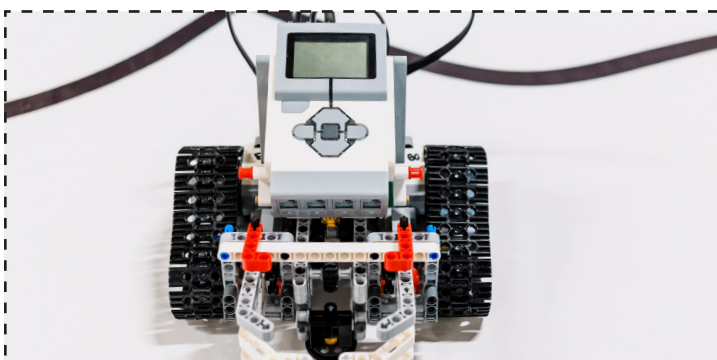


Robotics Badges: *Programming Robots 2*

Robots Parts Cards

Before the meeting, cut out the cards for girls to use in As Everyone Arrives: Robot Card Game. You may want to make one or more copies depending on how many girls you have. Feel free to make cards with other options as well!



PART: Controller *Brick*

Some types of robot kits, including Lego Mindstorms, have their own controllers that may use a special programming language.



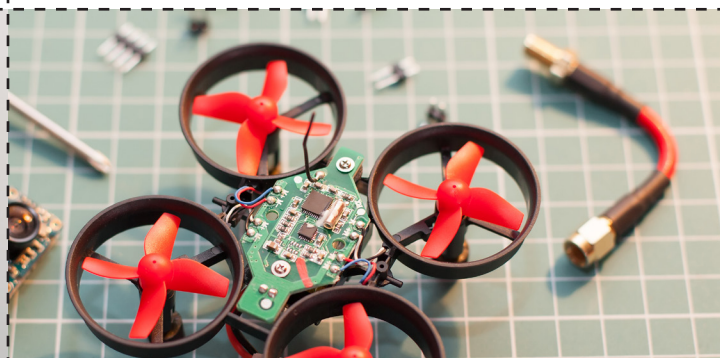
PART: Controller *Smartphone robot*

Smart phone apps can be used to control robots remotely. They can also be attached to the robot to provide GPS, tilt, camera, and other sensing.



PART: Controller *Laptop robot*

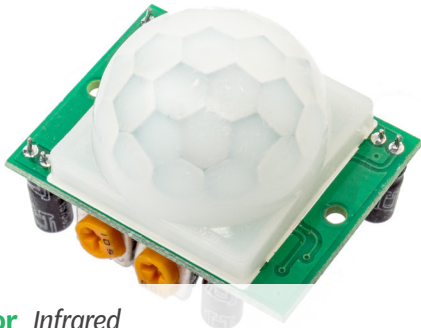
A laptop or tablet can be used to control a robot.



PART: Sensor *Accelerometer (speed and tilt)*

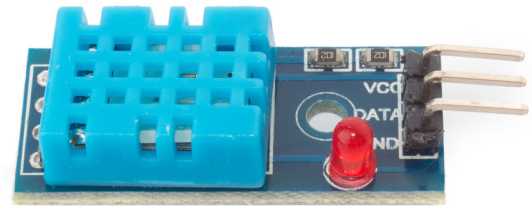
Accelerometers tell robots their direction, speed, and their angle of tilt in by measuring changes in the force of gravity and motion.

(continued)



PART: Sensor *Infrared*

Infrared (IR) motion sensors let robots know when they are near people or animals by detecting small amounts of heat given off in the form of IR radiation.



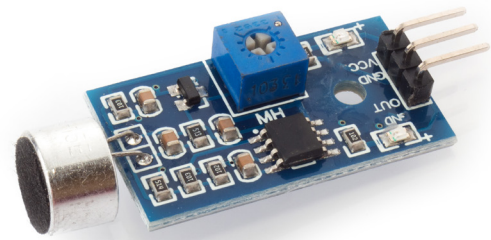
PART: Sensor *Temperature and Humidity*

Temperature and humidity sensors let robots collect information about the environment by measuring changes in the ability of the air to conduct electricity.



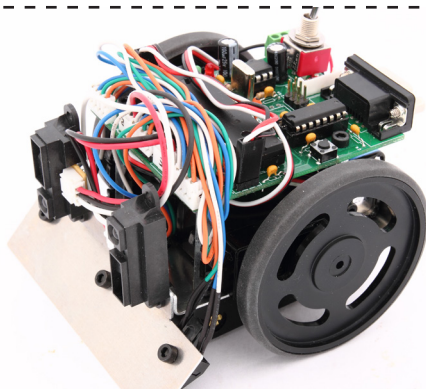
PART: Effector *Robotic hands*

Experimental robotic hands can be controlled by arm muscle movements or even brain waves.



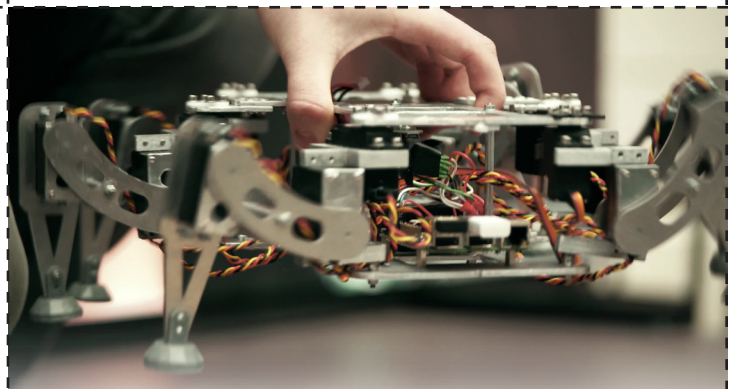
PART: Sensor *Sound*

Robots use sound sensors with microphones to pick up sound waves in the air. In this picture, the microphone is on the left side of the picture.



PART: Effector *Wheels*

Robots with two wheels can make tight turns.



PART: Effector *Legs*

Robots with more than two legs have extra stability.

(continued)



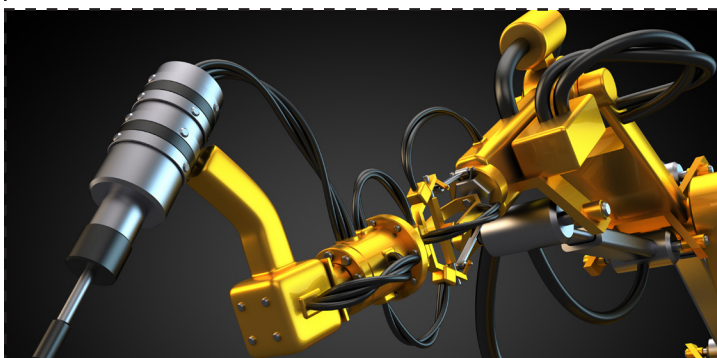
PART: Effector *Helicopter rotors*

Quadcopters use robotics to control their rotors and keep them flying steady while human pilots tell them where to go using remote control.



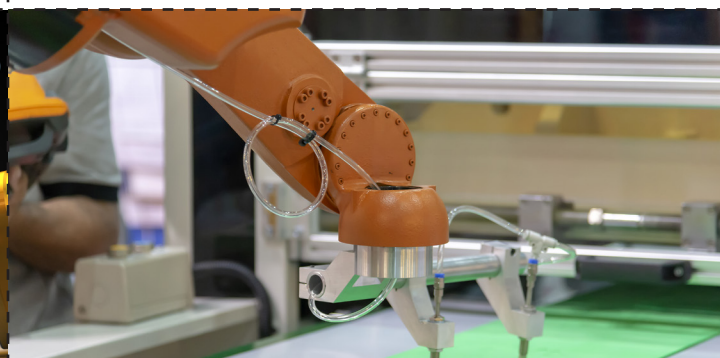
PART: Effector *Treads*

Robots with treads can move over difficult terrain.



PART: Actuator *Hydraulic systems*

A hydraulic system uses fluid such as oil pumped through tubes to make robot parts move.



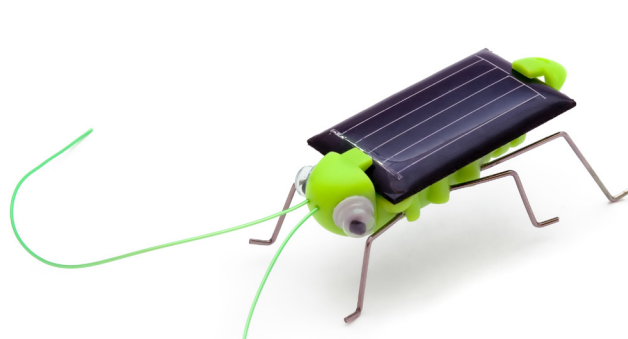
PART: Actuator *Pneumatic systems*

A pneumatic system uses air pumped through tubes to make robot parts move.



PART: Actuator *Batteries*

Batteries produce electricity through chemical reactions. They are used to power many kinds of robots.



PART: Actuator *Solar panels*

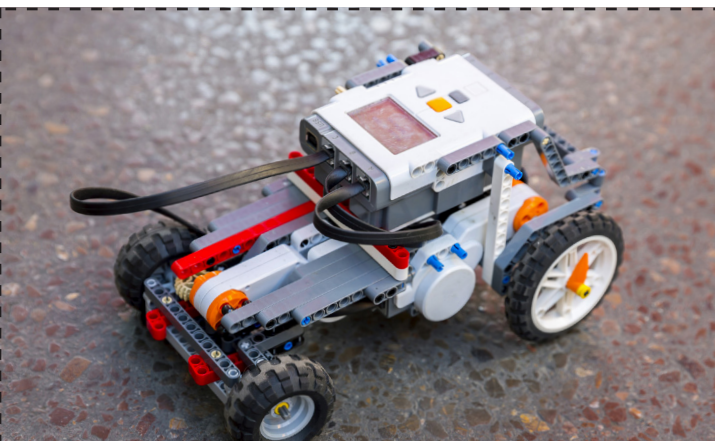
Solar-powered robots use the energy of light waves to produce electricity.

(continued)



PART: Sensor *Bump and turn*

Robot vacuums use advanced sensors to make them turn when the bump into an object. Simple robots can do the same thing using on/off buttons that temporarily stop one wheel spinning, making them veer in the other direction.

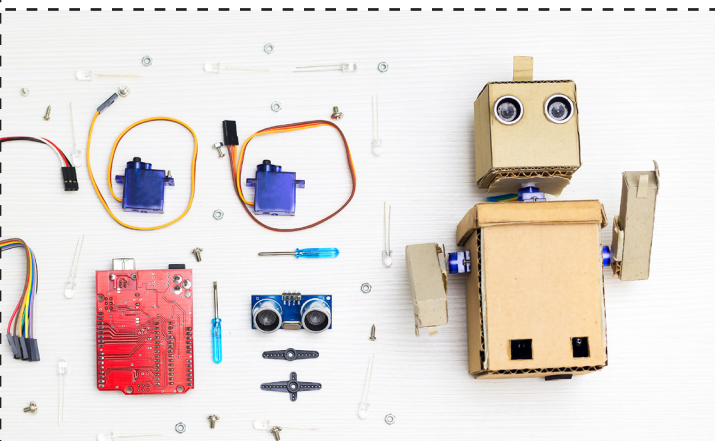


PART: Housing *Plastic robot*



PART: Sensor *GPS*

Self-driving robotic cars use GPS to navigate city streets.



PART: Housing *Cardboard robot*



PART: Housing *Humanoid robot*



PART: Housing *Robotic vehicle*

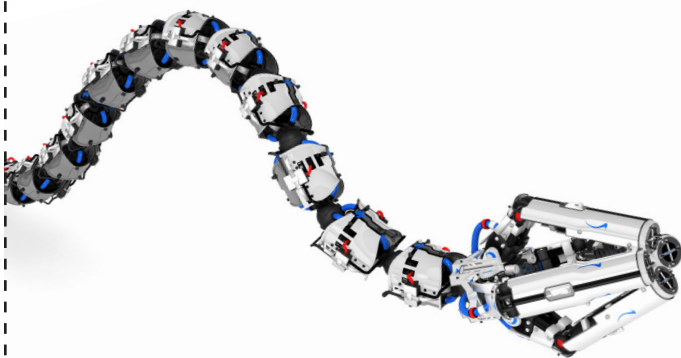
(continued)



PART: Actuator *Solenoid pistons that go back and forth*
A solenoid is a piston that can push and pull parts of a robot. It's powered by electromagnets that can be turned on and off.



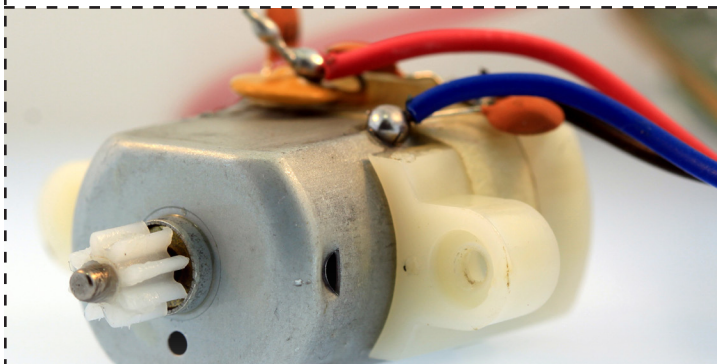
PART: Sensor *Light*
Light sensors contain a chemical they carries more electricity when exposed to light. They help line-following and photovore (light-seeking) robots tell dark areas from bright areas.



PART: Effector *Robot tentacle*
Flexible tentacles let robots reach more areas than traditional arms.



PART: Housing *Metal robot*

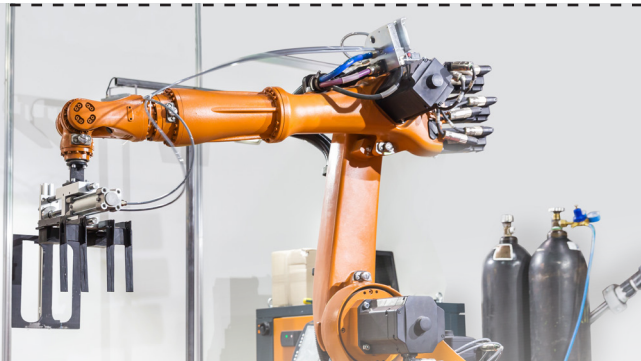


PART: Actuator *Motors that spin*
Battery powered DC (direct current) motors are found in toys, electronics kits, and hobby robots.



PART: Sensor *Image (camera)*
Robots use cameras to recognize faces and objects. They also transmit images back to their human controller.

(continued)



PART: Effector *Robotic arms*

Robot arms are used in factories and warehouses to move heavy objects.



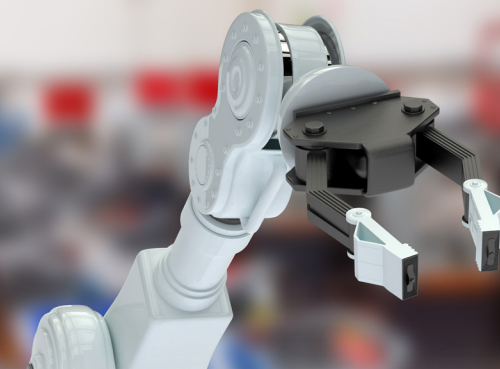
PART: Effector *Wings (insect, etc.)*

Robotic drone aircraft can navigate on their own.



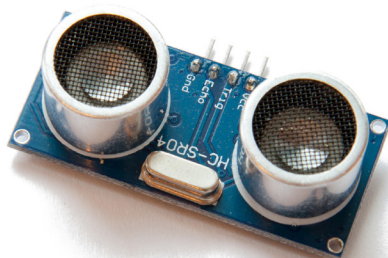
PART: Controller *Raspberry Pi*

A Raspberry Pi is a miniature computer that is sometimes used as a controller on hobby robots.



PART: Effector *Claws*

Robot claws are simpler to control than complete robot hands.



PART: Sensor *Ultrasound*

Ultrasound sensors work like sonar to detect objects by bouncing sound waves off them. Robots often use two sensors to act like eyes that provide “3D vision.”



PART: Controller *Arduino microcontroller board*

An Arduino microcontroller board is a simple computer designed to run one program at a time. It is often used in beginning robotics projects.