Design Your Own Vibrobots

https://www.sciencebuddies.org/science-fair-projects/project-ideas/Robotics_p030/robotics/vibrobots
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Experimental Procedure

Note: This engineering project is best described by the **engineering design process,** as opposed to the **scientific method.** You might want to ask your teacher whether it's acceptable to follow the engineering design process for your project before you begin. You can learn more about the engineering design process in the Science Buddies Engineering Design Process Guide (http://www.sciencebuddies.org/engineering-design-process/engineering-design-process-steps.shtml).

Assembling Your Circuit

Before you design and build your vibrobot, you need to learn how to connect the motor and battery wires to create a **circuit** so electricity flows through the motor and causes it to vibrate. To connect them, twist together the exposed metal parts of the wires, as shown in Figure 2. The motor should start vibrating. Do not let the battery's red and black wires touch each other—this will create a **short circuit** and drain the battery very quickly. **Note:** be gentle with the motor wires. They are thin and can rip out if you are not careful. You can apply a dab of hot glue at the base of the wires to help reinforce them.

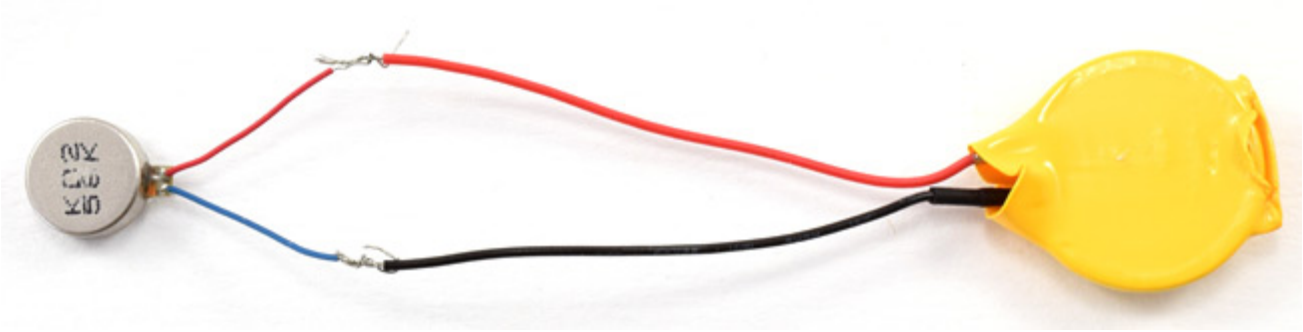

Figure 2. Motor (the gray circle on the left) and battery (the yellow circle on the right) wires connected to form a circuit.

You will need to attach the battery and motor to the body of your robot once it is built. The motor has a built-in sticky backing (peel off the protective paper first), but you will need to use tape or glue to attach the battery. For now, disconnect *one* set of wires to turn your motor off and save battery power.

Designing Your Robot

Remember that this section will follow the engineering design process (http://www.sciencebuddies.org/engineering-design-process/engineering-design-process-steps.shtml#theengineeringdesignprocess), so there is not an exact step-by-step procedure for you to follow. In general, you will need to build a body for your robot using household and craft materials, and then attach the motor and battery. However, there is no single right way to build a vibrobot.

1. Define your problem. What type of vibrobot do you want to build? Do you want to build a fast racing robot? Do you want to build a sumo wrestling robot? Do you want to build a robot that bounces off obstacles without getting stuck? What you decide to build is up to you!
2. Do background research about vibrobots. The information in the background (#background) section should help you think about some of the design factors that will affect your robot's performance.
3. Specify requirements for your robot. These requirements will depend on the type of robot you want to build and what you want it to do. For example, for a racing robot you could say, "The robot should be able to go straight over a distance of at least 30 centimeters."
4. Brainstorm different designs for your robot. Look around your house for materials you could use. Figure 1 in the

background (#background) section will give you some ideas for different designs, but use your imagination and come up with your own! What will you use for your robot's body? Will your robot have legs? How will you connect the motor and battery to the robot's body? Use your design notebook to sketch out different ideas before you start building anything.
5. Build a **prototype**, or initial version, of the design you think will work best. It is OK if your design does not work out exactly like you thought it would. You might realize as you start to build that there is a problem with your design. The engineering design process is **iterative**, meaning sometimes you go back and do the steps more than once. Engineers rarely get things right on the first try!
6. Test your robot! Connect both sets of wires to complete the circuit and make the motor vibrate. Then, put your robot down on a smooth surface and watch it go! Remember that your robot might not work like you want it to the first time. It might fall apart, it might fall over, it might not move at all! This is OK—now you can redesign and improve your robot.
7. Does your robot meet the requirements you set in step 3? If not, keep going back through steps 4–6 until you have a robot that meets all your requirements. For example, maybe you wanted to build a racing robot that goes straight, but your robot always curves off to one side. You will need to figure out how to adjust your design to make it go straight. You might decide to make small changes to your existing design, or start again with a totally new design. Remember that the engineering design process is iterative, and you might go through the steps multiple times. If you need to present your project (see next step), it will help to use your lab notebook to document changes you make to your robot or take pictures of each new design.
8. Communicate your results. Once you have a working robot, you are ready to present your project. If possible, bring your robot to demonstrate it in your classroom or at your science fair. You can also make a display board (http://www.sciencebuddies.org/science-fair-projects/science-fair/science-fair-project-display-boards) documenting your design process. Keep in mind that the display board for an engineering design project will be slightly different than one for a scientific method project. You can see a comparision of the engineering design process and the scientific method on this page (http://www.sciencebuddies.org/science-fair-projects/engineering-design-process/engineering-design-compare-scientific-method).