels into the gear box at the back of the chassis, you will see that the wheels only fit in in one direction.

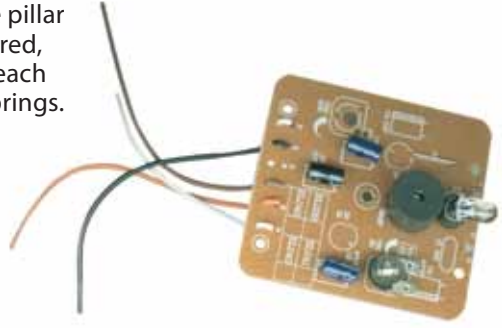


Step 2

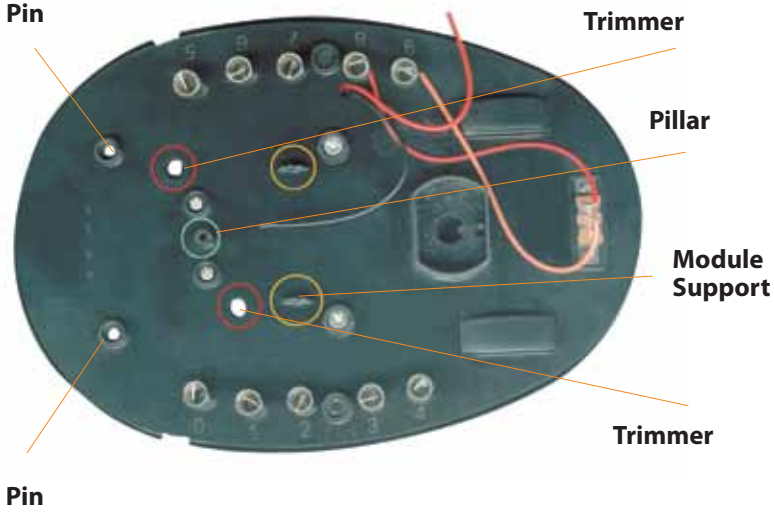
Take the motor (10) and insert it into the large hole (motor housing) from the top side of the chassis, so that the "worm wheel" of the motor connects (meshes) with the cog wheel that drives the back wheels.
Place the gearbox cover (8) on the gearbox
and secure it with 4 screws.
After you have secured the gear box cover, secure the motor.
Between the motor and the switch there is a post,
take the screw with the shape as shown in the picture, tighten it to the post, this will hold the motor in place.

Step 3

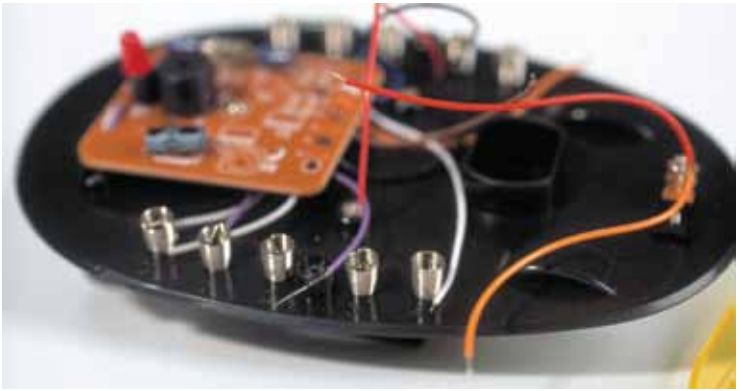
Take the Module (printed circuit) and very carefully place it at the front of the chassis, inserting the plastic rod into one of the two holes, either on the right or the left, depending on the module.
The plastic rod is the trimmer, used for adjusting the sensivity.
In the middle of the module there is a small hole for the small screw in your kit and two small holes at the back of the module that fit onto two small pins on the chassis. Using your screwdriver tighten the screw in place on the pillar on the chassis. Using a small screwdriver tighten the screw in place on the pillar of the chassis. When secured, take the wires and place each wire next to one of the springs.



Electronic Module



Step 4



Connect all the wires of the same color to the same spring (there should be 2 or 3 wires of the same color).It does not matter which spring you use; take whichever spring is easiest to reach with the same colored wires.
The springs are only used to connect the colored wires together, the numbers next to them are meaningless.
The wires are connected by bending the spring sideways with your finger; this creates a gap in the side of the spring. Push the wires into the gap, making sure that only the bare parts of the wires are inserted into the spring. Now let go and the wires are trapped in the spring.

Step 5

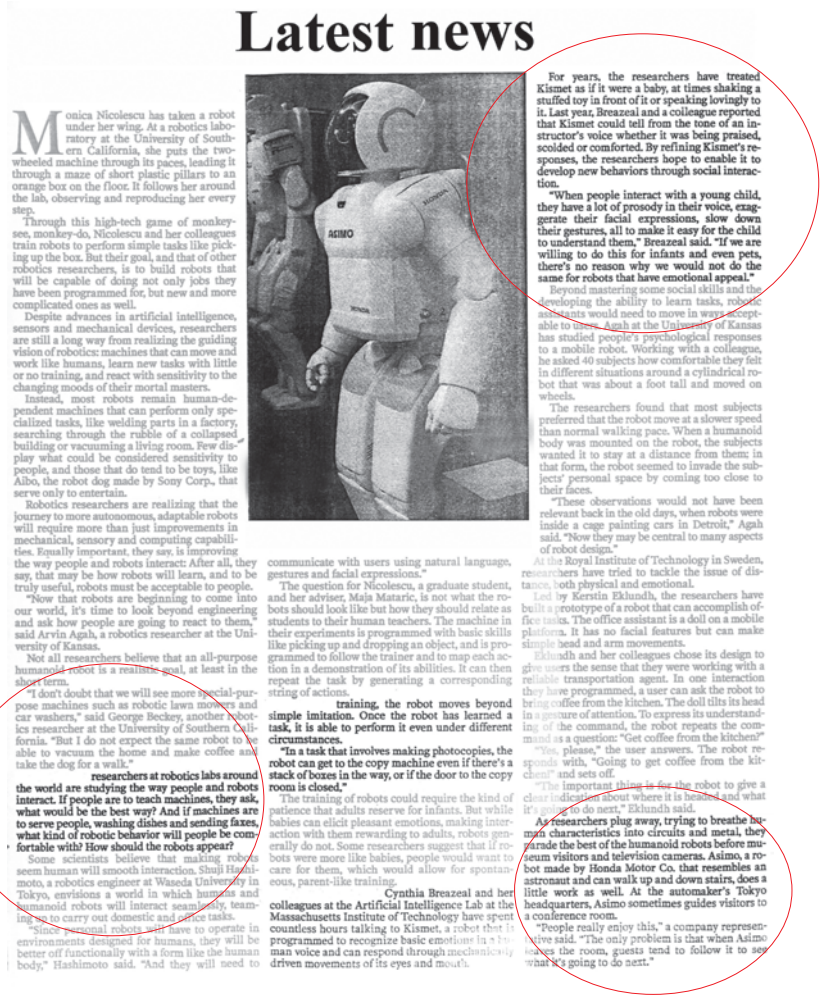
If the black and red wires from the battery holder are not on the bottom side of chassis push them through the hole next to the battery holder.

Step 6

Make sure that all the wires are in the right place and that none of the wires have come out of the springs.
Take one of the bodies of your choice and place it on the chassis.
Hold the body with one hand and turn the Robot over: with your other hand insert the the 2 screws into the holes situated between the springs on both sides, and tighten them with a small screwdriver.

Step 7

Insert two AA batteries, switch on and try out the Robot. You will probably want to change the sensitivity: you can do this by adjusting the trimmer. This can be done from the bottom of the Robot.
You will see a small rod by the front wheel.
Gently rotate it in one direction and then the other until your Robot responds, the way you want.
When not in use remove the batteries. NOTE: DO NOT USE RECHARGABLE BATTERIES
It is best to use new batteries when starting to use the Robot for the first time.



Latest news

Monica Nicolescu has taken a robot under her wing. At a robotics laboratory at the University of Southern California, she puts the two-wheeled machine through its paces, leading it through a maze of short plastic pillars to an orange box on the floor. It follows her around the lab, observing and reproducing her every step.

Through this high-tech game of monkey-see, monkey-do, Nicolescu and her colleagues train robots to perform simple tasks like picking up the box. But their goal, and that of other robotics researchers, is to build robots that will be capable of doing not only jobs they have been programmed for, but new and more complicated ones as well.

Despite advances in artificial intelligence, sensors and mechanical devices, researchers are still a long way from realizing the guiding vision of robotics: machines that can move and work like humans, learn new tasks with little or no training, and react with sensitivity to the changing moods of their mortal masters.

Instead, most robots remain human-dependent machines that can perform only specialized tasks, like welding parts in a factory, searching through the rubble of a collapsed building or vacuuming a living room. Few display what could be considered sensitivity to people, and those that do tend to be toys, like Aibo, the robot dog made by Sony Corp., that serve only to entertain.

Robotics researchers are realizing that the journey to more autonomous, adaptable robots will require more than just improvements in mechanical, sensory and computing capabilities. Equally important, they say, is improving the way people and robots interact: After all, they say, that may be how robots will learn, and to be truly useful, robots must be acceptable to people.

"Now that robots are beginning to come into our world, it's time to look beyond engineering and ask how people are going to react to them," said Arvin Agah, a robotics researcher at the University of Kansas.

Not all researchers believe that an all-purpose humanoid robot is a realistic goal, at least in the short term.

"I don't doubt that we will see more special-purpose machines such as robotic lawn mowers and car washers," said George Beckey, another robotics researcher at the University of Southern California. "But I do not expect the same robot to be able to vacuum the home and make coffee and take the dog for a walk."

researchers at robotics labs around the world are studying the way people and robots interact. If people are to teach machines, they ask, what would be the best way? And if machines are to serve people, washing dishes and sending faxes, what kind of robotic behavior will people be comfortable with? How should the robots appear?

Some scientists believe that making robots seem human will smooth interaction. Shuji Hashimoto, a robotics engineer at Waseda University in Tokyo, envisions a world in which humans and humanoid robots will interact seamlessly, teaming up to carry out domestic and office tasks.

"Since personal robots will have to operate in environments designed for humans, they will be better off functionally with a form like the human body," Hashimoto said. "And they will need to communicate with users using natural language, gestures and facial expressions."

The question for Nicolescu, a graduate student, and her adviser, Maja Mataric, is not what the robots should look like but how they should relate as students to their human teachers. The machine in their experiments is programmed with basic skills like picking up and dropping an object, and is programmed to follow the trainer and to map each action in a demonstration of its abilities. It can then repeat the task by generating a corresponding string of actions.

training, the robot moves beyond simple imitation. Once the robot has learned a task, it is able to perform it even under different circumstances.

"In a task that involves making photocopies, the robot can get to the copy machine even if there's a stack of boxes in the way, or if the door to the copy room is closed."

The training of robots could require the kind of patience that adults reserve for infants. But while babies can elicit pleasant emotions, making interaction with them rewarding to adults, robots generally do not. Some researchers suggest that if robots were more like babies, people would want to care for them, which would allow for spontaneous, parent-like training.

Cynthia Breazeal and her colleagues at the Artificial Intelligence Lab at the Massachusetts Institute of Technology have spent countless hours talking to Kismet, a robot that is programmed to recognize basic emotions in a human voice and can respond through mechanically driven movements of its eyes and mouth.

For years, the researchers have treated Kismet as if it were a baby, at times shaking a stuffed toy in front of it or speaking lovingly to it. Last year, Breazeal and a colleague reported that Kismet could tell from the tone of an instructor's voice whether it was being praised, scolded or comforted. By refining Kismet's responses, the researchers hope to enable it to develop new behaviors through social interaction.

"When people interact with a young child, they have a lot of prosody in their voice, exaggerate their facial expressions, slow down their gestures, all to make it easy for the child to understand them," Breazeal said. "If we are willing to do this for infants and even pets, there's no reason why we would not do the same for robots that have emotional appeal."

Beyond mastering some social skills and the developing the ability to learn tasks, robotic assistants would need to move in ways acceptable to users. Agah at the University of Kansas has studied people's psychological responses to a mobile robot. Working with a colleague, he asked 40 subjects how comfortable they felt in different situations around a cylindrical robot that was about a foot tall and moved on wheels.

The researchers found that most subjects preferred that the robot move at a slower speed than normal walking pace. When a humanoid body was mounted on the robot, the subjects wanted it to stay at a distance from them; in that form, the robot seemed to invade the subjects' personal space by coming too close to their faces.

"These observations would not have been relevant back in the old days, when robots were inside a cage painting cars in Detroit," Agah said. "Now they may be central to many aspects of robot design."

At the Royal Institute of Technology in Sweden, researchers have tried to tackle the issue of distance, both physical and emotional.

Led by Kerstin Eklundh, the researchers have built a prototype of a robot that can accomplish office tasks. The office assistant is a doll on a mobile platform. It has no facial features but can make simple head and arm movements.

Eklundh and her colleagues chose its design to give users the sense that they were working with a reliable transportation agent. In one interaction they have programmed, a user can ask the robot to bring coffee from the kitchen. The doll tilts its head in a gesture of attention. To express its understanding of the command, the robot repeats the command as a question: "Get coffee from the kitchen?"

"Yes, please," the user answers. The robot responds with, "Going to get coffee from the kitchen" and sets off.

The important thing is for the robot to give a clear indication about where it is headed and what it's going to do next," Eklundh said.

As researchers plug away, trying to breathe human characteristics into circuits and metal, they parade the best of the humanoid robots before museum visitors and television cameras. Asimo, a robot made by Honda Motor Co. that resembles an astronaut and can walk up and down stairs, does a little work as well. At the automaker's Tokyo headquarters, Asimo sometimes guides visitors to a conference room.

"People really enjoy this," a company representative said. "The only problem is that when Asimo leaves the room, guests tend to follow it to see what it's going to do next."

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(With compliments to the New York Times)


Latest news

Trouble Shooting

If your Robot does not move, check if you have inserted the batteries correctly.
Make sure the batteries are new.
Make sure your switch is on.
Check if you need to adjust the trimmer.
Check if all the connections are correct and that the wires have not moved.
Check if the motor is pushed all the way down and that the gears are "meshed"
Check if there is nothing disturbing the wheels from moving.